

COMMISSIONER'S DECISION

Computer Program - The correcting signal obtained by the arrangement of means in a process control system was found to be directed to more than an algorithm. All claims found not to define the arrangement. Rejection modified.

This decision deals with Applicant's request that the Commissioner of Patents review the Examiner's Final Action on application 287,623 (Class 341-110). The application was filed September 27, 1977, and is entitled GAIN ADAPTIVE PROCESS CONTROL. The inventors are Thomas M. Bartley and Richard F. Giles. The Examiner in charge issued a Final Action on April 21, 1981 refusing the application.

The application relates to a method and apparatus used in a process control system such as in electrical analog, digital electronic, pneumatic, mechanical, hydraulic and other control system formats. Such a system is shown in figure 1 of the application, reproduced below. Controller 11 receives an input signal 12 and a variable signal 14. The controller has a comparison means 15 and a controller characteristic means 17 which act on signals 12 and 14 to produce a process control signal 18, which in turn is sent both to the actual process 21, and to the process simulator means 31. Signal 27 which is actually produced by the process, and signal 37 from the simulator, are led to the divider means 41. Here a ratio signal 42 is obtained and sent to a multiplier means 43. This means performs a multiplying action on both the ratio signal and the process prediction signal 33 to produce the variable signal 14. Controller 11 uses the variable signal to control the process in an on-going manner in response to process variations from desired conditions.

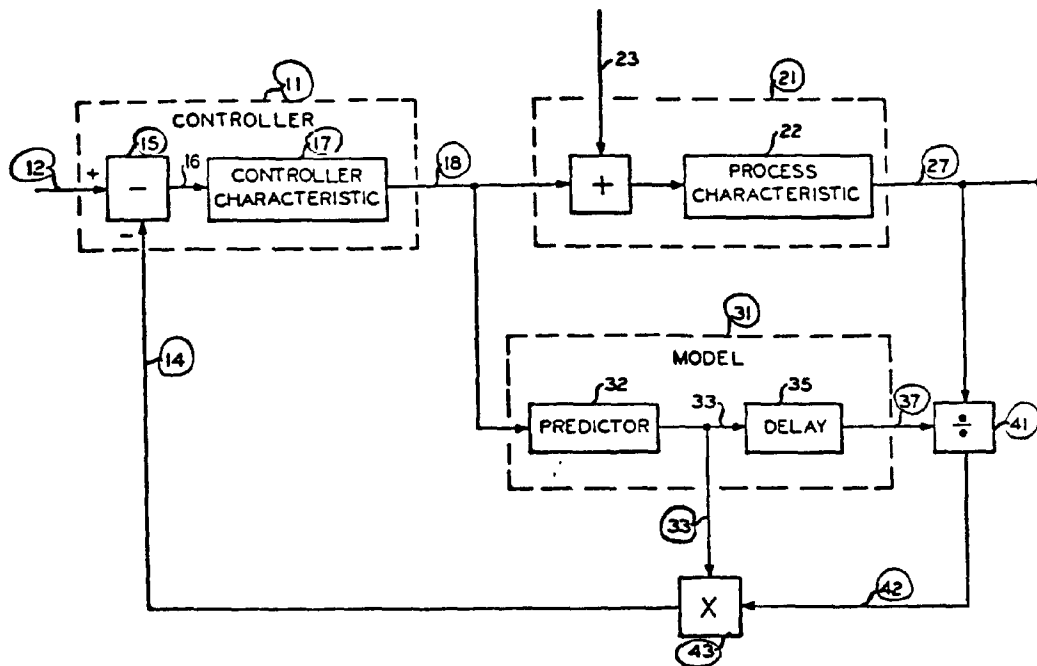


FIG. 1

In the Final Action the Examiner said that the disclosure and claims are essentially directed to an algorithm for controlling a process and are therefore unpatentable under Section 2 of the Patent Act. In that action the Examiner stated (in part):

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The examiner categorizes the method of claim 1 to incorporate the following steps.

- (i) generate a process control signal
- (ii) apply this signal to a process
- (iii) generate a process prediction signal
- (iv) apply a delay factor
- (v) generate a process measurement signal
- (vi) generate a correction signal
- (vii) apply a controller variable input signal in a response to above.

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Mathematical methods are disclosed to equate each of the alleged novel aspects of claim 1 as outlined below:

- (1) The process (item 21) embodies a transfer function as well as a dead time function (page 8, line 28)

...

- (2) The predictive term embodies transfer function (page 9, line 2)

...

It is conclusive to the examiner that the steps recited in claim 1 all relate to the computer program function and the only embodiment disclosed is the computer program generated one and the sub-routines to simulate the process control system. It is concluded that the only difference from the old structure (Smith Predictor) is the software applied.

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An analysis of claim 11 reveals that a process controller is used to generate a process control signal and consequently argued by the applicant that this is novel apparatus in this application.

It is well known that a programmable controller is well suited to a variety of applications and offers logic in an easily programmable system which will operate in an industrial environment. Furthermore, a controller resembles a memory. However, the fact remains that it is a programmed machine and differs from a computer only in its level of sophistication. This situation could be compared to generating a logical or function using either diodes or a linear element where both provide the same functional result.

In consideration of the fact that no unique apparatus or novel combination is disclosed it is held that no novelty exists.

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Since the disclosed programming is not carried out with specific new fully disclosed apparatus devised to implement a new method of process control, the disclosure and claims are rejected as being essentially directed to an algorithm for controlling a process and therefore unpatentable subject matter under Section 2.

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The Applicant did not agree with the Examiner and argued (in part):

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The claims are directed to method and apparatus for controlling a process and not simply to an algorithm or computer program. Certainly mathematics is involved in the process control but it is difficult to imagine any type of process control which does not rely on some type of mathematics even if it is a simple comparison. However, even though mathematics are involved in the process control it is respectfully submitted that the claims are not directed to an algorithm or a computer program but are rather directed to method and apparatus for controlling a process. The claimed process control requires measurements, control of a process in response to certain signals and the calculation or generation of certain signals. It is recognized that parts of the process control claimed could be implemented on a digital computer but that does not lead to the conclusion that the claims are directed to an algorithm or a computer program.

Referring specifically to the independent claims, claim 1 requires the generation of a process control signal. This process control signal could be generated using a digital computer or could be generated using a large variety of process controllers which are manufactured by numerous

vendors. Claim 1 also requires that the process must be controlled in response to the process control signal. This is not a computer program but is rather process control based on a control signal.

Claim 1 further requires the generation of a process prediction signal and the applying of a delay factor to that process prediction signal to produce a delayed prediction signal. It is recognized that these two steps could be implemented on a digital computer but the fact that certain method steps in a claim can be carried out in a digital computer does not necessarily lead to the conclusion that the claims are directed to a computer program. These method steps define specific steps which must be taken in controlling the process.

Claim 1 further requires the generation of a process measurement signal. Typically a process measurement signal is provided by a measurement device such as a chromatograph.

The final two steps in claim 1 are based on mathematics and could be carried out by means of a digital computer but it is again respectfully submitted that these method steps are specific steps required to control the process and are not simply a computer program.

In summary with respect to claim 1, it is pointed out that two specific steps are totally outside any type of computer program and other steps while mathematical in nature could be implemented by means other than a computer program. It is recognized that mathematics is involved in some of the method steps of claim 1 but it is respectfully submitted that claim 1, when taken as a whole, is directed to specific method steps required to control a process. The novelty lies in the predictive manner in which a process is controlled and does not lie in any specific computer program.

Referring now to the independent apparatus claim 11, there is required a process controller means for generating a process control signal. A process controller means can be implemented on a digital computer but can also be implemented by using a number of different types of process controllers which are manufactured by a number of different vendors. Claim 11 further provides means for providing a process measurement signal. This would typically be a measurement instrument such as a chromatograph, thermocouple, etc. Claim 11 further requires a process model means, means for generating a correction signal in response to a ratio and means for multiplying. It is recognized that mathematics is involved in the operation of this apparatus. However, this does not necessarily imply that a digital computer programmed in a specific manner is being claimed. This apparatus could also be implemented outside a digital computer. Further, this apparatus is specific apparatus required for the process control of the present invention.

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...When claim 11 is taken as a whole, it can be seen that the claim requires not only a process controller but also requires specific measurement apparatus and other control apparatus which when combined in the manner required provides novel apparatus for controlling a process. Thus, the claim does not rely on the presence of a process controller for novelty. Further, the claim is not directed to a digital computer programmed in a specific manner but is rather directed to a specific apparatus which is required for controlling a process in accordance with the present invention. Some of the apparatus required is measurement

apparatus and other apparatus could be easily implemented outside by a digital computer.

...

...it is noted that the novelty in the present invention, as claimed, does not lie solely in a program or algorithm but lies in specific steps or apparatus required to control a process in accordance with applicant's invention. Some of the steps require measurements. Others require control of a process in response to certain signals. Others are mathematical in nature but are still specific steps required to control the process in accordance with applicant's invention. When taken as a whole the claims do not define a computer program and certainly the novelty does not lie solely in a computer program or algorithm.

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The issue before the Board is whether or not the application and all claims are directed to patentable subject matter under Section 2 of the Patent Act. Claim 1 reads:

A method of controlling a process, said method comprising:
generating a process control signal in response to a comparison of a controller variable input signal and a controller setpoint signal;
applying said process control signal to said process to effect control thereof;
generating, in response to said process control signal, a process prediction signal representative of the predicted response of a measured process variable to said process control signal;
applying a delay factor, modeled after the response delay of said process, to said process prediction signal to produce a delayed prediction signal;
generating, a process measurement signal representative of the value of said measured process variable;
generating, in response to said process measurement signal and said delayed prediction signal, a correction signal responsive to the ratio of said measured process variable to the delayed process response prediction; and
generating said controller variable input signal in response to the product of said process signal and said correction signal.

It may well be that the method and means of the application have used calculations to arrive at altered signals, but the end result of the signals is an altered process and not merely a display of information. We find therefore that something more than a mere algorithm has been advanced by Applicant, and that the application is directed to patentable subject matter.

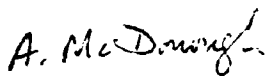
In the prosecution of Applicant's corresponding United States application, United States patent 3,558,045 January 26, 1971 to Smith et al was cited. We note that Applicant's system is different from the system of the Smith predictor circuit noted by Applicant. In the Smith predictor, the subtracting

means acts on a signal coming from a process in order to produce a correcting signal which is used in controlling a process, and in the patent a correcting signal is used in controlling chemical reactions. Applicant uses a correcting signal in process control systems including electrical analog, digital electronic, pneumatic, mechanical, hydraulic, and other control system formats. We are impressed by the fact that Applicant has used different means from those in the Smith patent. We note however that the Smith patent was not cited by the Examiner.

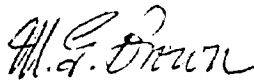
We find that the claims are also directed to patentable subject matter. In so finding however, we observe that all of the claims do not adequately define the method and means of dividing the process signal and the delayed prediction signal to produce an interim signal, and of providing a multiplying effect to the interim signal and a process prediction signal so that a correction signal is obtained which is representative of on-going changes in a process.

In summary, we are satisfied that the application discloses patentable subject matter and that in the absence of cited art it may be properly claimed.

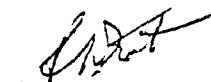
We recommend that the rejection of the application and claims as being directed essentially to an algorithm be withdrawn and that the application be returned to the Examiner for further prosecution leading to acceptable claims.



A. McDonough
Chairman
Patent Appeal Board



M.G. Brown
Assistant Chairman



S.D. Kot
Member

I concur with the findings and recommendation of the Patent Appeal Board. Accordingly, I withdraw the Final Action, and I am remanding the application to the Examiner for further prosecution consistent with the recommendation.



J.B.A. Gariépy
Commissioner of Patents

Agent for Applicant

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Dated at Hull, Quebec
this 5th. day of August, 1983