Keywords: **patentable subject matter; 35 U.S.C. § 101; unpatentable principle; mathematical algorithm**

General: **The Supreme Court holds that an invention which has no inventive concept other than the use of a mathematical algorithm is not patentable. The mathematical algorithm itself is treated as part of the prior art.**

Parker v. Flook
437 U.S. 584 (1978)
Decided June 22, 1978

I. Facts

Flook applied for a patent which describes a method of updating "alarm limits," which are predetermined parameter thresholds in a catalytic conversion process. During transient operating situations (e.g., start-up), it may be necessary to periodically recalculate alarm limits. Claim 1 is reproduced below:

> 1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of
>
> Bo+K
>
> wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:
>
> (1) Determining the present value of said process variable, said present value being defined as PVL;
>
> (2) Determining a new alarm base, B1, using the following equation:
>
> B1 = Bo(1.0-F)+PVL(F)
>
> where F is a predetermined number greater than zero and less than 1.0;
>
> (3) Determining an updated alarm limit which is defined as B1+K; and, thereafter
>
> (4) Adjusting said alarm limit to said updated alarm limit value.

The only difference between conventional methods of changing alarm limits and the method claimed by Flook was the mathematical algorithm used to calculate the updated alarm limit.

The Examiner rejected the application on the basis that the mathematical formula was the only difference between Flook's claim and the prior art, and "would in practical effect be a patent on the formula or mathematics itself." The Board sustained the Examiner's rejection, concluding that the point of novelty in the claimed method lay in the algorithm, which was unpatentable subject matter under Benson.

The Court of Customs and Patent Appeals reversed the Board, stating that *Gottschalk v. Benson* applied only to claims that entirely pre-empt a mathematical formula or algorithm. The CCPA noted that Flook claimed a method to update alarm limits in a process comprising catalytic chemical conversion of hydrocarbons. Using the claimed algorithm would not constitute infringement of the claims. Therefore, Flook's claim (including the formula) would not pre-empt the algorithm itself.

The acting Commissioner filed a petition for a writ of certiorari, which the Supreme Court granted.

II. Issue

Did the CCPA err in holding Flook's claim patentable under §101?

III. Discussion

Yes. The Court examined whether Flook's claim was a "process," and thus patentable under §101. The Court referred to *Benson*, which held that an algorithm, or mathematical formula, is like a law of nature, which cannot be the subject of a patent. Quoting from other cases, the Court suggested that Flook's claim was an unpatentable principle rather than a patentable process.

Flook argued that *Benson* does not apply because the present claim does not seek to wholly pre-empt the mathematical formula, and because the present claim includes specific "post-solution" activity (e.g., the adjustment of the alarm limit to the figure computed by the algorithm). However, the Court held that the mere addition of post-solution activity cannot transform an unpatentable principle into a patentable process. By adopting this concept, any form of post-solution activity could be attached to any mathematical formula.

The Court also allowed that a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm. For example, *Mackay Radio and Telegraph Co. v. Radio Corporation of America*, and similarly, *Funk Bros. Seed Co. v. Kalo Co.*, held that a scientific truth or its mathematical expression is not patentable, but that a novel and useful structure created with the aid of knowledge of scientific truth may be patentable. The Court stated that *Mackay Radio* and *Funk Bros.* point to the proper analysis for the case, and that the process in general, not merely the mathematical algorithm, must be new and useful.

Furthermore, the Court emphasized that whether the algorithm was known at the time of the claimed invention is not a determining factor in determining the patentability of the claim. Referring again to *Benson* and to *O'Reilly v. Morse*, the Court reinforced that a mathematical algorithm is treated as though it were part of the prior art.

Flook argued that the Court's approach improperly imports into §101 conditions of §102 and §103. The Court responded by stating a process application which implements a principle in some way does not automatically fall within patentable subject matter under § 101. The Court stated that Flook's claim is unpatentable under §101 "not because it contains a mathematical algorithm, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention." While a mathematical formula may be prior art, an inventive application of the formula may be patentable. However, the mere discovery of the mathematical formula is unpatentable without some other inventive concept.

With regard to Flook's application, the chemical processes involved in the catalytic conversion of hydrocarbons, the monitoring of chemical process variables, the use of alarm limits to trigger alarms, the idea that alarm limits must be recomputed, and the use of computers for automatically processing the monitoring and alarming were all prior art. The only difference between Flook's method and existing methods was the new way to calculate alarm limit values using the claimed mathematical algorithm. The Court quoted the CCPA, stating that "if a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory." *Application of Richman*, 562 F.2d 1026, 1030, 195 USPQ 340, 343 (1977).

IV. Conclusion

The Supreme Court held that a claim reciting a mathematical algorithm is unpatentable if the application, considered as a whole, contains no patentable invention. The Court also restated that

mathematical algorithms are assumed to be within the prior art and rejected the notion that post-solution activity can transform an unpatentable principle into a patentable process. Therefore, limiting a mathematical formula to a particular application does not make the application patentable.

V. Dissent

Justice Stewart (joined by Chief Justice Burger and Justice Rehnquist) dissented from the majority opinion. In the dissenting opinion, Stewart argued that the decision of the CCPA seemed to be in conformity with basic principles of patent law. By holding Flook's claim unpatentable, the Court imported criteria of §102 and §103 into a §101 inquiry. Stewart argued that the claimed process clearly meets the standards of subject matter patentability under §101, and that whether the patent would actually issue should depend on §§ 102 and 103.