

# Algorithm Patentability after *Diamond v. Diehr*

## I. INTRODUCTION

The explosive growth of computer technology has generated considerable interest in the industry regarding the availability of legal protection for inventions related to computer technology. The field of computer products can be divided into two categories. One category, hardware, consists of the actual physical device.<sup>1</sup> The other category, software, can best be described as the program or programs which cause the hardware to perform its various functions.<sup>2</sup>

Legal protection for hardware presents little or no problem because it falls squarely within the classification of a "machine" and as such is patentable.<sup>3</sup> The question of what protection to afford software, on the other hand, has caused the courts considerable difficulty.

In the software area, part of the problem has been the definition of the term "algorithm." Although a scientific definition of the term would be "a fixed step-by-step procedure for accomplishing a given result,"<sup>4</sup> the only definition specifically adopted by the Supreme Court has been "[a] procedure for solving a given type of mathematical problem."<sup>5</sup>

The question of patentability of computer controlled processes is another area which has caused courts a great deal of confusion.<sup>6</sup> The Supreme Court has addressed this question in two recent cases. In *Parker v. Flook*,<sup>7</sup> the Court denied the patent claim. In a subsequent case, *Diamond v. Diehr*,<sup>8</sup> the Court allowed the patent for what was arguably the same type of process that was rejected in *Flook*. Furthermore, the *Diehr* case did not resolve the issue of algorithm patentability.

This Note focuses on two aspects of legal protection for computer software and computer based processes. First, the recent Supreme Court decision in *Diamond v. Diehr*<sup>9</sup> is analyzed to determine the current scope of protection afforded a computer controlled process. Second, the term "algorithm" is examined. The question whether algorithms should be afforded patent protection is addressed,

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<sup>1</sup>K. McLOUGHLIN, CLARIFYING THE COMPUTER 188 (1967).

<sup>2</sup>*Id.*

<sup>3</sup>35 U.S.C. § 101 (1976).

<sup>4</sup>*Diamond v. Diehr*, 450 U.S. 175, 186 n.9 (1981).

<sup>5</sup>*Gottschalk v. Benson*, 409 U.S. 63, 65 (1972).

<sup>6</sup>*See generally* notes 31-104 *infra* and accompanying text.

<sup>7</sup>437 U.S. 584 (1978).

<sup>8</sup>450 U.S. 175 (1981).

<sup>9</sup>*Id.*

and an argument calling for congressional action to provide adequate legal protection for algorithms is developed.

## II. HISTORICAL PERSPECTIVE: DEFINITION OF A PROCESS

The most recent comprehensive patent legislation is the Patent Act of 1952.<sup>10</sup> The Patent Act has three sections which define the requirements an invention must meet to be patentable. Section 101 deals with subject matter patentability.<sup>11</sup> Section 102 requires that the invention be novel,<sup>12</sup> and section 103 mandates that the invention not be obvious "to a person having ordinary skill in the art to which said subject matter pertains."<sup>13</sup> In other words, the invention must be non-obvious.

In determining what subject matter is patentable, section 101 of the act reads: "Whoever invents or discovers any new and useful *process* . . . may obtain a patent therefor, subject to the conditions and requirements of this title."<sup>14</sup> Though the language of this section is straightforward, a problem arises regarding the definition and scope of the term "process."

The definition section of the statute states: "The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."<sup>15</sup> This statutory definition of a "process" is not significantly different from the language in section 101 dealing with patentable subject matter.<sup>16</sup> Consequently, it provides little guidance in determining what is meant by the term "process."

In the landmark case of *Graham v. John Deere Co.*,<sup>17</sup> the Supreme Court interpreted the effect of the 1952 Patent Act upon the traditional tests of patentability and concluded that the 1952 Patent Act was meant to codify existing judicial precedents.<sup>18</sup> There-

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<sup>10</sup>Patent Act, ch. 950, 66 Stat. 797 (1952)(current version at 35 U.S.C. §§ 100-376 (1976)). Congressional authority to pass legislation in this area is derived from Article I of the United States Constitution. "The Congress shall have Power To . . . promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. CONST. art. I, § 8, cl. 8.

<sup>11</sup>35 U.S.C. § 101 (1976).

<sup>12</sup>*Id.* § 102.

<sup>13</sup>*Id.* § 103.

<sup>14</sup>*Id.* § 101 (emphasis added).

<sup>15</sup>*Id.* § 100(b).

<sup>16</sup>*Id.* § 101.

<sup>17</sup>383 U.S. 1 (1966).

<sup>18</sup>*Id.* at 3-4. Although the holding in *Graham* was limited to the interpretation of section 103 of the Patent Act, the Court has applied this principle in subsequent decisions dealing with subject matter patentability. See *Diamond v. Diehr*, 450 U.S. at 182; *Parker v. Flook*, 437 U.S. at 588-89; *Gottschalk v. Benson*, 409 U.S. at 67-71.

fore, pre-1952 decisions are relevant to the meaning of the term "process" under the Patent Act and these earlier cases can offer some guidelines for determining the scope of this term. The term "process" was defined in the 1876 case of *Cochrane v. Deener*<sup>19</sup> as follows:

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 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.<sup>20</sup>

Thus, an early definition of "process" required a transformation of one tangible substance to another.

The question whether a particular process is patentable subject matter may also be determined by looking to certain subject matters which have been held to be outside the scope of the patent laws. The Supreme Court defined these areas in the 1852 case of *Le Roy v. Tatham*.<sup>21</sup>

It is admitted, that a principle is not patentable. 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. Nor can an exclusive right exist to a new power, should one be discovered in addition to those already known.<sup>22</sup>

Furthermore, in 1938, the Supreme Court held in *Mackay Radio and Telegraph Co. v. Radio Corp. of America* that a scientific principle or the mathematical expression of it, such as  $E = mc^2$ , is not patentable.<sup>23</sup>

An invention is not automatically rendered unpatentable under section 101, however, simply because it utilizes a scientific principle. "While 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."<sup>24</sup> As stated by the Court in *Le Roy v. Tatham*: "In all such cases, the processes used to

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<sup>19</sup>94 U.S. 780 (1876).

<sup>20</sup>*Id.* at 788.

<sup>21</sup>55 U.S. (14 How.) 155 (1852).

<sup>22</sup>*Id.* at 174.

<sup>23</sup>306 U.S. 86, 94 (1939).

<sup>24</sup>*Id.*

extract, modify, and concentrate natural agencies, constitute the invention. The elements of the power exist; the invention is not in discovering them, but in applying them to useful objects."<sup>25</sup> Consequently, the Court has upheld patents for the application of physical principles. Such patents include the method for reducing fatty bodies to their component parts through the use of superheated water<sup>26</sup> and the use of the Arrhenius equation to improve a process for molding synthetic rubber.<sup>27</sup>

A related concept in this area of patentable subject matter is the "mental steps" doctrine,<sup>28</sup> a process consisting of only mental steps.<sup>29</sup> This doctrine was defined in the 1951 pre-computer case of *In re Abrams*.<sup>30</sup> The Court of Customs and Patent Appeals (C.C.P.A.) held that certain mental steps, such as registering, measuring, and computing were not patentable even if novel.<sup>31</sup>

The C.C.P.A. repudiated the mental steps doctrine, as set forth in *Abrams*, nineteen years later in *In re Musgrove*.<sup>32</sup> In *Musgrove*, the C.C.P.A. held that "[a]ll that is necessary, in our view, to make a sequence of operational steps a statutory 'process' within 35 U.S.C. § 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.'" <sup>33</sup> Thus the interpretation of section 101 in *Musgrove* allows a sequence of steps to be patentable if it satisfies the very low level test of furthering the useful arts.

### III. HISTORY OF PATENT PROTECTION FOR COMPUTER SOFTWARE

The United States Patent Office has been in conflict with the C.C.P.A. over the availability of patent protection for computer software since the mid-1960s.<sup>34</sup> In 1966, a report by the President's Com-

<sup>25</sup>55 U.S. (14 How.) at 174.

<sup>26</sup>*Tilghman v. Proctor*, 102 U.S. 707, 729-30 (1880).

<sup>27</sup>*Diamond v. Diehr*, 450 U.S. 175 (1981). The Court noted that the Arrhenius equation, a well known equation expressing time, temperature, and cure relationships, "has long been used to calculate the cure time in rubber molding presses." *Id.* at 177, n.2.

<sup>28</sup>*Davis, Computer Programs and Subject Matter Patentability*, 6 RUT. J. COMP. TECH. L. 1, 8 (1977).

<sup>29</sup>*Id.*

<sup>30</sup>188 F.2d 165 (C.C.P.A. 1951).

<sup>31</sup>*Id.* at 170.

<sup>32</sup>431 F.2d 882 (C.C.P.A. 1970).

<sup>33</sup>*Id.* at 893.

<sup>34</sup>The prosecution of a patent application may be explained in the following simplified version. A patent application begins with the submission of a patent application to the Patent Office. The Patent Office reviews the application and decides to issue or deny the patent. If the patent is denied, the decision can be appealed to the

mission on the Patent System recommended that computer programs be denied patent protection, primarily because even if adequate classification techniques existed, which they did not, the sheer volume of the prior art would make searches economically infeasible.<sup>35</sup> Shortly thereafter, the Patent Office issued a set of guidelines which denied patent protection to computer programs.<sup>36</sup> The C.C.P.A. did not accept these guidelines, however, and in *In re Prater*,<sup>37</sup> the court affirmed an apparatus claim that involved, in part, a general purpose digital computer programmed to perform the specific function claimed. The Patent Office then withdrew its guidelines.<sup>38</sup>

The Supreme Court first considered the question of computer program patentability in the 1972 case of *Gottschalk v. Benson*.<sup>39</sup> The claimed invention in *Benson* was a technique which converted binary-coded-decimal (BCD) numbers to pure binary numbers. Although the claim specified the manipulation of a re-entrant shift register in a particular manner,<sup>40</sup> the Court found that the claim was

Patent and Trademark Board of Appeals. An applicant, receiving an adverse decision from the Board of Appeals, can appeal the decision to the Court of Customs and Patent Appeals (C.C.P.A.) or bring a suit against the Patent Commissioner in the Federal District Court for Washington D.C. Procedural differences between the courts may influence the applicant's choice of forum. The primary difference is that the C.C.P.A. review is based entirely upon the record made in the Patent Office, while extrinsic evidence can be brought into the federal district court proceedings. An additional consideration is that no appeal from the C.C.P.A. is available unless the U.S. Supreme Court grants a writ of certiorari, while a suit brought in the federal district court can be appealed by the normal manner. ROSENBERG, PATENT LAW FUNDAMENTALS §§ 15.01-.04 (2d ed. 1980).

<sup>35</sup>S. Doc. No. 5, 90th Cong., 1st Sess. 12-13 (1967) (the report noted that the lack of patent protection has not prevented a substantial growth in the software industry).

<sup>36</sup>Examination of Patent Applications on Computer Programs, 33 Fed. Reg. 15609, 15610 (1968) (rescinded 34 Fed. Reg. 15724 (1969)).

<sup>37</sup>415 F.2d 1393 (C.C.P.A. 1969).

<sup>38</sup>34 Fed. Reg. 15724 (1969).

<sup>39</sup>409 U.S. 63 (1972).

<sup>40</sup>*Id.* at 73-74. In the appendix to the Court's opinion, claim "8" reads:

'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.'

*Id.*

actually an algorithm which was equivalent to a mathematical formula.<sup>41</sup> Because mathematical formulas are not patentable subject matter under section 101 of the Patent Act, the Court held the claimed process in *Benson* was "non-statutory" material and thus unpatentable.<sup>42</sup> The Court in *Benson* did not, however, hold that a computer program was unpatentable per se. The Court stated: "It is said that the decision precludes a patent for any program servicing a computer. We do not so hold."<sup>43</sup> Furthermore, the Court stated that it did not intend to "freeze process patents to old technolog[y]."<sup>44</sup>

Because the *Benson* decision did not establish firm guidelines for computer program patentability, the C.C.P.A. soon found ways to limit the scope of *Benson*. In *In re Johnston*,<sup>45</sup> the C.C.P.A. upheld a patent claim for an automatic financial record keeping system. The court, narrowly construing *Benson*,<sup>46</sup> stated: "Furthermore, the instant claims, in apparatus form, do not claim or encompass a law of nature, a mathematical formula, or an algorithm. For these reasons, we do not find the holding of *Benson* to be applicable to claims of the type now before us."<sup>47</sup> Consequently, in subsequent cases the C.C.P.A. limited the *Benson* holding regarding unpatentability to non-apparatus claims,<sup>48</sup> that is, those claims not involving a specific, physical machine.

The C.C.P.A. also limited the effect of *Benson* by concluding in *In re Freeman* that *Benson* only applied to algorithms which involved a procedure for solving mathematical formulas.<sup>49</sup> The C.C.P.A. broadened the term "algorithm" by defining it as "'a step-by-step procedure for solving a problem or accomplishing some end.'"<sup>50</sup> The court then set forth a two-step test in *Freeman* for determining if a claim is pre-empted by the holding in *Benson*:

First, it must be determined whether the claim directly or indirectly recites an 'algorithm' in the *Benson* sense of that

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<sup>41</sup>*Id.* at 65.

<sup>42</sup>*Id.* at 71-72.

<sup>43</sup>*Id.* at 71.

<sup>44</sup>*Id.*

<sup>45</sup>502 F.2d 765 (C.C.P.A. 1974), *rev'd sub nom.* *Dann v. Johnston*, 425 U.S. 219 (1976).

<sup>46</sup>*Id.* at 771.

<sup>47</sup>*Id.* (emphasis deleted). *Johnston* was later overturned, but on section 103 grounds of non-obviousness. The Supreme Court chose not to clarify the *Benson* decision at that time. *Dann v. Johnston*, 425 U.S. 219, 220, 230 (1976).

<sup>48</sup>See, e.g., *In re Noll*, 545 F.2d 141, 148-49 (C.C.P.A.), *cert. denied*, 434 U.S. 875 (1976).

<sup>49</sup>*In re Freeman*, 573 F.2d 1237, 1245 (C.C.P.A. 1978).

<sup>50</sup>*Id.* at 1245 (quoting WEBSTER'S NEW COLLEGIATE DICTIONARY, (1976)).

term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.<sup>51</sup>

Therefore, for a claim to be pre-empted by the analysis in *Benson*, it must wholly pre-empt a mathematical algorithm which is the same general type as that in *Benson*.

#### IV. DENIAL OF PATENT PROTECTION FOR A COMPUTER BASED PROCESS

In 1978, the Supreme Court decided *Parker v. Flook*,<sup>52</sup> which involved a claim for updating alarm limits on any process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons.<sup>53</sup> The Court in *Flook* rejected the patent application on section 101 grounds.<sup>54</sup> Although stating that the claim was a "process" in the ordinary sense of the word,<sup>55</sup> the Court held that *Benson* precluded a purely literal reading of section 101.<sup>56</sup> Referring to the *Benson* decision, the Court said, "[t]he question is whether the method described and claimed is a 'process' within the meaning of the Patent Act."<sup>57</sup> The Court stated that in many cases, the difference between a patentable process and an unpatentable principle can be "seen only by [their] effects when being executed . . . ."<sup>58</sup>

The Court analyzed the contention that the presence of specific "post-solution" activity would distinguish the case from *Benson* and make the process patentable. The Court, however, concluded that allowing the presence of post-solution activity to transform an "unpatentable principle into a patentable process exalts form over substance."<sup>59</sup> According to the Court, a competent draftsman could add post-solution activity to almost any mathematical formula and obtain patent protection for it.<sup>60</sup>

Once the contention regarding "post-solution" activity had been dismissed, the Court turned to the problem of how to analyze a process containing a law of nature or mathematical formula. Referring

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<sup>51</sup>*Id.*

<sup>52</sup>437 U.S. 584 (1978).

<sup>53</sup>*Id.* at 586 (the claim is reproduced in the Appendix to the Opinion of the Court).

<sup>54</sup>*Flook*, 437 U.S. at 588.

<sup>55</sup>*Id.*

<sup>56</sup>*Id.* at 589.

<sup>57</sup>*Id.* at 589 n.10 (quoting *Gottschalk v. Benson*, 409 U.S. 63, 64 (1972)).

<sup>58</sup>*Flook*, 437 U.S. at 589.

<sup>59</sup>*Id.* at 590.

<sup>60</sup>*Id.*

to the cases of *Mackay Radio*<sup>61</sup> and *Funk Bros. Seed Co. v. Kalo Inoculant Co.*,<sup>62</sup> the Court said:

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, . . . it is treated as though it were a familiar part of the prior art.<sup>63</sup>

Under *Flook*, therefore, an algorithm must be treated as though it were a part of the prior art when the claim is analyzed to determine if it is a patentable invention.<sup>64</sup>

The Court in *Flook* rejected the claimant's argument that this approach improperly imported section 102 and 103 considerations into section 101. The Court held that the fact that a process utilizes a principle in some specific fashion does not automatically cause the process to be patentable subject matter within section 101.<sup>65</sup> In so holding, the Court emphasized that the underlying basis for the unpatentability of laws of nature was not because natural phenomena are not processes, but because of "the more fundamental understanding that they are not the kind of 'discoveries' that the statute was enacted to protect."<sup>66</sup>

Analyzing the claim at hand, the Court reiterated the principle that a patent claim must be considered as a whole.<sup>67</sup> Once the Court found the mathematical algorithm was assumed to be within the prior art, the claim contained no patentable invention.<sup>68</sup>

Although not specifically identified by the Court as being a basis for its conclusion, a significant factor in *Flook* was that the mathematical formula was conceded to be the only novel feature of the claimed method.<sup>69</sup> Once this concession was made, the Court limited itself to the question of whether specific "post-solution" applications of such a formula would render it patentable.<sup>70</sup> Analogizing the claimed method to patenting the use of the formula for determining the circumference of a circle,<sup>71</sup> the Court concluded that

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<sup>61</sup>306 U.S. 86 (1939).

<sup>62</sup>333 U.S. 127 (1948).

<sup>63</sup>*Flook*, 437 U.S. at 591-92.

<sup>64</sup>*Id.* at 594.

<sup>65</sup>*Id.* at 593.

<sup>66</sup>*Id.*

<sup>67</sup>*Id.* at 594 & n.16.

<sup>68</sup>*Id.*

<sup>69</sup>*Flook*, 437 U.S. at 588.

<sup>70</sup>*Id.* at 585.

<sup>71</sup>*Id.* at 595.

the claim in this case was merely for a new mathematical formula and was, therefore, unpatentable.<sup>72</sup>

#### V. PATENT PROTECTION GRANTED FOR A COMPUTER BASED PROCESS

Less than three years after *Flook*, the Supreme Court in *Diamond v. Diehr*, found a computer based process for molding synthetic rubber to be patentable subject matter under section 101.<sup>73</sup> As a result, *Diehr* has simply added to the growing confusion concerning computer program patentability.

The *Diehr* case involved a claim for "a process for molding raw, uncured synthetic rubber into cured precision products."<sup>74</sup> The cure time for the process can be calculated by using the Arrhenius equation,<sup>75</sup> which utilizes well known time, temperature, and cure relationships. Difficulty in accurately computing the cure time resulted from an inability to precisely monitor the temperature of the mold. The claimed technique solved this problem by continuously monitoring the temperature inside the mold cavity and feeding information to a digital computer which repeatedly recalculated the cure time by using the Arrhenius equation.<sup>76</sup>

The Patent and Trademark Office rejected the claim deciding it sought protection for a computer program which was non-statutory material under *Benson*.<sup>77</sup> The C.C.P.A. reversed, finding that statutory material is not rendered non-statutory merely because a computer is involved.<sup>78</sup> The C.C.P.A. then held that the claim was patentable because it was directed to an improved process for molding rubber articles, and not to a mathematical algorithm.<sup>79</sup>

The Supreme Court affirmed the decision of the C.C.P.A.<sup>80</sup> After reviewing the history of the term "process," the majority used the traditional meaning of the term "process," defining it as the transformation of an article to a different state.<sup>81</sup> In reaching this determination, the Court emphasized two factors. First, unless otherwise defined by statute, words will be interpreted according to their normal meaning.<sup>82</sup> Second, "courts "should not read into the

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<sup>72</sup>*Id.*

<sup>73</sup>450 U.S. 175 (1981).

<sup>74</sup>*Id.*

<sup>75</sup>*See id.* at 177 n.2.

<sup>76</sup>*See id.* at 179-80 n.5.

<sup>77</sup>*Id.* (citing *Benson*, 409 U.S. 63).

<sup>78</sup>*In re Diehr*, 602 F.2d 982, 985 (C.C.P.A. 1979).

<sup>79</sup>*Id.* at 988.

<sup>80</sup>*Diamond v. Diehr*, 450 U.S. 175 (1981).

<sup>81</sup>*Id.* at 183.

<sup>82</sup>*Id.* at 182.



The Court based its rejection of the notion that novelty was an appropriate consideration under section 101 on its interpretation of the Patent Act. Because section 102 deals specifically with novelty, the Court affirmed the C.C.P.A.'s position that the question of whether an invention is novel is separate and distinct from the question of whether it is section 101 patentable subject matter.<sup>91</sup>

## VI. THE *DIEHR* DISSENT

Justice Stevens, writing the dissent, adopted the position of *Flook*. With the exception of Justices White and Powell, the dissenters who joined Justice Stevens in *Diehr* were the members of the majority in *Flook*.<sup>92</sup>

The dissent began by stating that the position in *Flook* represented the proper approach to section 101.<sup>93</sup> It re-emphasized that *Flook* required that the algorithm, for section 101 purposes, be treated as though it were a part of the prior art and the claim then examined "to determine whether it discloses 'some other inventive concept.'"<sup>94</sup>

Following the approach in *Flook*, the dissent interpreted the claim in a different manner than the majority. The majority viewed the claim as involving a new process for curing synthetic rubber.<sup>95</sup> The dissent, however, dissected the claim. Finding that the claim disclosed nothing new about the physical process of curing synthetic rubber, the dissent concluded that the discovery was for "an improved method of calculating the time that the mold should remain closed during the curing process."<sup>96</sup>

Justice Stevens rejected the majority's conclusion that the claim involved a new method for constantly monitoring the temperature inside the mold.<sup>97</sup> The dissent pointed out that there was nothing unusual about the particular temperature measuring device used, and that constant temperature measuring devices were commonplace.<sup>98</sup> Furthermore, the dissent noted that the Board of Patent Appeals had found little difference between well known conventional methods for molding synthetic rubber and the claim in question; the only difference related to the calculation of the curing time through

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<sup>91</sup>450 U.S. at 189 (citing *In re Bergy*, 596 F.2d 952, 961 (C.C.P.A. 1979)).

<sup>92</sup>9 FLA. ST. U.L. REV. 381, 391-92 (1981).

<sup>93</sup>*Diamond v. Diehr*, 450 U.S. at 205 (Stevens, J., dissenting).

<sup>94</sup>*Id.* at 204 (Stevens, J., dissenting) (citing *Parker v. Flook*, 437 U.S. 584, 591-95 (1978)).

<sup>95</sup>*Id.* at 177.

<sup>96</sup>*Id.* at 205-07 (Stevens, J., dissenting).

<sup>97</sup>*Id.* at 207 (Stevens, J., dissenting).

<sup>98</sup>*Id.* at 207-08 (Stevens, J., dissenting).

the use of the mathematical formula.<sup>99</sup> The dissent therefore concluded that the claim actually involved the use of a digital computer to calculate the time the press should remain closed during the molding process.<sup>100</sup> Using this view, the dissent found that the *Diehr* claims did not differ substantially from the claims in *Flook*.<sup>101</sup> The dissent interpreted the claimed discovery in both cases as being an algorithm that could be programmed on a digital computer.<sup>102</sup>

After defining the discovery, Justice Stevens applied the *Flook* analysis to the claim. The dissent reasoned that the majority misapplied *Flook* because the majority failed to distinguish between section 101 and section 102.<sup>103</sup> The position of the dissent was that the analysis of a patent claim must begin with a determination of whether the claim falls within section 101 patentable subject matter.<sup>104</sup> In this, the relevant issue was whether a new method of programming a digital computer to repeatedly calculate the correct curing time was patentable subject matter.<sup>105</sup> Reviewing the *Benson* and *Flook* positions, the dissent concluded that a method for programming a digital computer was not statutory matter.<sup>106</sup> The dissent then called upon Congress to resolve the question of computer program patentability.<sup>107</sup>

#### VII. COMPUTER BASED PROCESSES: THE SCOPE OF PATENT PROTECTION

The question remaining after *Diehr* involves the scope of the protection to be afforded a computer based process. The *Diehr* dissent's position, which was the majority position in *Flook*,<sup>108</sup> interpreted the patent statutes in a fundamentally different way than the majority in *Diehr*. The conflict centered around the extent to which considerations of novelty and non-obviousness should enter into a determination of what is included in section 101 patentable subject matter.

The majority in *Diehr* interpreted the Patent Act liberally, basing its decision in part upon the landmark case of *Diamond v. Chakrabarty*,<sup>109</sup> in which an artificially produced bacterium was held

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<sup>99</sup>*Id.* at 208 (Stevens, J., dissenting).

<sup>100</sup>*Id.* at 209 (Stevens, J., dissenting).

<sup>101</sup>*Id.* at 209-10 (Stevens, J., dissenting).

<sup>102</sup>*Id.* at 209 (Stevens, J., dissenting).

<sup>103</sup>*Id.* at 211 (Stevens, J., dissenting).

<sup>104</sup>*Id.* at 212 (Stevens, J., dissenting).

<sup>105</sup>*Id.* at 213 (Stevens, J., dissenting).

<sup>106</sup>*Id.* at 213-15 (Stevens, J., dissenting).

<sup>107</sup>*Id.* at 216-17 (Stevens, J., dissenting).

<sup>108</sup>9 FLA. ST. U.L. REV. at 391-92.

<sup>109</sup>447 U.S. 303 (1980).

to be patentable subject matter under section 101.<sup>110</sup> The Court in *Chakrabarty* interpreted the section 101 provisions as being quite broad: "In choosing such expansive terms as 'manufacture' and 'composition of matter' modified by the comprehensive 'any,' Congress plainly contemplated that the patent laws would be given wide scope."<sup>111</sup>

The *Diehr* majority rejected the notion that section 101 was anything more than a broad, general statement of that subject matter which is eligible for patent protection. In reaching this conclusion, the Court also looked to the reasoning of the C.C.P.A. in interpreting other terms in section 101. In *In re Nelson*, the C.C.P.A. decided the meaning of one condition of section 101—the term "useful."<sup>112</sup> The C.C.P.A. quoted with approval the following passages: "[I]t is not the province of the court to go into the question of the extent or degree of usefulness. It is enough that the invention is useful; how useful it may be is immaterial."<sup>113</sup> The court added, "[a]s to the term 'useful,' the courts have construed the condition expressed by it so liberally that it almost never serves to defeat a patent."<sup>114</sup> This liberal construction of the term "useful" lends support to an equally liberal construction of the other condition of section 101—the term "new".

The majority in *Diehr* adopted a liberal construction of the term when it held that section 101 was a general statement of subject matter patentability and that novelty played no part in the section 101 determination. The dissent, however, interpreted the Patent Act in a narrower manner. It dissected the claim to determine what part of it was actually new.<sup>115</sup> If that part was not eligible under section 101, the entire claim fell.<sup>116</sup>

The flaw in the dissent's position was that by dissecting the claim and singling out the method of calculation as the actual claimed invention, the dissent ignored the fact that the claim could also be for a new, improved process for molding synthetic rubber. By failing to construe the claim in this manner, the dissent ignored familiar principles of patent law that have been long applied to combination patents.

The Supreme Court established a definition of a combination pat-

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<sup>110</sup>*Id.* at 310.

<sup>111</sup>*Diamond v. Chakrabarty*, 447 U.S. at 308.

<sup>112</sup>280 F.2d 172 (C.C.P.A. 1960).

<sup>113</sup>*Id.* at 179 (emphasis omitted) (quoting PHILLIPS, THE LAW OF PATENTS FOR INVENTIONS 142 (1837)).

<sup>114</sup>*In re Nelson*, 280 F.2d at 179 (quoting H.C. MERWIN, PATENTABILITY OF INVENTIONS 75 (1883)).

<sup>115</sup>*Diamond v. Diehr*, 450 U.S. at 204 (Stevens, J., dissenting).

<sup>116</sup>*Id.* at 212 (Stevens, J., dissenting).

ent in the 1873 case of *Hails v. Van Wormer*:<sup>117</sup> "It must be conceded that a new combination, if it produces new and useful results, is patentable, though all the constituents of the combination were well known and in common use before the combination was made."<sup>118</sup> In other words, the combination of old, unpatentable devices may be patentable if the result achieved is new and useful and meets the other requirements of the Patent Act.<sup>119</sup> The Court applied this principle in *Diehr* and found that the computer based process was a new process which consisted of the application of an unpatentable algorithm<sup>120</sup> to the old process of curing synthetic rubber to arrive at a new, improved process of curing synthetic rubber.<sup>121</sup> This interpretation is clearly consistent with the spirit of the Patent Act which permits combination patents. As the majority noted:

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.<sup>122</sup>

The decision in *Diehr* leaves no doubt that a new and useful process will not be considered unpatentable subject matter merely because it utilizes an algorithm implemented with a digital computer. *Diehr*, however, is directed toward a claim for a process. It neatly avoided the issue of computer program patentability per se.

### VIII. ALGORITHM PATENTABILITY

Before answering the question whether an algorithm is patentable subject matter under section 101, the term "algorithm" must be defined. To date, the only definition the Supreme Court has adopted is "[a] procedure for solving a given type of mathematical problem."<sup>123</sup> As the Court itself recognized in *Diehr*, however, this is a narrow definition of the term.<sup>124</sup> The majority noted that a broader

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<sup>117</sup>87 U.S. (20 Wall.) 353 (1873).

<sup>118</sup>*Id.* at 368.

<sup>119</sup>*Gruendler Crusher v. Williams Patent Crusher*, 496 F. Supp. 1385 (E.D. Mo. 1980); *Egley v. United States*, 576 F.2d 309 (C.C.P.A. 1978).

<sup>120</sup>According to *Flook*, an algorithm must be treated as part of the familiar art and is, therefore, unpatentable. 437 U.S. at 591-92. *But see* notes 123-51 *infra* and accompanying text.

<sup>121</sup>450 U.S. at 188.

<sup>122</sup>*Id.*

<sup>123</sup>*Gottschalk v. Benson*, 409 U.S. at 65.

<sup>124</sup>450 U.S. at 186 n.9.

and more scientific definition of the term "algorithm" would be "[a] fixed step-by-step procedure for accomplishing a given result."<sup>125</sup> Whether this type of algorithm would be patentable was left unresolved by *Diehr*.<sup>126</sup>

Adopting the broader definition, it is apparent that the algorithm itself must be analyzed to determine whether it is patentable subject matter. Should the algorithm involve only a procedure for solving a mathematical formula, it is clearly not patentable subject matter.<sup>127</sup> An algorithm, however, could also be the step-by-step sequence needed to implement a process and thus be patentable subject matter.

#### A. *The Algorithm for a Computer Based Process*

An example of the broader definition of an algorithm can be constructed using the *Diehr* claims. Assume that the process for molding synthetic rubber was not an old, established process, but that the claimants had just developed it. Assume also that the process was implemented by using a digital computer to control the entire molding sequence. In this setting, the algorithm which defined the computer program would also define the molding process. Consequently, if patent protection were afforded the newly developed process, which is clearly proper, the algorithm also would be protected.

This example illustrates the holding in *Diehr*; under the broader definition, the algorithm simply defined the process claimed in *Diehr*. Patent protection is afforded the claimed process. The fact that the algorithm was implemented using a digital computer did not render the claimed process unpatentable subject matter. It must be noted that the term "algorithm" in the hypothetical defines the entire claimed process. It is not the algorithm discussed by the Court in *Diehr*, which was limited to the solution of the Arrhenius equation.<sup>128</sup> This approach, however, still leaves unresolved the problem of whether an algorithm defining a technique which is of use only in a digital computer program is patentable. Although not directly addressed, the position taken by the dissent in *Diehr* indicates that they would deny patent protection for this type of algorithm.

#### B. *Algorithms Limited to Programming Techniques*

*Gottschalk v. Benson* can be used to illustrate the problem in this area. In *Benson*, the Court properly found the conversion of a

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<sup>125</sup>*Id.*

<sup>126</sup>*Id.*

<sup>127</sup>409 U.S. at 71-72.

<sup>128</sup>*Diamond v. Diehr*, 450 U.S. at 177.

binary-coded-decimal (BCD) number to a pure binary number involves the solution of a mathematical relationship.<sup>129</sup> The claim in *Benson*, however, involved a specific technique for the solution of this relationship. The technique utilized the manipulation of the registers of a computer in a unique manner.<sup>130</sup> If the claimants had used electronic hardware to implement their conversion technique, the invention clearly would have qualified under section 101 as a new and useful machine.

This might be the critical distinction for section 101 purposes. An electronic device which implements the algorithm is patentable because it qualifies for patent protection in and of itself as a new and useful "machine." The use of a digital computer to implement the algorithm, however, does not qualify for protection in and of itself because a digital computer is an old device, and the program itself does not qualify under section 101.<sup>131</sup>

### C. *The Claim: Form or Substance*

The *Diehr* dissent, when comparing *Flook* with *Diehr*, reasoned that the claims were fundamentally similar and that allowing protection to *Diehr* while denying it to *Flook* made the issue of subject matter patentability turn upon the drafting of the claim.<sup>132</sup> In other words, it exalted form over substance.<sup>133</sup>

In a patent, however, it is the claim which defines the scope of the protection.<sup>134</sup> In this respect, the claims in both *Flook* and *Diehr*, although substantially equivalent in the end result, were clearly different in the protection afforded under a patent. In *Flook*, the claim was for a method of updating alarm limits. Although the claim referred to a specific process, the catalytic conversion of hydrocarbons,<sup>135</sup> the phrasing of the claim made it clear to the majority that the claim was actually for the discovery of a new mathematical formula with certain post-solution activity included.<sup>136</sup> Therefore, the protection afforded would be for the mathematical formula. This result is clearly counter to accepted notions of what is patentable subject matter under section 101.

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<sup>129</sup>Gottschalk v. Benson, 409 U.S. at 65.

<sup>130</sup>*Id.* at 73-74 (Appendix to the Opinion of the Court).

<sup>131</sup>The *Diehr* Court followed the established definition of a patentable process which is the "[t]ransformation and reduction of an article 'to a different state or thing...'" *Diamond v. Diehr*, 450 U.S. at 184, (quoting *Gottschalk v. Benson*, 409 U.S. at 70).

<sup>132</sup>*Diamond v. Diehr*, 450 U.S. at 210, n.32; See Novick & Wallenstein, *The Algorithm and Computer Software Patentability: A Scientific View of a Legal Problem*, 7 RUT. J. COMP. TECH. L. 313 (1980); 9 FLA. ST. U.L. REV. at 395.

<sup>133</sup>*Parker v. Flook*, 437 U.S. at 590.

<sup>134</sup>*Smith v. Snow*, 294 U.S. 1 (1935).

<sup>135</sup>437 U.S. at 596 (Appendix to the Opinion of the Court).

<sup>136</sup>*Id.* at 585.

*Diehr*, on the other hand, involved a claim for a process for molding synthetic rubber which was improved by the method recited in the claim.<sup>137</sup> As such, the protection was for the type of process that qualifies under section 101.<sup>138</sup>

It could be argued that this is a distinction without a difference. Yet, the patent laws have been interpreted as providing protection for a tangible thing. With respect to a process, the tangible thing requirement is satisfied by the transformation of an article from one state to another. A claim reciting an improved method of calculation which includes post-solution activity is attempting to obtain protection for an intangible that is outside section 101. A claim for a process that is improved by the application of such an intangible falls within section 101.

The *Flook* claim could be reworded to recite an improved process as did the *Diehr* claim. Similarly, the *Diehr* claim could be reworded to resemble the *Flook* claim.<sup>139</sup> However, in doing so, even though the methods and techniques involved would not change, the scope of the protection would. The *Flook* claim attempts to protect a method of calculation while the *Diehr* claim protects a process.

The end result of this analysis is that *Diehr* may represent a trap for the unwary draftsman. Yet, this may be proper. The importance of the phrasing of the claims in a patent application cannot be overstated. It is the claims which determine the protection afforded. "The claims 'measure the invention.'"<sup>140</sup>

#### D. The Definition of the Term "Algorithm"

Perhaps the confusion regarding the patentability of an algorithm rests with the courts' conception of the term. The courts have construed the term "algorithm" as something in and of itself to be analyzed under section 101. This is improper. The term "algorithm" is a word of art that is generally used in connection with a digital computer. As Novick and Wallenstein suggest in their article dealing with the patentability of algorithms: "In summary, an algorithm provides a method to proceed with a given task. It represents the breakdown of the task into its most fundamental elements for solution by the employed device."<sup>141</sup> Therefore, the question whether algorithms should be afforded patent protection is

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<sup>137</sup>450 U.S. at 179 n.5.

<sup>138</sup>*Id.* at 191-93.

<sup>139</sup>*Id.* at 210 n.32 (quoting Blumenthal & Riter, *Statutory or Non-Statutory?: An Analysis of the Patentability of Computer Related Inventions*, 62 J. PAT. OFF. SOC'Y 454, 505-06 (1980)).

<sup>140</sup>*General Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 369 (1938).

<sup>141</sup>*Patentability of Algorithms*, *supra* note 132, at 335.

irrelevant. The proper question is what type of algorithm should be afforded patent protection.

It has been suggested that there is no real distinction between a computer program which doubles the value of a number supplied by an operator and a machine which doubles the amount of a liquid supplied by an operator.<sup>142</sup> "They are equivalent processes—theoretically the same, but physically operating in different media. To treat these two processes as being dissimilar is to make a meaningless distinction."<sup>143</sup> Both the computer program and the process do the same thing; that is, double the quantity of an item. This statement, at first glance, appears to ignore an important distinction: the Supreme Court has limited patentable processes to those which transform an article to a different state.<sup>144</sup> The machine-based process clearly qualifies because it operates on a tangible object and transforms it. The computer process, in transforming the value of a number, does not operate on the type of tangible thing which is proper subject matter under section 101.

The context in which this statement is made, however, is important in understanding its meaning. Novick and Wallenstein refer to certain modeling programs used by scientists and engineers to simulate a process on a computer before actually implementing it.<sup>145</sup> To make a distinction between the algorithm used in the modeling program and the algorithm used to implement the process would be meaningless. The modeled process is still directed toward the physical transformation of one thing into another when the process is physically implemented.

The authors suggest that algorithms should be understood as being "physical" manifestations of ideas.<sup>146</sup> If this approach were adopted, then device-specific algorithms, including those in both *Flook* and *Diehr*, would not be rejected on section 101 grounds.<sup>147</sup> Conversely, those algorithms that are not device-specific would be rejected under section 101.<sup>148</sup>

Unfortunately, this analysis is not congruent with the traditional definition of a patentable process. This definition requires that a process transform an article or thing to a different state.<sup>149</sup> In the

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<sup>142</sup>*Id.*

<sup>143</sup>*Id.* (citation omitted).

<sup>144</sup>450 U.S. at 183-84, (quoting *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972)).

<sup>145</sup>*Patentability of Algorithms*, *supra* note 132 at 334, n.177.

<sup>146</sup>*Id.* at 338 (citation omitted).

<sup>147</sup>*Id.* The authors define a device-specific algorithm as being "the analysis of the desired task in relation to the device employed in the solution. The algorithm must explain the procedure that the device employed will use to execute the given task. Therefore, the device must be an integral part of the patent claim." *Id.* at 339.

<sup>148</sup>*Id.* at 338 & n.202.

<sup>149</sup>450 U.S. at 183-84.

context in which this definition developed, it is apparent that an article or thing is something that is tangible and not simply a number in a computer.

Consequently, at the present time, only those algorithms which implement traditionally defined processes would qualify for patent protection. Those algorithms which represent only an improved technique for processing information in a digital computer, are not patentable. In addition, under the current Patent Act, it is unlikely that such an improved technique will ever qualify for patent protection.

### *E. The Case for Algorithm Patentability*

Whether an algorithm for an improved method of accomplishing operations performed in a digital computer will ever qualify for patent protection remains for Congress to decide. One problem with the current Patent Act is that the electronics industry cannot be certain that newly developed devices using microprocessors will be eligible for patent protection.

As it has become more available and less expensive, the microprocessor is finding its way into an increasing number of electronic devices. The problem is that a manufacturer who develops an idea and reduces it to practice, utilizing a standard microprocessor with a custom-written program, cannot be sure that his invention will be patentable. The manufacturer who elects to implement his idea with a custom electronic design, however, will not be denied patent protection on section 101 grounds. Yet, the two devices may accomplish exactly the same result and, in some cases, use the same algorithm. The algorithm is merely implemented in a different manner.

The algorithm described in the *Benson* claims could clearly represent the type of innovation and inventiveness that the patent statutes were designed to protect. Although the Court in *Benson* characterized the algorithm as being equivalent to a mathematical formula,<sup>150</sup> the algorithm was actually a technique for manipulating the registers of a digital computer to accomplish the conversion of the BCD number to a binary number. The mathematical formula that this technique implemented would be the conversion of a number in base ten form (decimal) to a number in base two form (binary). Furthermore, the technique did not actually pre-empt the mathematical relationship between the two number systems, but only solved the relationship by using a unique technique of register manipulation.<sup>151</sup> In other words, the claimed technique represented only one of a potentially large number of methods for solving the mathe-

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<sup>150</sup>Gottschalk v. Benson, 409 U.S. 63, 65 (1972).

<sup>151</sup>See note 40 *supra*.

mational relationships between the two number systems with a digital computer.

It is clear that *Benson*-type inventions can represent the type of innovation that is deserving of patent protection. In keeping with the purpose of the patent laws as set forth in article I of the Constitution, Congress must afford algorithms legal protection.<sup>152</sup>

## IX. CONCLUSION

*Diamond v. Diehr* left the major question of algorithm patentability unresolved. *Diehr* stands for the proposition that a process will not be defined as unpatentable subject matter under section 101 simply because it makes use of an unpatentable algorithm. *Diehr's* importance is its implication that a claim must be drafted to claim patentable subject matter such as an improved process, and not merely an improved method of calculation.

From the decisions to date, it is apparent that algorithms which only provide an improved method of processing information with a digital computer will not be patentable. Furthermore, ideas for electronic devices which are implemented using general purpose microprocessors with custom-written software may or may not be afforded protection. Because these inventions may represent the type of scientific advancement that patent laws are designed to protect, Congress must act to define the type of protection to be afforded the various types of algorithms.

ROLAND A. FULLER III

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<sup>152</sup>U.S. CONST. art. I, § 8, cl. 8 ("To promote the Progress of Science and useful Arts. . .").