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D E C I S I O N
of 15 June 2000

Case Number: T 1124/97 - 3.2.6

Application Number: 89307508.5

Publication Number: 0353005

IPC: D03C 3/20

Language of the proceedings: EN

Title of invention:
Loom or like control

Patentee:
Palmer, Raymond Leslie

Opponent:
PICANOL N.V.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 123

Keyword:
"Amendments - added subject-matter (no)"
"Disclosure - sufficiency - skilled person (yes)"
"Novelty (claim 1 - main request) (no) (claim 1 - first and second auxiliary request) (yes)"
"Inventive step (claim 1 - first auxiliary request) (no) (claims 1 and 12 - second auxiliary request) (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1124/97 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.2.6
of 15 June 2000

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 12 September 1997 rejecting the opposition filed against European patent No. 0 353 005 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: P. Alting van Geusau
Members: H. Meinders
C. Holtz

Summary of Facts and Submissions

I. The opposition against European patent No. 0 353 005, granted in respect of application No. 89 307 508.5, was rejected by the Opposition Division by decision announced on 17 June 1997 and posted on 12 September 1997.

As state of the art the following document was considered most relevant:

D1: JP-A-59-192749 (of which the English translation filed by the Opponent was used in the proceedings)

The Patentee submitted on 6 September 1996 the following documents in the opposition proceedings:

D10: Statutory declaration by Mr R. L. Palmer (patentee)

D11: Statutory declaration by Mr R. R. H. Bucher

D12: Statutory declaration by Mr F. Sciacca

D13: Statutory declaration by Mr J. E. Freeman,

and during the oral proceedings held on 17 June 1997 a further document:

D10A: "Explanation of open loop and closed loop control"

Independent claim 1 of the patent in suit reads (feature numbering has been introduced by the Board for easy reference):

1. "A fabric forming machine having

2. apparatus for controlling the movement of members (3) for moving yarn (W) to form a fabric of a selected pattern, the apparatus characterised by:

3. a plurality of electronically controlled electric actuators (1)

4. each of which has connection means (2, 2[1], 8) for connecting it to at least one of said members (3)

5. and is actuable to move said at least one member in a substantially linear movement between first and second extreme positions;

6. computer means having a memory for storing data representing selected operating parameters for producing a preselected textile pattern, and

7. data transfer means for inputting said data into said memory; and wherein

8. said computer means is operable to control actuation of said actuators (1) in a preselectable manner in dependence on said data to cause each said actuator selectively to move said at least one member (3) into a selected one of said first and second extreme positions; wherein

9. said first and second extreme positions are variable in response to said selected operating parameters to produce said preselected textile pattern,

10. said first and second extreme positions being controlled by said computer means in response to stored data representing said selected operating parameters; and wherein

11A. said fabric forming machine is either a weaving machine with said members being healds of said machine, or

11B. said machine is a knitting machine with said members being yarn actuating members; and wherein

12. means (6, 7) are provided for monitoring movement of each said member (3, Y) between said extreme positions in response to actuation of the associated actuator (1) by said computer means thereby to indicate deviation of said movement from normal operation."

Independent method claim 16 of the patent in suit reads:

"A method of controlling the movement of yarn moving members (3,Y) in a fabric forming machine to form fabric of a selected pattern, the method being characterised by:

providing a plurality of electronically controlled electric actuators (1) each of which is connected to at least one of said members (3,Y) and actuable to move said at least one member in a substantially linear movement between first and second extreme positions; storing data representing selected operating parameters for producing a preselected textile pattern; controlling actuation of said actuators (1) in a

preselectable manner in dependence on said data to cause each said actuator selectively to move said at least one member (3,Y) into a selected one of said first and second extreme positions;
and including the steps of:
connecting each said actuator (1) to said at least one member (3,Y) by connection means (2,2^{1},8), said actuator being operable to move said connection means along its own path in a forward or reverse direction, to move said member between said first and second positions; and controlling locations of said first and second extreme positions in response to said stored data representing selected operating parameters to produce said preselected textile pattern; and wherein said fabric forming machine is either a weaving machine with said members being healds of said machine, or said machine is a knitting machine with said members being yarn actuating members; and further characterised by monitoring movement of each said member (3,Y) between said first and second extreme positions in response to actuation of the associated actuator (1) thereby to indicate deviation of said movement from normal operation."

II. The Appellant (Opponent) both filed the notice of appeal against this decision and paid the appeal fee on 11 November 1997. On 8 January 1998 the statement of grounds of appeal was filed.

In the statement of grounds of appeal the Appellant maintained his objections raised in opposition regarding lack of novelty, lack of inventive step, lack of sufficient disclosure and unallowable amendment (Article 100(a), (b) and (c) EPC).

III. The Respondent (Patentee) argued in a letter of 27 November 1997 that the appeal was not admissible as it did not indicate the extent to which amendment or cancellation of the decision under appeal was required.

IV. In an annex to the summons to oral proceedings the Board expressed its preliminary opinion that the appeal appeared to be admissible and that the patent appeared to disclose the invention sufficiently clearly for the skilled person to carry it out. Objections remained regarding extension of subject-matter, novelty and inventive step.

With his reply to the summons the Appellant filed the following further documents:

D15: GB-A-2 145 120

D16: EP-A-0 235 987

D17: DE-A-2 257 224

D18: US-A-4 195 671

D19: US-A-3 853 150

V. Oral proceedings were held on 15 June 2000.

The Appellant requested revocation of the patent in its entirety.

The Respondent requested dismissal of the appeal, auxiliarily maintenance of the patent in amended form according to two auxiliary requests as filed in the oral proceedings. The objection in respect of

inadmissibility of the appeal was withdrawn.

Claim 1 of the *first auxiliary request* reads:

1. "A fabric forming machine having

2. apparatus for controlling the movement of members (3) for moving yarn (W) to form a fabric of a selected pattern; the apparatus characterised by:

3. a plurality of electronically controlled electric actuators (1);

4. each actuator has connection means (2, 2^1, 8) for connecting it to at least one of said members (3);

5. each actuator is independently actuable to move said at least one member in a substantially linear movement between first and second extreme positions;

6. computer means having a memory for storing data representing selected operating parameters for producing a preselected textile pattern;

7. (said) computer means having data transfer means for inputting said data into said memory;

8. said computer means is operable to control actuation of said actuators (1) in a preselectable manner in dependence on said data to cause each said actuator selectively to move said at least one member (3) into a selected one of said first and second extreme positions;

9. said first and second extreme positions are variable in response to said selected operating parameters to produce said preselected textile pattern;

10. said first and second extreme positions being controlled by said computer means in response to stored data representing said selected operating parameters;

11A. said fabric forming machine is a weaving machine with said members being healds of said machine, or

11B. said fabric forming machine is a knitting machine with said members being yarn actuating members;

12. means (6, 7) forming part of a feedback closed loop in a diagnostic routine for monitoring movement of each said member (3, Y) between said extreme positions in response to actuation of the associated actuator (1) by said computer means thereby to indicate deviation of said movement from normal operation including incorrect linear motion."

Claim 1 of the *second auxiliary request* reads:

1. "A weaving machine having

2. apparatus for controlling the movement of healds (3) for moving yarn (W) to form a fabric of a selected pattern;

3. a plurality of electronically controlled electric actuators (1);

4. each actuator has connection means (2, 2[1], 8) for connecting it to a respective one of said healds (3);

5. each actuator is independently actuable to move said respective heald in a substantially linear movement between first and second extreme positions;

6. computer means having a memory for storing data representing selected operating parameters for producing a preselected textile pattern;

7. said computer means having data transfer means for inputting said data into said memory;

8. said computer means is operable to control actuation of said actuators (1) in a preselectable manner in dependence on said data to cause each said actuator selectively to move said respective heald (3) into a selected one of said first and second extreme positions;

9. said first and second extreme positions are variable in response to said selected operating parameters to produce said preselected textile pattern;

10. said first and second extreme positions being controlled by said computer means in response to stored data representing said selected operating parameters thereby to enable oblique or parabolic shedding during operation;

11. means (6, 7) forming part of a feedback closed

loop system in a diagnostic routine for monitoring movement of each said heald (3) between said extreme positions in response to actuation of the associated actuator (1) by said computer means thereby to indicate deviation of said movement from normal operation including incorrect linear movement."

Independent method claim 12 of the *second auxiliary request* reads:

"A method of controlling the movement of healds (3) in a weaving machine to form fabric of a selected pattern, the method comprising the steps of:

providing a plurality of electronically controlled electric actuators (1) each of which is connected to a respective one of said healds (3) and independently actuable to move said heald in a substantially linear movement between first and second extreme positions;
storing data representing selected operating parameters for producing a preselected textile pattern;
controlling actuation of said actuators (1) in a preselectable manner in dependence on said data to cause each said actuator selectively to move said heald (3) into a selected one of said first and second extreme positions;
connecting each said actuator (1) to said respective heald (3) by connection means (2,2^1,8), said actuator being operable to move said connection means along its own path in a forward or reverse direction, to move said heald between said first and second positions;
controlling locations of said first and second extreme positions in response to said stored data representing selected operating parameters to produce said

preselected textile pattern thereby to enable oblique or parabolic shedding during operation; and using a feedback closed loop system in a diagnostic routine to monitor movement of each said heald (3) between said first and second extreme positions in response to actuation of the associated actuator (1) thereby to indicate deviation of said movement from normal operation including incorrect linear movement."

VI. The arguments of the Appellant in support of its requests can be summarised as follows:

Amendments:

The original application lacked any disclosure of the computer controlling, i.e. varying, the extreme positions of the yarn moving members as was claimed (feature 10) in claim 1 of the granted patent. Furthermore, there was no original disclosure of which of the operating parameters determining the textile pattern should be selected for controlling the extreme positions of the yarn moving members (features 9 and 10).

As regards the first auxiliary request: the only originally disclosed monitoring means (feature 12) could not indicate incorrect linear motion as these were only disclosed as end position sensors, not as intermediate position sensors.

As regards the second auxiliary request: the application as filed did not disclose the possibility of changing the extreme positions for oblique or parabolic shedding **during** operation of the machine (feature 10). Further, the third intermediate position

of the healds (dependent claims 2 and 13) could only be arrived at when the machine was standing still, but not during weaving operation of the machine as was now implied by the mention "to enable oblique or parabolic shedding during operation" in the claim.

Sufficiency of disclosure:

The patent in suit contained as features only objects to be achieved, but not the technical means to achieve them. It did not supply the skilled person with information concerning which of the operating parameters determining the textile pattern should specifically be selected for the controlling of the extreme positions and how this control should be carried out by a computer, because the operating parameters for a textile pattern had nothing to do with the extreme positions of the yarn moving members. To be able to do this the machine needed intelligent actuators or the computer needed information on intermediate positions of the yarn moving members between their extreme positions, which it could not receive as only end position sensors were disclosed.

Novelty and inventive step:

D1 disclosed all features of claim 1 of the main request, in its embodiment involving sensors at the warp centre line with magnetic scales mounted on the heald frames. The other types of actuator mentioned in D1 did not necessarily show overshoot at the extreme positions as experienced with linear induction motors, therefore the heald frames could be moved "into" the extreme positions as claimed. The machine according to D1 detected incorrect velocity and/or wrong direction

of movement, which was the same as "indicating a deviation of the movement from normal operation". The claim did not mention varying of the extreme positions **during operation**, nor that the monitoring means provided position information, so these features could not distinguish the subject-matter of the claim from that disclosed in D1.

D1 also disclosed all features of claim 1 of the first auxiliary request in that the heald frames had individually controlled actuators. The mention in D1 of detecting and adjusting velocity was an indication of a closed-loop control system for the actuators, which was the same as monitoring incorrect linear motion. In any event, it would be obvious to the skilled person to improve the velocity/direction control in the machine disclosed in D1 by a closed-loop control using position information.

In respect of the second auxiliary request: the person skilled in weaving, being familiar with oblique or parabolic shedding, would adapt the setting-up of the weaving machine disclosed in D1 accordingly, if the need therefor arose. Individual actuation of warp yarns was equally well known in the field of weaving, see D18 or D19. Individual actuation of knitting yarn members was also known, see D15 or D16, both disclosures from the closely-related field of knitting machines. A skilled person had no difficulty incorporating teachings from the knitting field into weaving machines or applying the concept of individual heald actuation of D18 or D19 to the machine of D1.

VII. The Respondent disputed the Appellant's conclusions and argued essentially as follows:

Amendments:

The computer control of the extreme positions during weaving was evident from the original application documents referring to the computer determining the size and shape of the shed as well as the speed of how the shed size and shape is operated. To any person skilled in the field of weaving or knitting the term "pattern" involved not only the "colour pattern", but also the cloth pattern (density, texture). Any such pattern required the selection of operating parameters, including those for the size and shape of the shed.

As regards the first auxiliary request, the monitoring means detecting departure from correct linear movement were originally described as providing feedback forming part of a closed loop system. This could only be achieved by providing intermediate position information.

Regarding the second auxiliary request: the amendments in claims 1 and 12 also had their basis in the description. Because of the computer control being capable of varying the extreme positions to enable oblique or parabolic shedding and the software enabling the computer to call up any pattern for immediate use, the extreme positions could be varied during operation. Bringing the healds also to a third intermediate position during operation (dependent claims 2 and 13) was evident from those parts of the original application referring to threading and splicing.

Sufficiency of disclosure:

The skilled person setting up a loom knew very well

which operating parameters to choose for the colour pattern and which for the quality of the cloth. For the latter the operation of the shed (shape, size, speed) was important, which determined *inter alia* the density and texture of the cloth. The servomotors as well as the monitoring means referred to provided intermediate position information.

Novelty and inventive step:

Main request:

The machine disclosed in D1 was not capable of varying the extreme positions during weaving, nor did it operate by position control as did the machine according to claim 1. Moving the members "into extreme positions" meant a specific position, which the machine disclosed in D1 could not achieve due to overshoot at the end positions as its operation was controlled by end position sensors.

First auxiliary request:

The machine disclosed in D1 had no independently actuable heald frames; the reference to plain weave also implied a linked movement of these frames because heald frames were usually provided in pairs. The reference in the claim to "a closed loop in a diagnostic routine" implied a closed-loop control of the yarn moving members in which output controlled input. D1 did not show such a control nor did it suggest one, because it mainly concerned an open loop control system.

Second auxiliary request:

D1 did not disclose or suggest individual actuation of each heald, nor did it allow for changing the shed size and shape during operation by varying the extreme positions, as now claimed. D18 or D19 did not suggest position monitoring of the individual healds; their control was in any event problematic due to the valves involved. D15 or D16 relating to knitting machines would not be considered relevant by the person skilled in weaving as the technology of knitting machines was not easily transferable to weaving machines. Moreover, the individual knitting members disclosed in these documents were not independently movable, nor were their positions monitored.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of the late filed documents*

2.1 Together with a letter of 8 May 2000, i.e. after expiry of the opposition period, the Appellant filed five new documents (D15 to D19).

Documents D15, D16, D18 and D19 are admitted into the proceedings as they are related to the issues of feedback control of changeable extreme positions of members moving yarn (D15 and D16), independent individual raising and lowering of weft threads (D18) and oblique shedding (D19), issues which either can be seen as a reaction to the decision under appeal or which gained relevance only in the appeal proceedings.

Document D17 is not admitted into the proceedings since

the Appellant did not supply the Board with any information as to the particular relevance of this document. To the Board it is, furthermore, not *prima facie* more relevant than the documents referred to above.

2.2 If a document is relied upon for the first time during the appeal proceedings and it is admitted because it is relevant, the case should normally be remitted to the department of first instance (see Case law of the Boards of Appeal of the EPO, 3rd edition 1998, VII, D-9). However, these documents were brought forward as evidence of prior disclosure, in this field of technology, of features already under discussion in respect of novelty and inventive step of the subject-matter of claim 1 of all requests when compared with D1, a document which has been under discussion from the outset of the opposition proceedings. Further, they were filed before expiry of the time limit indicated by the Board for filing further submissions in preparation for the oral proceedings and are of no particular difficulty to understand. There has thus been sufficient time for the parties as well as the Board to study the content of these documents and to prepare for a discussion of them. For these reasons, and because neither the Respondent nor the Appellant expressed objections in this respect, the Board deems it expedient, in view of the advanced state of the proceedings and the fact that all substantive issues (allowability of amendments, sufficiency of disclosure, novelty and inventive step) raised in the opposition and appeal have been dealt with, to exercise pursuant to Article 111(1) EPC the power within the competence of the Opposition Division to decide on novelty and inventive step of the subject-matter of the claims in

respect of these documents also.

3. *Amendments (Article 123(2) EPC)*

3.1 Main request

3.1.1 The computer control of the extreme positions of the yarn moving members is evident from page 9, last paragraph, to page 10, second paragraph, and claim 1 of the original application documents referring to the control of the actuators by the computer, the computer determining the size and shape of the shed as well as the speed of how the shed size and shape is operated.

3.1.2 In claim 1 as granted only the term "textile pattern" is used. Normally this involves only the colour or weave pattern, determined by the operating parameter "which warp yarn is lifted when". Due to the use in the claim of the term "textile pattern" in connection with the extreme positions of the yarn moving members, which do not affect the colour or weave pattern, the question arises whether this term should be interpreted as involving only the colour or weave pattern or also other technical aspects of the woven or knitted cloth.

The original application has a number of references to the pattern **and the design** of the cloth in connection with the extreme positions of the members as well as with the computer control thereof, see page 7, second paragraph, page 9, last paragraph, and page 10, third paragraph, referring to the shedding of the warp threads effected by the actuators to achieve a pattern or design, the possibility of oblique or parabolic shedding and the introduction of pattern and/or **obliqueness data** in the computer. It is further

mentioned in the description (page 11, second paragraph) that the computer provides setting-up procedures and operation from any of a wide range of patterns **or the like** stored in the computer. The original main claim refers to the computer controlling the actuators for the members moving yarn in accordance with a preselected pattern, **design or the like**.

3.1.3 It is well known that the **design** of a woven or knitted cloth involves *inter alia*:

- the **density** determined by the operating parameter: "number of weft threads per length of cloth" (which is linked to the operating parameter "size and shape of the shed" because for a high density of weft threads it is necessary to have a wide shed opening) and

- the **texture** determined by the operating parameter: "size and shape of the shed" and "obliqueness", i.e. the extent of the extreme positions of individual warp threads, relative to those of other warp threads.

In view of the above the term "textile pattern" used in claim 1 as granted should be interpreted in the sense of "colour pattern as well as the technical design of the cloth" and not in the sense of only the "colour pattern", as interpreted by the Appellant.

3.1.4 The "operating parameters" as referred to in claim 1 (features 6, 9 and 10) are thus the operating parameters related to the colour pattern as well as those which are related to other design aspects such as density and texture. The qualification "selected"

relates to the necessity of choosing the operating parameters according to a selected pattern or design.

The general indication "operating parameters" finds its basis in the reference in the original description, page 9, third paragraph, to page 11, second paragraph, to "pattern data", "obliqueness data", "data regarding the geometry of the shed" "data regarding the speed of operation of the shed", "data regarding the centre or closed shed operation" and "data for setting up the loom".

Of all these data those which are related to the shed size and shape ("obliqueness data", "geometry data", "speed data") have to do with the extreme positions of the members for moving yarn, with the help of the computer controlling these positions.

There is thus sufficient basis in the original application for interpreting "selected operating parameters" as parameters related to the textile pattern as well as to the extreme positions of the yarn moving members as claimed in features 6, 9 and 10 of claim 1.

3.1.5 The above interpretation is not at odds with the declaration of Mr Freeman (D13), page 4, point 8, as argued by the Appellant. This declaration also refers to the density of the material being determined by the setting of the extreme positions of the members. The reference to the extreme positions of the members not needing to be altered to suit the actual weave pattern is correct in that, in the context of the declaration, "weave pattern" is the same as "colour pattern", as referred to above. The patent in suit, however, refers

to the overall **pattern and design** of the cloth, which also involves the extreme positions of the yarn moving members to be set and controlled for a specific shed size and shape, as explained in point 2.1.4.

3.1.6 The Appellant also argued that there was no disclosure in the original application of the computer changing the extreme positions of the yarn moving members **during operation of the machine**. The Opposition Division had considered this to be an important distinguishing feature of the machine according to the patent in suit when compared with the disclosure in D1.

As this feature is not present in the claims of the main request (nor in those of the first auxiliary request), this matter need not at this point be further discussed, but will be taken into account when considering the amendments according to the second auxiliary request.

3.1.7 The subject-matter of claim 1 of the main request being otherwise also derivable from the original application documents, the requirements of Article 123(2) EPC are fulfilled.

3.2 First auxiliary request

3.2.1 The amendments involve the specification in claim 1 that each actuator is independently actuable (feature 5) and in that the means for monitoring movement of each member form part of a feedback closed loop in a diagnostic routine, capable of indicating deviation of normal operation, including incorrect linear motion (feature 12). The basis for these features can be found in page 9, fourth paragraph, and page 4, last

paragraph, to page 5, first paragraph, respectively of the original application documents.

3.2.2 The Appellant has argued that the original application did not disclose a feedback closed loop system in the control of the extreme positions as there was no disclosure of a detection of the actual position of each of the yarn moving members. Further, there were only end detectors for the linear actuators, the heddle frame or the cord operating the member, which were only capable of checking whether or not full linear operation was taking place, but not whether **intermediate positions** were reached or passed by the yarn moving members **themselves**.

The original application, in the paragraph bridging pages 4 and 5, mentions a scanner 7 as sensing means following a metal tag 27 on the cord operating the member moving the yarn for detecting any departure of correct movement of that member, i.e. a sensor providing information on intermediate positions. This is distinguished from the sensing means 6 detecting any departure from full linear operation of the actuators, i.e. a pair of end position sensors. Figure 3 shows this means 17 as a single entity, not as two end position sensors 6. Page 13, third paragraph, refers to cord movement being sensed at 7, 77 to detect immediately faulty operation or non-operation of the yarn feeders Y. These too are not drawn as end position sensors. Page 6, last sentence, to page 7, first paragraph, refers to monitoring and sensing means 17 respectively for detecting incorrect movement of the hooks 8 and the heddle 8 (i.e. **the members for moving yarn themselves**) respectively.

According to page 10, fourth paragraph, to page 11, second paragraph, the machine is controlled by a computer, which is able to advise on the management and the performance of the apparatus and to control the sequence of operations in connection with a wide range of patterns, designs or the like stored in the computer. The end position sensors 6, for detecting departure of full linear operation, and the scanner 7, for detecting departure from correct linear movement, are described as providing feedback forming part of a closed loop system in providing a diagnostic routine. From this it is evident that the data from the sensors 6 and 7 provide an input for the computer in the management, performance and operation control of the machine. A diagnostic routine for correct (linear) movement of the yarn moving members provided by a closed loop system can only function properly if it involves data regarding intermediate positions of these members. As it is mentioned in the indicated passage of the original application as well as original claim 1 that the computer takes care of the operation control of the machine to achieve a selected pattern, design or the like, any person skilled in the control of weaving or knitting machines would know that this can only be achieved if the feedback data from sensor 7 are used to diagnose and indicate incorrect linear movement of the members. This in turn can only be done properly and accurately if location information on intermediate positions of the yarn moving members is collected.

3.2.3 The amendments further limit the subject-matter of claim 1 as granted and thus the requirements of Article 123(2) and (3) EPC are both fulfilled.

3.3 Second auxiliary request

3.3.1 The amendments to claim 1 additionally involve the limitation of the subject-matter to a weaving machine, the specification that the members for moving yarn are healds and that the controlling of the extreme positions of the healds is for enabling oblique or parabolic shedding during operation (feature 10).

3.3.2 At this point it is appropriate to discuss the Appellant's objection that the original application does not disclose the possibility of changing the extreme positions of the healds **during operation**, which was not relevant for the main and the first auxiliary request (see point 3.1.6). In the present claim 1 this is now mentioned in feature 10 ("thereby to enable oblique or parabolic shedding during operation").

According to the original application the computer controls the extreme positions when oblique or parabolic shedding is required and it is capable of controlling the operation of the machine in accordance with a preselected pattern or design which can be "called up instantly for immediate use". The speed of how the shed size and shape is operated is also programmable in the computer. To a skilled person this implies that during operation it can be switched from one pattern or design to another or from one shed configuration to another. In the Board's opinion this implies that changing of the extreme positions during weaving is possible.

The basis for these amendments can be found in the original application, page 6, last paragraph, to page 7, first paragraph and page 10, third paragraph, to page 11 second paragraph.

3.3.3 The amendments to the method claim (now claim 12) involve identical features as introduced/amended in the apparatus claim 1, and their basis in the original application can therefore be found in the passages already referred to above.

3.3.4 As the amendments also involve further limitation of the subject-matter of these independent claims, the requirements of Article 123(2) and (3) EPC are fulfilled.

3.3.5 The amendments to the description and Figures represent acknowledgement of the prior art for the purposes of Rule 27(1)(b) EPC, consistency of wording between the claims and the description (Article 84 EPC) and the deletion of embodiments no longer falling under the wording of the claims (Article 84 EPC).

3.3.6 The Appellant has argued, regarding claims 2 and 13 of this request, dependent on claim 1 and claim 12 respectively, that the original application, page 9, third and fourth paragraphs, disclosed the claimed third intermediate position of the healds only in connection with the machine **not** being in operation. In view of the amended wording in a preceding feature ("thereby to enable oblique or parabolic shedding during operation"), the additional possibility of moving the healds into this third intermediate position **during weaving operation** was now claimed, which was not justified in respect of the original application, nor did it make technical sense.

The Board is not of the same opinion. The reference in claims 1 and 12 to enabling oblique or parabolic shedding "during operation" relates only to the

possibility of modification of the first and second extreme positions during operation. The capability of the computer control to move the heald in a preselectable manner into either the first, second or a third (intermediate) position as it is now claimed in claims 2 and 13 is a feature in its own right, not related to an ongoing weaving operation of the machine. Moreover, contrary to the opinion expressed by the Respondent, the indicated passages of the original description clearly state that the third position applies to the machine not operating, namely during threading of warp threads or longer periods of standstill.

4. *Sufficiency of disclosure (Article 83 EPC)*

4.1 The patent in suit concerns weaving or knitting machines. The person skilled in this field of technology can be expected to know that, in setting up a loom or a knitting machine to achieve a specific colour pattern, density and texture of the cloth to be woven or knitted, he has to select operating parameters and to enter data in the computer control of the machine. These are, according to the patent in suit (column 6, line 3, to column 7, line 14):

- colour pattern data (which warp thread is lifted or lowered at which point in time),

- shed size and shape data (the relative extreme positions of the warp threads at which point in time),

- data regarding the speed of change of shed size and shape,

- setting up data,

- data regarding the centre or closed shed position.

This is considered sufficient indication in the patent in suit for a skilled person setting up a loom as to which operating parameters are important and which data should be introduced in the computer control of the machine, in particular the data determining the shed size and shape for the control of the extreme positions.

4.2 The Appellant argued that the patent in suit did not supply the skilled person with information on how to detect intermediate positions of the yarn moving members. Apparently intelligent actuators were used in actual practice, as was also argued by the Respondent. About such actuators there is, however, no information in the patent in suit.

The use of intelligent actuators providing position information themselves is not disclosed as such in the patent in suit, but is also not necessary for carrying out the invention. This is because the references to the scanner (7) or the sensing means (17) detecting any departure from correct movement of the yarn moving members (heddles or hooks 8) in column 3, line 56, to column 4, line 10 and column 4, line 51, to column 5, line 12, are considered sufficient information to the skilled person regarding which intermediate position detecting means are required.

It is therefore considered that the requirements of Article 83 EPC are fulfilled by the patent in suit.

5. *Main request - Novelty of claim 1*

5.1 D1 discloses a loom which is a fabric forming machine having computer controlled (Figure 5) motors M1 and M2 moving members for moving yarn (heald frames) to form a fabric of a selected pattern (page 2, line 8, and page 3, line 13). There is a plurality of electric actuators, namely two (M1 and M2) in the form of either linear induction motors, linear DC motors, linear oscillatory actuators, linear pulse motors or synchronous linear motors (page 5, point (7)). These are electronically controlled by the computer and the motor drive circuits (Figure 5). Each actuator is connected by connection means in the form of a heald frame to the healds for linear movement of the healds between a first (top) and a second (bottom) extreme position. The computer has memory means ROM 11 for storing data (the control program for the selected weave) and RAM 12 for storing data regarding the angle at rest at the extreme positions, the opening forming timing, the opening angle and the size of the opening (see page 4, lines 9 and 10, 29 to 31 and 44), representing selected operating parameters for producing a preselected textile pattern or design. Naturally a computer has data transfer means for inputting the data into the memory. As it is a loom the computer controls the motors of the heald frames in a preselectable manner, according to the chosen pattern and the design, i.e. in dependence on the pattern and design data so that the healds are moved into a selected one (top or bottom) of the two extreme positions (see page 3, lines 26 to 28). The extreme positions are variable in response to the selected operating parameters for that particular selected pattern or design, as is derivable from the disclosure

that the angle at rest, the opening size and the opening angle can be changed by altering the respective data in the computer. As these data are stored in the computer controlling the actuation of the heald frames and a change therein leads to a different opening angle, opening size or angle at rest, it can only be concluded that the computer controls the extreme positions of the heald frames and consequently of the healds. The movement between the extreme positions of each heald frame is monitored by sensors 17a, 18a co-operating with magnetic scales 20a and 21a (page 5, lines 18 to 41), in response to actuation of the associated actuator M1, M2 by the computer, to indicate deviation of said movement from normal operation. As regards the latter, page 5, lines 37 to 41, make clear that the velocity of the heald frames is monitored and adjusted, if necessary, and that the operating direction of the heald frames is monitored, which is "useful in the prevention of malfunction". Both can only mean that deviation from normal operation (incorrect velocity, incorrect direction of movement) is indicated so that corrective measures can be taken.

Thus, all features of claim 1 of the main request are disclosed in D1 and the subject-matter of claim 1 is therefore not novel.

5.2 In its decision the Opposition Division concluded that the subject-matter of claim 1 differed from the disclosure of D1 in that the extreme positions were controlled by the computer and the machine according to D1 did not allow changing of the extreme positions during weaving, whereas the machine according to claim 1 did, and that only the movement of the heald frames, but not of each heald, was monitored (Reasons

point 5.2). The Respondent relied thereon in support of its contention in the appeal that the subject-matter of claim 1 was novel.

5.2.1 However, there is no mention in claim 1 of the main request that the varying of the extreme positions can take place during operation of the machine. Thus, this cannot be a feature distinguishing claim 1 from D1.

5.2.2 The computer control of the extreme positions is evident from D1 where it refers to the possibility of setting the size of the opening freely by detecting the signal from magnet scale 20a and changing it (page 5, lines 34 to 37). The magnet scale 20a and the sensor 17a operate such that the number of magnets which pass the sensor 17a, which has a position on the centre warp line, is counted. In the Board's opinion this can only mean that changing the opening size is performed by altering the number of magnets counted before the direction of movement of the heald frame is changed. From D1 it is clear that the whole operation of the machine is controlled by the computer having a memory in which data regarding operating parameters relating to the opening size, opening angle and angle at rest are stored (see page 3, lines 9 to 38, and page 4, lines 29, 30 and 40 to 44)). Thus, if D1 states that the opening size can be set, this means that such data (i.e. number of magnets of magnet scale 20a counted) should be introduced in the memory of the computer, which will then control the opening size with the help of the actuator M1, the magnetic scale 20a and the sensor 17a. This means that the extreme positions of each heald frame are set and controlled by the computer. Figure 10 of D1 shows a number of those intermediate extreme positions for different opening

sizes of the shed.

5.2.3 If the machine according to D1 monitors the movement of the heald frames, the movement of each heald is monitored therewith. Claim 1 under discussion does not mention the **individual** monitoring of the movement of each heald. Moreover, it cannot be interpreted in that sense either, as the description of the patent in suit, column 5, lines 24 to 36, and Figure 4, discloses an arrangement in which two actuators move heald frames in the same way as in the machine disclosed in D1.

5.3 The Respondent further argued that the actuators according to D1 were not able to move the heald frames **into** a selected one of the extreme positions, as they were linear induction motors liable to overshoot at the end positions, necessitating mechanical stoppers to stop and hold the heald frames in those positions.

However, the patent in suit does not provide a basis for such a restricted interpretation of the term "into a position", in the sense of "without any overshoot", as neither the patent (nor the original application for that matter) uses this wording in that context. Furthermore there are embodiments involving a spring 5 in the cord forming the connection means between the actuator and the heald or the heald frame. In such a case it is not guaranteed that there is no overshoot nor that the heald or heald frame always arrives exactly at the extreme position.

In any event, D1 discloses not only linear induction motors, but a number of other linear motors (see page 5, point 7) of which it cannot be said that they lead to problems concerning stable end positions as do

linear induction motors. Linear pulse motors are for example better able to move heald frames "into" end positions, i.e. with little or no overshoot.

Furthermore, D1 recognises the need to arrive at the specific end points correctly in that the control of the actuators is such that the frames are decelerated before the end points to produce a "slow movement approximating to stopping" (page 5, point (3)). It also mentions that over-run should be taken into account when end-position sensors are used (page 3, line 3).

5.4 The Respondent further argued that the loom of D1 did not allow for detection of the actual position of the heald frames as it relied on velocity control instead of position control which it considered the machine according to the patent in suit to do.

5.4.1 The wording of feature 12 of claim 1 does not allow for such a limited interpretation as it refers, combined with feature 11A, to monitoring "movement of the healds", not monitoring "position of the healds".

Equally, in the loom disclosed in D1 the velocity of the combined healds in the heald frames is monitored and adjusted and the operating direction of these frames (page 5, lines 38 to 41) is monitored to prevent malfunction. This cannot be interpreted other than "monitoring movement". If malfunction is to be prevented it is evident that deviation of the intended velocity or intended direction of movement is indicated within the control as a deviation from normal movement, so that the velocity can be adjusted or the direction of actuation can be corrected.

5.4.2 From the wording of feature 8 of claim 1 ("first and second extreme positions being controlled by said computer means in response to stored data") it cannot be inferred either that the computer can only perform this with position control; this can very well be done with data like "number of magnets passed" as disclosed in D1, which is a measure of the size of the shed opening, thus of the extreme positions.

5.5 The Respondent further argued that the weaving machine according to claim 1 differs itself from the loom disclosed in D1 in that it had a closed-loop control of the actuation of the yarn moving members, acting on intermediate position information, whereas the loom of D1 only had end position sensors giving the order to change the direction of movement of the heald frames at the extreme positions, which could not be considered as a closed-loop control system (D10A).

These submissions are not considered convincing for the following reasons:

Firstly, the wording of claim 1 does not allow for the conclusion that a closed-loop control system is involved, as such a control is not mentioned explicitly, nor can it be considered implied by the simple use of the wording "control" in the claim.

Secondly, D1 discloses not only the end position sensors 7a, 7b, 8a, 8b, but also the magnetic scales 20a, 21a with the sensors 17a, 18a. These are specifically mentioned for "setting the opening size freely" and "changing the opening state to intermediate positions". For this the sensors 17a, 18a on the centre warp line need not be moved, only the data regarding

the number of magnets counted need be changed in the computer (RAM 12). As the actuators M1, M2 are controlled by the computer this change in setting will result in a control action on the actuators taking account of these new settings.

Thirdly, neither feature 12 nor features 9 or 10 of claim 1 refer explicitly to the fact that intermediate position information is collected and used in the control of the extreme positions of the actuators or imply as much. Features 9 and 10 rather define what is disclosed in D1, namely that the extreme positions are set by the computer according to the number of magnets counted without further monitoring of the position (feature 12 only refers to monitoring "movement", not monitoring "position").

5.6 As the subject-matter of claim 1 of the main request is not novel for the above reasons, this request cannot be allowed.

6. *First auxiliary request - Novelty (claim 1)*

6.1 This claim differs from claim 1 of the main request by the additional features that each actuator is **independently** actuable (feature 5) and that the means for monitoring movement **form part of a feedback closed loop in a diagnostic routine** and that these are also capable of **indicating incorrect linear motion** (feature 12).

6.2 D1 does not mention explicitly that the weaving machine is capable of providing independent movement to each heald frame. However, it follows from the introductory portion of D1 that there are no mechanical linkages

between the heald frames, as it is the object of the machine disclosed in D1 to avoid these. Further, each heald frame has its own actuator (M1, M2), which is controlled by its own control circuit 13, 14 (see Figure 5 and page 3, lines 18 to 23). Page 6, second paragraph, mentions, in connection with each heald frame being directly driven by its own actuator, that all parameters (weave, opening forming timing, angle at rest, angle of opening) could be changed easily. This can only mean that each actuator is independently actuable. The reference in D1 to "plain weave" relied on by the Respondent merely means that if one warp yarn is in the upper position, the next should be in the lower position. To a skilled person this is merely an example of a possible weave, but does not imply that the actuators of the heald frames are always mechanically or electronically linked.

6.3 The means for monitoring movement of the heald frames 17a, 18a, 20a, 21a known from D1 provide information to the control computer about the velocity of the heald frame and the direction of movement of the heald frame (page 5, lines 34 to 41), which is described as useful in the prevention of malfunction. In the Board's opinion, this means that there is a diagnostic routine in respect of the velocity and the direction of movement, using the signal coming back (feedback of information) from the sensors of the monitoring means. The velocity, for instance, is then adjusted. If malfunction in respect of the direction of movement is to be prevented, the actual direction of movement must be indicated somewhere and compared with the settings therefor.

Therefore, these known malfunction prevention means

have to be considered equivalent to "part of a feedback closed loop in a diagnostic routine for monitoring movement indicating deviation of the movement from normal operation".

6.4 The only feature by which the subject-matter of claim 1 of the first auxiliary request differs from D1 is that the means for monitoring movement are capable of "indicating incorrect linear motion". As already discussed in point 3.2.2, this can only be done correctly if information on the location of the yarn moving members at intermediate positions is provided. The magnetic scales and sensors of the loom disclosed in D1 do not provide such information. From D1 it can only be unambiguously derived that the control is based on counting magnets that pass the sensors on the middle line, not **which** magnet actually passes the sensor at that specific moment. In D1 there is no mention or suggestion of specific magnet information.

6.5 The Appellant suggested that "monitoring and adjusting the velocities" as referred to in D1 implied a closed-loop **control** system for the velocity of the heald frame, which was equivalent to indicating incorrect linear motion.

As already explained, the Board considers that to a skilled person the disclosure in D1 of monitoring and adjusting velocity does not point to providing information on the actual position of the heald frames, as is necessary for indicating incorrect linear motion. Velocity information is not identical with position information. It may very well be in the form of time elapsed (between two magnets in the magnetic scale) or number of magnets passed and counted in a specific

length of time.

However, contrary to what was argued by the Respondent, the wording of the claim does not imply that the actuators are closed-loop controlled. There is only a mention of a feedback closed loop in a **diagnostic routine**, not a feedback **controlling** the input of the actuators.

6.6 Thus the subject-matter of claim 1 of the first auxiliary request is novel over D1. As this claim is not allowable for lack of inventive step over D1, see below, the question of novelty over the other disclosures available in these appeal proceedings need not be considered.

7. *First auxiliary request - Inventive step (claim 1)*

7.1 The starting point for the discussion on inventive step of the subject-matter of claim 1 of this request is limited to D1 as closest prior art. The subject-matter of claim 1 differs from D1 only in that the means for monitoring movement of the yarn moving members are also capable of indicating incorrect linear motion, which implies the provision of information on the actual position of the yarn moving members.

7.2 This feature solves the problem existing in the machine disclosed in D1 that the control of the extreme positions of the heald frames is not accurate as it operates on the basis of counting magnets of the magnet scale fixed to the heald frame, which does not give an indication of the actual position of the heald frame.

7.3 However, it is a standard task for the skilled person

in the control of weaving machines to improve accuracy of the control of the heald frames, particularly where size and shape of the shed is addressed in D1 as important parameters to be set, monitored and controlled.

7.4 Collecting actual heald frame position information, which is information directly linkable to the shed size, angle at rest and angle of opening, for use in the control of the movement of the heald frames, will be the first option available to the skilled person. He can therefore be expected to implement a position monitoring system in the control of the movement of the heald frames, e.g. by numbering the magnets on the magnet scales. In doing this he will arrive at the subject-matter of claim 1 of the first auxiliary request.

The subject-matter of this claim therefore does not involve inventive step. For that reason the first auxiliary request cannot be allowed.

8. *Second auxiliary request - Novelty (claim 1)*

8.1 The subject-matter of claim 1 according to this request, compared with claim 1 of the first auxiliary request, differs **further** from D1 by the features that the machine is a **weaving machine**, that **each heald has an independent actuator**, the first and second extreme positions of each heald are controlled by the computer, **thereby to enable oblique or parabolic shedding during operation,** and the means for monitoring movement of each heald form part of a feedback closed loop **system** in a diagnostic routine.

8.2 The addition in feature 11 of the word "system" to the "feedback closed loop" as compared with this feature in claim 1 of the first auxiliary request does not change it in a technical sense, and therefore does not need further discussion. This also applies to the change in wording from "incorrect motion" to "incorrect movement".

8.3 As the subject-matter of claim 1 of the first auxiliary request is already novel over D1 and the subject-matter of claim 1 of the second auxiliary request is limited by further technical features, the latter consequently presents novelty over D1 as well.

8.4 For the purposes of novelty, since the subject-matter of claim 1 of this request is limited to a weaving machine, only the documents relating to such machines need be taken into account. Documents D15 and D16 are therefore not considered further.

8.4.1 D18 does not disclose the variability of the extreme positions of the warp threads; D19 appears to disclose oblique shedding in Figure 1, but does not disclose how this is technically achieved, in particular no monitoring means forming part of a feedback closed loop system in a diagnostic routine indicating deviation of the movement from normal operation, including incorrect linear movement, are disclosed.

8.4.2 Of the documents produced by the Appellant in the opposition proceedings (D2 to D9), none are relevant to the question of novelty of the subject-matter of claim 1 of this request as they do not disclose variable extreme positions for individual healds.

8.5 The subject-matter of claim 1 of the second auxiliary request is therefore novel.

9. *Second auxiliary request - Novelty (claim 12)*

The subject-matter of independent method claim 12 for a method of controlling the movement of healds in a weaving machine consists of the technical features of product claim 1, now worded in the form of method steps. As these features are the functional equivalents of the features of claim 1 and none of the documents available in these proceedings discloses all features of this claim, the subject-matter of claim 12 is also novel.

10. *Second auxiliary request - Inventive step (claim 1)*

10.1 In determining the closest prior art, the Boards of Appeal generally consider that it must be directed to the same purpose or effect as the invention claimed. In that respect the documents related to knitting machines (D15 and D16) are no longer relevant as a starting point for the discussion of inventive step as they do not relate to weaving machines enabling oblique or parabolic shedding.

Of the documents related to weaving machines D1 is considered closer prior art than D18 or D19, as it addresses the question of shed size and shape *expressis verbis*. D18 is totally silent about this feature and D19 appears to show oblique shedding in Figure 1, but contains no information on whether such shedding is actually envisaged, nor a further disclosure of the technical features necessary to achieve oblique shedding. The arguments of the Appellant, based on the

combination of the teachings of D18 together with either D15 or D16, therefore require no further discussion.

The remaining documents are even more remote than the above-mentioned documents. For the discussion of inventive step therefore D1 remains the document representing the closest prior art.

10.2 The subject-matter of claim 1 of this request differs from D1 in that:

- implicitly intermediate position information is collected so as to monitor movement of each heald to indicate incorrect linear movement thereof,

- each heald has its individual actuator independently controlled by the computer, by which the extreme positions of the heald can be varied to enable oblique or parabolic shedding during operation.

These features achieve the object of accurately setting, monitoring and controlling (in the sense of varying), during weaving, the extreme positions of each warp yarn.

10.3 Individual actuation of warp yarns in weaving machines is as such known, see for example D18 and D19. The application of the teaching of one of these documents to the weaving machine disclosed in D1 would, however, require such extensive redesigning of the weaving machine that it cannot be expected of the skilled person to contemplate this or to do this without the exercise of inventive skills. This is all the more so

since it is evident from these documents that they do not contain a teaching specific enough to arrive at individual setting, monitoring and control of the extreme positions of each heald, or that they disclose the feature of varying the extreme positions during operation.

10.4 If the skilled person starting from D1 cannot be expected to turn to teachings in the technical field of weaving machines related to individual actuation of healds, *a fortiori* he will not turn to disclosures in the more removed field of knitting machines. The combination of teachings of D1 with either D15 or D16 would therefore not be contemplated by the skilled person.

10.5 The subject-matter of claim 1 of the second auxiliary request therefore involves an inventive step.

11. *Second auxiliary request - Inventive step (claim 12*)

The subject-matter of independent method claim 12 for a method of controlling the movement of healds in a weaving machine consists of the technical features of claim 1 of the second auxiliary request, now worded in the form of method steps. As these features are the functional equivalents of the features of that claim and none of the documents available in these proceedings alone or in combination suggest such a combination, the subject-matter of claim 12 also presents an inventive step.

The second auxiliary request can therefore be allowed.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The main and first auxiliary requests are rejected.

3. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

Claims: 1 to 20 according to the second auxiliary request submitted in the oral proceedings,

Description: columns 1 to 8 as submitted in the oral proceedings,

Drawings: Figures 1 to 6 as submitted in the oral proceedings.

The Registrar: The Chairman:

M. Patin P. Alting van Geusau