

Candidate's Answer Paper

European Patent Office,
Munich,
Germany

28-3-96

Dear Sirs,

European Patent Application N° XXX
Applicant: XXX
Our file: XXX

With reference to the official communication dated XXX, new claims 1 to 9 are filed herewith in triplicate to replace all claims presently on file.

The pre-characterizing portion of new claim 1 is based on former claim 1. Basis for the characterizing portion of new claim 1 is to be found on [page 107] 4th paragraph of the description. In particular, on [page 107] 4th paragraph, lines 2, 4 and 6 there is reference to a second signal produced in the form of pulses (see also fig 9). The function of the number of pulses is the same as with the first signal. It is also clear that one signal must lag behind the other in a particular way. If the pulses are either simultaneous or equally spaced from one another the beneficial effect set out below could not be obtained (see last sentence of 4th paragraph of [page 107]).

The Ep Search report has been drawn up under A 92(1) EPC on the basis of the original claims, with due regard to the description and drawings. Therefore, it is submitted that the characterizing feature of claim 1 has in fact be searched. The combination of such feature with claim 1 forms a single general inventive concept. Accordingly, the amendment satisfies R 86(4) and should be examined in the present application.

Furthermore, owing to the support for the amendment in the description, it is submitted that the amendment to claim 1 does not contravene A 123(2) EPC.

With regard to A 52(1) and A 54(1)(2) EPC, the following is to be observed:

Document II does not disclose each transducer producing a second signal comprising a number of pulses corresponding to the amount of rotation of the ball. Instead, Document II discloses only the production of one such signal (see figure 4).

Document III similarly does not disclose the production of a second signal according to new claim 1. Whilst this document does not show graphically any pulsed signal, [page 123] 5th paragraph, line 2 describes a generated signal with pulses of different length.

Therefore new claim 1 is novel over both Document II and document III.

With regard to A 52(1) and A 56 EPC, the following is to be observed:

Document II is considered to be the closest prior art. Hence, the pre-characterizing portion has

been drafted to recite the features in common between the present invention and Document II.

The present invention as now defined in new claim 1 is concerned with the problem of how to derive information about both the amount of rotation of the ball and the direction of the rotation of the ball from the transducers.

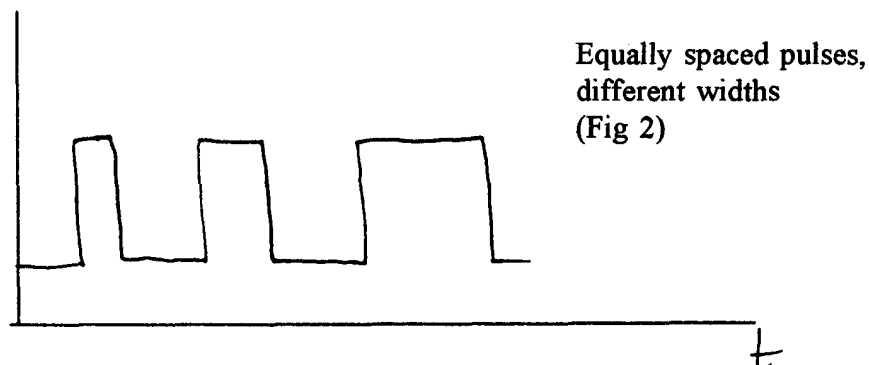
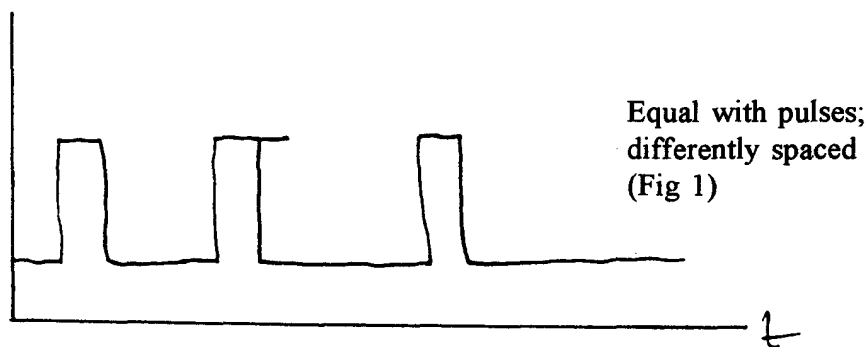
This problem is foreseen in Document II, see for example the suggestion on last paragraph of [page 120] of incorporating the directorial detectors with the encoder discs.

The solution to the problem defined in the characterizing portion of new claim 1 is not to be found in Document II. The solution, according to the invention, relies upon generating two pulsed signals at the same time, the pulsed signals being neither exactly in phase nor symmetrically out of phase.

The number of pulses in either signal produced according to claim 1 determines the amount of rotation of the ball in the same way as signal 17 in Document II does. However, by having a second, staggered pulsed signal (see [page 108] 1st paragraph, line 5 of present application), the order in which the pulses are produced in the two signals gives the sense of rotation direction. Thus, the second signal completely does away with the need for a separate directional detector which is contrary to the teaching of document DII.

The combination of Documents II and III as suggested in paragraph 5 of the communication does not lead to the present invention.

Whilst the signal generated by the transducer of document III does indicate the direction of rotation of the encoder disc, it does this in a very different way to the present invention. The signal generated according to document III would resemble either of the following:



According to document III, the sense of rotation direction is determined by detecting the order in which small/medium/large width pulses or spaces between pulses are produced. This is not the same as simply detecting the order of pulses as in the present invention. According to document III, the width of the pulses or spaces must first be determined, then compared, before the direction of rotation is determined. This is not the case with the present invention, where it is not necessary to measure the width of the pulses in the two signals, only the order in which they are created. Therefore, the signals of the present invention can be decoded and information determined more easily enabling the use of a less complicated signal processor. This is clearly advantageous.

Therefore, it is submitted that new Claim 1 is inventive over document II and over document II combined with document III.

The invention defined in new claim 1 is also inventive over document III, if this were taken as the closest prior art. For the reasons set out above, there is no suggestion of the solution used in the present invention namely the use of two pulsed signals, staggered in the way defined in claim 1, to obtain rotation direction information - in document III. Accordingly, the skilled man would not be lead to the solution employed by present applicants to determine the sense of direction of rotation information.

Furthermore, document III would not be used in combination with another document to produce the rotation direction information in the way achieved by the present invention. This is because the way in which the information is determined in document III is very different to the way it is determined in the present invention.

Turning to the dependent claims, replacement claims 2 to 5 and 8 correspond to former claims 2 to 5 and 6 respectively, with minor alteration for consistency with new claim 1. New claims 6 and 7 are based on 4th paragraph, lines 1-2 and 5th paragraph on [page 107] . New claim 9 is based on last paragraph of [page 107-108]. It is submitted that newly introduced claims 6, 7 and 9 are supported by the description and do not infringe A 123(2)EPC.

Favourable reconsideration of the amended claims is requested. If the Examining Division is minded to refuse the application without the possibility of further written submissions, oral proceedings under A 116 EPC are requested.

Yours faithfully,

(Authorized Representative)

CLAIMS

1. A cursor control device for a computer, the cursor control device comprising a housing (14, 62) containing a freely rotatable ball (15) and first and second transducers (26, 27) associated with the ball, each transducer comprising means for translating rotation of the ball into a first signal (70, 71) comprising a number of pulses corresponding to the amount of rotation of the ball, the housing having an opening through which the ball partly projects, characterized in that each transducer further comprises means for translating rotation of the ball into a second signal (70, 71) comprising a number of pulses corresponding to the amount of rotation of the ball, the pulses of the first and second signals being neither simultaneous nor equally spaced from one another.
2. A device as claimed in claim 1, wherein each transducer comprises a roller (16,17) in frictional contact with the ball, the axes (19,20) of the rollers being mutually perpendicular.
3. A device as claimed in claim 2, further comprising means (18) for biasing the ball towards the intersection of the axes of the rollers.
4. A device as claimed in any preceding claim, wherein each transducer comprises an encoder disc (42,43,54) arranged so as to rotate when the ball rotates and detecting means (40a,40b,41a,41b;40,41,44;56,57,58) for detecting rotation of the encoder disc and for generating the first and second signals each signal comprising a corresponding number of pulses.
5. A device as claimed in claim 4, wherein the detecting means comprises a photo-emitter (40a,40b) and a photo-detector (41a,41b) and the encoder disc has a plurality of radially disposed slots or apertures (44) arranged so that a light beam emitted by the photo-emitter and directed to the photo-detector is periodically interrupted when the encoder disc rotates.
6. A device according to claim 5 in which the detecting means further comprises a second photo-detector (41a, 41b), the two photo-detectors, in use, producing the first and second signals (70, 71).
7. A device according to claim 6 in which the two photo detectors (41a, 41b) in use receive light beams from the same photo-emitter (40a, 40b).
8. A device as claimed in claim 4, wherein the encoder disc has a plurality of teeth (58) and the detecting means comprises a permanent magnet (56) and a coil (57), the teeth of the encoder disc causing variation in the magnetic field produced by the permanent magnet during rotation of the encoder disc, whereby a pulsed electromotive force is induced in the coil.
9. A device according to claim 4 comprising a pair of inductive detectors (55a, 55b), each inductive detector being in accordance with the detecting means of claim 8, the inductive detectors, in use, producing the first and second signals (70, 71).