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GOTTSCHALK v. BENSON
409 U.S. 63 (1972)

MR. JUSTICE DOUGLAS delivered the opinion of the Court.

Respondents filed in the Patent Office an application for an invention which was described as being related 'to the processing of data by program and more particularly to the programmed conversion of numerical information' in general-purpose digital computers. They claimed a method for converting binary-coded decimal (BCD) numerals into pure binary numerals. The claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use. They purported to cover any use of the claimed method in a general-purpose digital computer of any type. Claims 8 and 13 were rejected by the Patent Office but sustained by the Court of Customs and Patent Appeals. * * * The case is here on a petition for a writ of certiorari. * * *

[Decimal notation is the common system used for writing numbers, in which each digit of a number represents a multiple of a power of ten; thus, for example, the number 105 represents

$$(1 \times 10^2) + (0 \times 10^1) + (5 \times 10^0) = (1 \times 100) + (0 \times 10) + (5 \times 1) = 105.$$

In "pure binary" notation, powers of two are used instead, so the same number would be represented as 1101001, meaning

$$(1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) = \\ (1 \times 64) + (1 \times 32) + (0 \times 16) + (1 \times 8) + (0 \times 4) + (0 \times 2) + (1 \times 1) = 105.$$

"Binary Coded Decimal," the subject of the patent at issue, represents numbers by taking their ordinary decimal representation and translating each decimal digit individually into binary notation, using four binary digits for this purpose (because the decimal digits 8 and 9 require four binary digits). Thus, 105 would be represented as 0001 0000 0101, because 0001, 0000, and 0101 are, respectively, the four-digit binary representations of 1, 0, and 5.

Claim 8 of the patent at issue read:

'The method of converting signals from binary coded decimal form into binary which comprises the steps of

- '(1) storing the binary coded decimal signals in a reentrant shift register,
- '(2) shifting the signals to the right by at least three places, until there is a binary '1' in the second position of said register,
- '(3) masking out said binary '1' in said second position of said register,
- '(4) adding a binary '1' to the first position of said register,
- '(5) shifting the signals to the left by two positions,
- '(6) adding a '1' to said first position, and
- '(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary '1' in the second position of said register.'

Claim 13 read:

'A data processing method for converting binary coded decimal number representations into

binary number representations comprising the steps of

‘(1) testing each binary digit position ‘1,’ beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary ‘0’ or a binary ‘1’;

‘(2) if a binary ‘0’ is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

‘(3) if a binary ‘1’ is detected, adding a binary ‘1’ at the (i 1)th and (i 3) th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

‘(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

‘(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed.’]

The question is whether the method described and claimed is a ‘process’ within the meaning of the Patent Act. * * *

The patent sought is on a method of programming a general-purpose digital computer to convert signals from binary-coded decimal form into pure binary form. A procedure for solving a given type of mathematical problem is known as an ‘algorithm.’ The procedures set forth in the present claims are of that kind; that is to say, they are a generalized formulation for programs to solve mathematical problems of converting one form of numerical representation to another. From the generic formulation, programs may be developed as specific applications. * * *

The conversion of BCD numerals to pure binary numerals can be done mentally * * *. The method sought to be patented varies the ordinary arithmetic steps a human would use by changing the order of the steps, changing the symbolism for writing the multiplier used in some steps, and by taking subtotals after each successive operation. The mathematical procedures can be carried out in existing computers long in use, no new machinery being necessary. And, as noted, they can also be performed without a computer.

The Court stated in *Mackay Co. v. Radio Corp.*, 306 U.S. 86, 94 that ‘(w)hile a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.’ That statement followed the longstanding rule that ‘(a)n idea of itself is not patentable.’ *Rubber-Tip Pencil Co. v. Howard*, 20 Wall. (87 U.S.) 498, 507 ‘A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.’ *Le Roy v. Tatham*, 14 How. (55 U.S.) 156, 175. Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work. As we stated in *Funk Bros. Seed Co. v. Kalo Co.*, 333 U.S. 127, 130, ‘He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.’ We dealt there with a ‘product’ claim, while the present case deals with a ‘process’ claim. But we think the same principle applies.

Here the ‘process’ claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion. The end use may (1) vary from the operation of a train

to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus.

In *O'Reilly v. Morse*, 15 How. (56 U.S.) 62, Morse was allowed a patent for a process of using electromagnetism to produce distinguishable signs for telegraphy. *Id.*, at 111. But the Court denied the eighth claim in which Morse claimed the use of 'electromagnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances.' *Id.*, at 112. The Court in disallowing that claim said, 'If this claim can be maintained, it matters not by what process or machinery the result is accomplished. For aught that we now know, some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated--less liable to get out of order--less expensive in construction, and in its operation. But yet, if it is covered by this patent, the inventor could not use it, nor the public have the benefit of it, without the permission of this patentee.' *Id.*, at 113.

In *The Telephone Cases*, 126 U.S. 1, 534, the Court explained the Morse case as follows: 'The effect of that decision was, therefore, that the use of magnetism as a motive power, without regard to the particular process with which it was connected in the patent, could not be claimed, but that its use in that connection could.' Bell's invention was the use of electric current to transmit vocal or other sounds. The claim was not 'for the use of a current of electricity in its natural state as it comes from the battery, but for putting a continuous current, in a closed circuit, into a certain specified condition, suited to the transmission of vocal and other sounds, and using it in that condition for that purpose.' *Ibid.* The claim, in other words, was not 'one for the use of electricity distinct from the particular process with which it is connected in his patent.' *Id.*, at 535. The patent was for that use of electricity 'both for the magneto and variable resistance methods'. *Id.*, at 538. Bell's claim, in other words, was not one for all telephonic use of electricity.

In *Corning v. Burden*, 15 How. (56 U.S.) 252, 267-268, the Court said, 'One may discover a new and useful improvement in the process of tanning, dyeing, etc., irrespective of any particular form of machinery or mechanical device.' The examples, given were the 'arts of tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores.' *Id.*, at 267. Those are instances, however, where the use of chemical substances or physical acts, such as temperature control, changes articles or materials. The chemical process or the physical acts which transform the raw material are, however, sufficiently definite to confine the patent monopoly within rather definite bounds.

Cochrane v. Deener, 94 U.S. 780, involved a process for manufacturing flour so as to improve its quality. The process first separated the superfine flour and then removed impurities from the middlings by blasts of air, reground the middlings, and then combined the product with the superfine. *Id.*, at 785. The claim was not limited to any special arrangement of machinery. *Ibid.* The Court said,

'That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar, or a mill. Either may be pointed out; but if the patent is not confined to that

particular tool or machine, the use of the others would be an infringement, the general process being the same. A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing.' *Id.*, at 787-788.

Transformation and reduction of an article 'to a different state or thing' is the clue to the patentability of a process claim that does not include particular machines. * * *

It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a 'different state or thing.' We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents. It is said that the decision precludes a patent for any program servicing a computer. We do not so hold. * * * It is said we freeze process patents to old technologies, leaving no room for the revelations of the new, onrushing technology. Such is not our purpose. What we come down to in a nutshell is the following.

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

It may be that the patent laws should be extended to cover these programs, a policy matter to which we are not competent to speak. The President's Commission on the Patent System rejected the proposal that these programs be patentable. * * *

If these programs are to be patentable, considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide variety of views which those operating in this field entertain. The technological problems tendered in the many briefs before us indicate to us that considered action by the Congress is needed.

Reversed.

MR. JUSTICE STEWART, MR. JUSTICE BLACKMUN, and MR. JUSTICE POWELL took no part in the consideration or decision of this case.

Notes and Questions

1. Take a careful look at claims 8 and 13 of the patent at issue. How do they differ? Was the Court correct in treating them in the same way?

2. In *Parker v. Flook*, 437 U.S. 584 (1978), the Supreme Court considered a patent application for a "Method of Updating Alarm Limits" for use in connection with industrial processes involving catalytic conversion. During such an industrial process, sensors continuously monitor certain temperatures, pressures, flow rates, and other process variables. If any of these variables

exceed an “alarm limit,” an alarm signals the presence of inefficient or dangerous conditions. The patent application disclosed a method for taking an initial set of alarm limits and process variables, using an algorithm to update the alarm limits, and then changing the alarm limits to the updated values. The only difference between the disclosed method and previous methods lay in the algorithm used. The patent application claimed the use of the method to update the alarm limit for any process variable in any industrial process involving the catalytic conversion of hydrocarbons; numerous such processes are used in the petrochemical and oil-refining industries. The Court said:

We assume that respondent’s formula is novel and useful and that he discovered it. We also assume, since respondent does not challenge the examiner’s finding, that the formula is the only novel feature of respondent’s method. * * *

[The inventor] does not seek to “wholly preempt the mathematical formula,” since there are uses of his formula outside the petrochemical and oil-refining industries that remain in the public domain. And he argues that the presence of specific “post-solution” activity--the adjustment of the alarm limit to the figure computed according to the formula--distinguishes this case from *Benson* and makes his process patentable. We cannot agree.

The notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance. A competent draftsman could attach some form of post-solution activity to almost any mathematical formula; the Pythagorean theorem would not have been patentable, or partially patentable, because a patent application contained a final step indicating that the formula, when solved, could be usefully applied to existing surveying techniques. * * *

The process itself, not merely the mathematical algorithm, must be new and useful. Indeed, the novelty of the mathematical algorithm is not a determining factor at all. Whether the algorithm was in fact known or unknown at the time of the claimed invention, as one of the “basic tools of scientific and technological work,” * * * it is treated as though it were a familiar part of the prior art. * * *

Respondent’s process is unpatentable under § 101, not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention. Even though a phenomenon of nature or mathematical formula may be well known, an inventive application of the principle may be patented. Conversely, the discovery of such a phenomenon cannot support a patent unless there is some other inventive concept in its application.

What does this add to the rule of *Gottschalk v. Benson*?

DIAMOND v. DIEHR
450 U.S. 175 (1981)

JUSTICE REHNQUIST delivered the opinion of the Court.

We granted certiorari to determine whether a process for curing synthetic rubber which includes in several of its steps the use of a mathematical formula and a programmed digital computer is patentable subject matter under 35 U.S.C. § 101.

I

The patent application at issue was filed by the respondents on August 6, 1975. The claimed invention is a process for molding raw, uncured synthetic rubber into cured precision products. The process uses a mold for precisely shaping the uncured material under heat and pressure and then curing the synthetic rubber in the mold so that the product will retain its shape and be functionally operative after the molding is completed.

Respondents claim that their process ensures the production of molded articles which are properly cured. Achieving the perfect cure depends upon several factors including the thickness of the article to be molded, the temperature of the molding process, and the amount of time that the article is allowed to remain in the press. It is possible using well-known time, temperature, and cure relationships to calculate by means of the Arrhenius equation² when to open the press and remove the cured product. Nonetheless, according to the respondents, the industry has not been able to obtain uniformly accurate cures because the temperature of the molding press could not be precisely measured, thus making it difficult to do the necessary computations to determine cure time.³ Because the temperature *inside* the press has heretofore been viewed as an uncontrollable variable, the conventional industry practice has been to calculate the cure time as the shortest time in which all parts of the product will definitely be cured, assuming a reasonable amount of mold-opening time during loading and unloading. But the shortcoming of this practice is that operating with an uncontrollable variable inevitably led in some instances to overestimating the mold-opening time and overcuring the rubber, and in other instances to underestimating that time and undercuring the product.

Respondents characterize their contribution to the art to reside in the process of constantly

² The equation is named after its discoverer Svante Arrhenius and has long been used to calculate the cure time in rubber-molding presses. The equation can be expressed as follows:

$$\ln v = CZ + x$$

wherein $\ln v$ is the natural logarithm of v , the total required cure time; C is the activation constant, a unique figure for each batch of each compound being molded, determined in accordance with rheometer measurements of each batch; Z is the temperature in the mold; and x is a constant dependent on the geometry of the particular mold in the press. A rheometer is an instrument to measure flow of viscous substances.

³ During the time a press is open for loading, it will cool. The longer it is open, the cooler it becomes and the longer it takes to reheat the press to the desired temperature range. Thus, the time necessary to raise the mold temperature to curing temperature is an unpredictable variable. The respondents claim to have overcome this problem by continuously measuring the actual temperature in the closed press through the use of a thermocouple.

measuring the actual temperature inside the mold. These temperature measurements are then automatically fed into a computer which repeatedly recalculates the cure time by use of the Arrhenius equation. When the recalculated time equals the actual time that has elapsed since the press was closed, the computer signals a device to open the press. According to the respondents, the continuous measuring of the temperature inside the mold cavity, the feeding of this information to a digital computer which constantly recalculates the cure time, and the signaling by the computer to open the press, are all new in the art.

The patent examiner rejected the respondents' claims on the sole ground that they were drawn to nonstatutory subject matter under 35 U.S.C. § 101.⁵ He determined that those steps in respondents' claims that are carried out by a computer under control of a stored program constituted nonstatutory subject matter under this Court's decision in *Gottschalk v. Benson*, 409 U.S. 63 (1972). The remaining steps—installing rubber in the press and the subsequent closing of the press—were “conventional and necessary to the process and cannot be the basis of patentability.” The examiner concluded that respondents' claims defined and sought protection of a computer program for operating a rubber-molding press.

The Patent and Trademark Office Board of Appeals agreed with the examiner, but the Court of Customs and Patent Appeals reversed. *In re Diehr*, 602 F.2d 982 (1979). * * *

II

Last Term in *Diamond v. Chakrabarty*, 447 U.S. 303 (1980), this Court discussed the historical purposes of the patent laws and in particular 35 U.S.C. § 101. As in *Chakrabarty*, we must here construe 35 U.S.C. § 101 which provides:

⁵ Respondents' application contained 11 different claims. Three examples are claims 1, 2, and 11 which provide:

“1. A method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer, comprising:

“providing said computer with a data base for said press including at least,

“natural logarithm conversion data (ln),

“the activation energy constant (C) unique to each batch of said compound being molded, and

“a constant (x) dependent upon the geometry of the particular mold of the press,

“initiating an interval timer in said computer upon the closure of the press for monitoring the elapsed time of said closure,

“constantly determining the temperature (Z) of the mold at a location closely adjacent to the mold cavity in the press during molding,

“constantly providing the computer with the temperature (Z),

“repetitively calculating in the computer, at frequent intervals during each cure, the Arrhenius equation for reaction time during the cure, which is

“ $\ln v = CZ + x[,]$ where v is the total required cure time,

“repetitively comparing in the computer at said frequent intervals during the cure each said calculation of the total required cure time calculated with the Arrhenius equation and said elapsed time, and

“opening the press automatically when a said comparison indicates equivalence.

“2. The method of claim 1 including measuring the activation energy constant for the compound being molded in the press with a rheometer and automatically updating said data base within the computer in the event of changes in the compound being molded in said press as measured by said rheometer. * * *”

“Whoever, invents or discovers any new and useful process, machine manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”⁶

* * * Although the term “process” was not added to 35 U.S.C. § 101 until 1952 a process has historically enjoyed patent protection because it was considered a form of “art” as that term was used in the 1793 Act. In defining the nature of a patentable process, the Court stated:

“That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed.... A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence.” *Cochrane v. Deener*, 94 U.S. 780, 787-788 (1877).

Analysis of the eligibility of a claim of patent protection for a “process” did not change with the addition of that term to § 101. Recently, in *Gottschalk v. Benson*, 409 U.S. 63 (1972), we repeated the above definition recited in *Cochrane v. Deener*, adding: “Transformation and reduction of an article ‘to a different state or thing’ is the clue to the patentability of a process claim that does not include particular machines.” 409 U.S., at 70.

Analyzing respondents’ claims according to the above statements from our cases, we think that a physical and chemical process for molding precision synthetic rubber products falls within the § 101 categories of possibly patentable subject matter. That respondents’ claims involve the transformation of an article, in this case raw, uncured synthetic rubber, into a different state or thing cannot be disputed. The respondents’ claims describe in detail a step-by-step method for accomplishing such, beginning with the loading of a mold with raw, uncured rubber and ending with the eventual opening of the press at the conclusion of the cure. Industrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws.

III

Our conclusion regarding respondents’ claims is not altered by the fact that in several steps of the process a mathematical equation and a programmed digital computer are used. This Court has undoubtedly recognized limits to § 101 and every discovery is not embraced within the statutory

⁶ The word “process” is defined in 35 U.S.C. § 100(b):

“The term ‘process’ means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.”

terms. Excluded from such patent protection are laws of nature, natural phenomena, and abstract ideas. See *Parker v. Flook*, 437 U.S. 584 (1978); *Gottschalk v. Benson*, *supra*, at 67. * * * “An idea of itself is not patentable,” *Rubber-Tip Pencil Co. v. Howard*, 20 Wall. 498, 507 (1874). “A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.” *Le Roy v. Tatham*, 14 How. 156, 175 (1853). Only last Term, we explained:

“[A] new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E = mc^2$; nor could Newton have patented the law of gravity. Such discoveries are ‘manifestations of ... nature, free to all men and reserved exclusively to none.’ ” *Diamond v. Chakrabarty*, 447 U.S., at 309. * * *

Our recent holdings in *Gottschalk v. Benson*, *supra*, and *Parker v. Flook*, *supra*, both of which are computer-related, stand for no more than these long-established principles. In *Benson*, we held unpatentable claims for an algorithm used to convert binary code decimal numbers to equivalent pure binary numbers. The sole practical application of the algorithm was in connection with the programming of a general purpose digital computer. We defined “algorithm” as a “procedure for solving a given type of mathematical problem,” and we concluded that such an algorithm, or mathematical formula, is like a law of nature, which cannot be the subject of a patent.

Parker v. Flook, *supra*, presented a similar situation. The claims were drawn to a method for computing an “alarm limit.” An “alarm limit” is simply a number and the Court concluded that the application sought to protect a formula for computing this number. Using this formula, the updated alarm limit could be calculated if several other variables were known. The application, however, did not purport to explain how these other variables were to be determined, nor did it purport “to contain any disclosure relating to the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system. All that it provides is a formula for computing an updated alarm limit.” 437 U.S., at 586.

In contrast, the respondents here do not seek to patent a mathematical formula. Instead, they seek patent protection for a process of curing synthetic rubber. Their process admittedly employs a well-known mathematical equation, but they do not seek to pre-empt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process. These include installing rubber in a press, closing the mold, constantly determining the temperature of the mold, constantly recalculating the appropriate cure time through the use of the formula and a digital computer, and automatically opening the press at the proper time. Obviously, one does not need a “computer” to cure natural or synthetic rubber, but if the computer use incorporated in the process patent significantly lessens the possibility of “overcuring” or “undercuring,” the process as a whole does not thereby become unpatentable subject matter.

Our earlier opinions lend support to our present conclusion that a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer. In *Gottschalk v. Benson*, we noted: “It is said that the decision precludes a patent for any program servicing a computer. We do not so hold.” 409 U.S., at 71. Similarly, in *Parker v. Flook*, we stated that “a process is not unpatentable simply because it

contains a law of nature or a mathematical algorithm.” 437 U.S., at 590. It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection. * * * As Justice Stone explained four decades ago:

“While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.” *Mackay Radio & Telegraph Co. v. Radio of America*, 306 U.S. 86, 94 (1939).

We think this statement in *Mackay* takes us a long way toward the correct answer in this case. Arrhenius’ equation is not patentable in isolation, but when a process for curing rubber is devised which incorporates in it a more efficient solution of the equation, that process is at the very least not barred at the threshold by § 101.

In determining the eligibility of respondents’ claimed process for patent protection under § 101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made. The “novelty” of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter.¹² * * *

In this case, it may later be determined that the respondents’ process is not deserving of patent protection because it fails to satisfy the statutory conditions of novelty under § 102 or nonobviousness under § 103. A rejection on either of these grounds does not affect the determination that respondents’ claims recited subject matter which was eligible for patent protection under § 101.

IV

We have before us today only the question of whether respondents’ claims fall within the § 101 categories of possibly patentable subject matter. We view respondents’ claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula. We recognize, of course, that when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract. A mathematical formula as such is not accorded the protection of our patent laws, *Gottschalk v. Benson*, 409 U.S. 63 (1972), and this principle cannot

¹² It is argued that the procedure of dissecting a claim into old and new elements is mandated by our decision in *Flook* which noted that a mathematical algorithm must be assumed to be within the “prior art.” It is from this language that the petitioner premises his argument that if everything other than the algorithm is determined to be old in the art, then the claim cannot recite statutory subject matter. The fallacy in this argument is that we did not hold in *Flook* that the mathematical algorithm could not be considered at all when making the § 101 determination. To accept the analysis proffered by the petitioner would, if carried to its extreme, make all inventions unpatentable because all inventions can be reduced to underlying principles of nature which, once known, make their implementation obvious. The analysis suggested by the petitioner would also undermine our earlier decisions regarding the criteria to consider in determining the eligibility of a process for patent protection. * * *

be circumvented by attempting to limit the use of the formula to a particular technological environment. *Parker v. Flook*, 437 U.S. 584 (1978). Similarly, insignificant post-solution activity will not transform an unpatentable principle into a patentable process. *Ibid.*¹⁴ To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection. On the other hand, when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (*e. g.*, transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101. Because we do not view respondents' claims as an attempt to patent a mathematical formula, but rather to be drawn to an industrial process for the molding of rubber products, we affirm the judgment of the Court of Customs and Patent Appeals.¹⁵

It is so ordered.

JUSTICE STEVENS, with whom JUSTICE BRENNAN, JUSTICE MARSHALL, and JUSTICE BLACKMUN join, dissenting.

* * * In *Flook*, this Court clarified *Benson* in three significant respects. First, *Flook* held that the *Benson* rule of unpatentable subject matter was not limited, as the lower court believed, to claims which wholly pre-empted an algorithm or amounted to a patent on the algorithm itself. * * * Second, the Court made it clear that an improved method of calculation, even when employed as part of a physical process, is not patentable subject matter under § 101. * * * Finally, the Court explained the correct procedure for analyzing a patent claim employing a mathematical algorithm.

¹⁴ Arguably, the claims in *Flook* did more than present a mathematical formula. The claims also solved the calculation in order to produce a new number or "alarm limit" and then replaced the old number with the number newly produced. The claims covered all uses of the formula in processes "comprising the catalytic chemical conversion of hydrocarbons." There are numerous such processes in the petrochemical and oil refinery industries and the claims therefore covered a broad range of potential uses, 437 U.S., at 586. The claims, however, did not cover every conceivable application of the formula. We rejected in *Flook* the argument that because all possible uses of the mathematical formula were not pre-empted, the claim should be eligible for patent protection. Our reasoning in *Flook* is in no way inconsistent with our reasoning here. A mathematical formula does not suddenly become patentable subject matter simply by having the applicant acquiesce to limiting the reach of the patent for the formula to a particular technological use. A mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses. Similarly, a mathematical formula does not become patentable subject matter merely by including in the claim for the formula token postsolution activity such as the type claimed in *Flook*. We were careful to note in *Flook* that the patent application did not purport to explain how the variables used in the formula were to be selected, nor did the application contain any disclosure relating to chemical processes at work or the means of setting off an alarm or adjusting the alarm unit. *Ibid.* All the application provided was a "formula for computing an updated alarm limit." *Ibid.*

¹⁵ The dissent's analysis rises and falls on its characterization of respondents' claims as presenting nothing more than "an improved method of calculating the time that the mold should remain closed during the curing process." * * * Respondents' claims, however, are not limited to the isolated step of "programming a digital computer." Rather, respondents' claims describe a process of curing rubber beginning with the loading of the mold and ending with the opening of the press and the production of a synthetic rubber product that has been perfectly cured—a result heretofore unknown in the art. * * * The fact that one or more of the steps in respondents' process may not, in isolation, be novel or independently eligible for patent protection is irrelevant to the question of whether the claims as a whole recite subject matter *eligible* for patent protection under § 101. * * *

Under this procedure, the algorithm is treated for § 101 purposes as though it were a familiar part of the prior art; the claim is then examined to determine whether it discloses “some other inventive concept.” * * *

II

* * * [T]he starting point in the proper adjudication of patent litigation is an understanding of what the inventor claims to have discovered. * * *

In the first sentence of its opinion, the Court states the question presented as “whether a process for curing synthetic rubber ... is patentable subject matter.” * * * Of course, that question was effectively answered many years ago when Charles Goodyear obtained his patent on the vulcanization process. The patent application filed by Diehr and Lutton, however, teaches nothing about the chemistry of the synthetic rubber-curing process, nothing about the raw materials to be used in curing synthetic rubber, nothing about the equipment to be used in the process, and nothing about the significance or effect of any process variable such as temperature, curing time, particular compositions of material, or mold configurations. In short, Diehr and Lutton do not claim to have discovered anything new about the process for curing synthetic rubber.

As the Court reads the claims in the Diehr and Lutton patent application, the inventors’ discovery is a method of constantly measuring the actual temperature inside a rubber molding press. As I read the claims, their discovery is an improved method of calculating the time that the mold should remain closed during the curing process. If the Court’s reading of the claims were correct, I would agree that they disclose patentable subject matter. On the other hand, if the Court accepted my reading, I feel confident that the case would be decided differently.

There are three reasons why I cannot accept the Court’s conclusion that Diehr and Lutton claim to have discovered a new method of constantly measuring the temperature inside a mold. First, there is not a word in the patent application that suggests that there is anything unusual about the temperature-reading devices used in this process—or indeed that any particular species of temperature-reading device should be used in it. Second, since devices for constantly measuring actual temperatures—on a back porch, for example—have been familiar articles for quite some time, I find it difficult to believe that a patent application filed in 1975 was premised on the notion that a “process of constantly measuring the actual temperature” had just been discovered. Finally, the Patent and Trademark Office Board of Appeals expressly found that “the only difference between the conventional methods of operating a molding press and that claimed in [the] application rests in those steps of the claims which relate to the calculation incident to the solution of the mathematical problem or formula used to control the mold heater and the automatic opening of the press.” This finding was not disturbed by the Court of Customs and Patent Appeals and is clearly correct. * * *

III

* * * It seems clear to me that Diehr and Lutton claim to have developed a new method of programming a digital computer in order to calculate—promptly and repeatedly—the correct curing time in a familiar process. In the § 101 analysis, we must assume that the sequence of steps in this programming method is novel, unobvious, and useful. The threshold question of whether such a method is patentable subject matter remains.

If that method is regarded as an “algorithm” as that term was used in *Gottschalk v. Benson*,

409 U.S. 63 (1972), and in *Parker v. Flook*, 437 U.S. 584 (1978), and if no other inventive concept is disclosed in the patent application, the question must be answered in the negative. In both *Benson* and *Flook*, the parties apparently agreed that the inventor’s discovery was properly regarded as an algorithm; the holding that an algorithm was a “law of nature” that could not be patented therefore determined that those discoveries were not patentable processes within the meaning of § 101.

As the Court recognizes today, *Flook* also rejected the argument that patent protection was available if the inventor did not claim a monopoly on every conceivable use of the algorithm but instead limited his claims by describing a specific postsolution activity—in that case setting off an alarm in a catalytic conversion process. In its effort to distinguish *Flook* from the instant case, the Court characterizes that postsolution activity as “insignificant,” *ante*, at 1059, or as merely “token” activity, *ante*, at 1059, n.14. As a practical matter however, the postsolution activity described in the *Flook* application was no less significant than the automatic opening of the curing mold involved in this case. For setting off an alarm limit at the appropriate time is surely as important to the safe and efficient operation of a catalytic conversion process as is actuating the mold-opening device in a synthetic rubber-curing process. In both cases, the post-solution activity is a significant part of the industrial process. But in neither case should that activity have any *legal* significance because it does not constitute a part of the inventive concept that the applicants claimed to have discovered.³⁹

In *Gottschalk v. Benson*, we held that a program for the solution by a digital computer of a mathematical problem was not a patentable process within the meaning of § 101. In *Parker v. Flook*, we further held that such a computer program could not be transformed into a patentable process by the addition of postsolution activity that was not claimed to be novel. That holding plainly requires the rejection of Claims 1 and 2 of the Diehr and Lutton application quoted in the Court’s opinion.

* * *

Notes and Questions

1. What is the difference between the patentable subject matter at issue in *Diehr* and the nonpatentable subject matter at issue in *Benson* and *Flook*? Explain the difference as clearly as you can.

2. The tension between *Benson* and *Flook* on the one hand and *Diehr* on the other has persisted and has generated extensive lines of cases. Following its creation in 1982, the Federal Circuit generally took a broad view of patentability in algorithmic cases. Two notable decisions were:

a. *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992): The claimed invention related to the problem of determining whether a heart attack victim, in the hours immediately following a heart attack, is at risk for a complication called ventricular tachycardia. If the patient is at risk, treatment with certain drugs is indicated; if not, the

³⁹ In *Flook*, the Court’s analysis of the postsolution activity recited in the patent application turned, not on the relative significance of that activity in the catalytic conversion process, but rather on the fact that that activity was not a part of the applicant’s discovery. * * *

drugs should be avoided because of their side effects. The inventor discovered that the patient's risk for ventricular tachycardia could be detected by performing an electrocardiogram (EKG) on the patient and analyzing a portion of the EKG results known as the "QRS" segment. The patent claimed a "method" of analyzing the QRS signal that digitized the signals and applied mathematical calculations to resulting numbers so as to produce a final number that was indicative of the patient's tachycardia risk; the patent also claimed an "apparatus" that would perform the method.

The Federal Circuit held that both the method and apparatus claims constituted patentable subject matter. As to the method claim, the court said that the output of the method "is not an abstract number, but is a signal related to the patient's heart activity." With regard to the apparatus, the court said that "The use of mathematical formulae or relationships to describe the electronic structure and operation of an apparatus does not make it nonstatutory. * * * Corazonix argues that the final output of the claimed apparatus (and process) is simply a number, and that *Benson* and *Flook* support the position that when the end product is a number, the claim is nonstatutory and can not be saved by claim limitations of the use to which this number is put. However, the number obtained is not a mathematical abstraction; it is a measure in microvolts of a specified heart activity, an indicator of the risk of ventricular tachycardia. That the product is numerical is not a criterion of whether the claim is directed to statutory subject matter."

b. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998) (this case appears in your casebook at p. 408): The claimed invention facilitated the operation of a partnership in which each partner was a mutual fund. The patent claimed a machine that would, on a daily basis, calculate the percentage of the partnership owned by each partner, the allocable share that each partner had of the partnership's income and expenses, and the final share price of each partner. The machine would be a computer programmed with software that would make the necessary calculations.

The court held that the patent claimed statutory subject matter. The court held that mathematical algorithms are not patentable subject matter "to the extent that they are merely abstract ideas," but that a mathematical algorithm was patentable subject matter if it produced a "useful, concrete, and tangible result." In this case, the court said, the transformation of data into a final share price constituted a "practical application of a mathematical algorithm . . . , because it produces 'a useful, concrete, and tangible result'—a final share price momentarily fixed for recording and reporting purposes."

The court also held that there was no barrier to patenting a "business method." "Whether the claims are directed to subject matter within § 101 should not turn on whether the claimed subject matter does 'business' instead of something else," the court said.

3. The Federal Circuit's decisions led to an explosion of algorithmic and business method patents. Recently, however, the Federal Circuit has started to cut back on its prior holdings.

In particular, in *In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008) (en banc), the patentee claimed a method of hedging against commodities risks by simultaneously entering into contracts agreeing to sell a commodity to its consumers at a fixed price and to buy it from its producers at a fixed price. For example, an intermediary might enter into contracts agreeing to sell coal at a fixed price to power plants that use coal to generate electricity, and simultaneously enter into contracts agreeing to buy

coal at a fixed price from coal mines. The intermediary is then protected regardless of what happens to the price of coal. If the price of coal goes up, the intermediary is selling at an unfavorable price, but buying at a favorable price. If the price of coal goes down, the reverse happens. Either way, the intermediary has hedged its risk.

The Federal Circuit held that the patent claimed nonstatutory subject matter. Recanvassing the Supreme Court's precedents, the court determined that "A claimed process is . . . patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing." This point of the test, the court said, is to prevent a patentee from pre-empting all uses of a fundamental principle. Therefore, the court said, the use of a specific machine or transformation of an article "must impose meaningful limits on the claim's scope to impart patent-eligibility," and "the involvement of the machine or transformation must not constitute mere 'insignificant postsolution activity.'" Moreover, the court said, if the claimed invention is to satisfy the "transformation" part of the test, "transformation must be central to the purpose of the claimed process," and the thing to be transformed must be a physical object or substance, or, at least, something (such as an electronic signal) that is representative of a physical object or substance.

The court rescinded the tests it had applied in the *Arrhythmia Research* and *State Street Bank*. The court declined, however, to say that patentable subject matter was limited to the "technological arts." It reaffirmed that "business method" patents are possible provided they meet the same requirements as all other patents.

Applying its revised test, the court held that the claimed invention was not patentable subject matter. It was not tied to any particular machine, and it manipulated only legal obligations and business risks, not physical objects or even anything representative of a physical object.

The Supreme Court granted certiorari in *Bilski*, and the case was argued in November 2009. A decision is expected soon.