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Brief (3)

In the Application of JAMES R. DIEHR, II and THEODORE A. LUTTON Serial No. 602,463 Filed August 6, 1975 For DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES Group Art Unit 236 Examiner: Joseph F. Ruggiero	RECEIVED NOV 4 1976 GROUP 230 BEFORE THE BOARD OF APPEALS APPEAL NO. 332-53

BRIEF ON APPEAL

Appellant is appealing from the Final Rejection of all the claims--claims 1-11, were rejected only on 35 U.S.C. 101.

An oral hearing is deemed unnecessary.

The application is a continuation application.

The rejected claims are as follows:

THE CLAIMS ON APPEAL

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,

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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

$$\ln v = C\,Z + x$$

where $\underline{v}$ 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.

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3. The method of claim 1 including providing the computer with a mold temperature set point for each mold and a constant of proportionality with which a range of permissible mold temperature variation may be calculated, calculating at frequent periodic intervals in the computer the range of mold temperature variations from the set point, comparing at frequent periodic intervals in the computer the range of mold temperatures and the actual temperature, and controlling the mold heater to keep the mold temperature within the calculated range of the set point.

4. The method of claim 3 wherein the frequent periodic interval is approximately 10 seconds.

5. A method of operating a plurality of rubber-molding presses simultaneously curing precision molded compounds in conjunction with a computer, comprising:

providing said computer with a data base for each 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 said press,

constantly informing the computer of the temperature (Z) of each mold,

informing the computer of the batch of the compound being molded in each mold,

constantly informing the computer of the elapsed time that the compound has been in each mold,

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repetitively calculating for each said press at frequent periodic intervals during each cure in the computer the Arrhenius equation to determine the total required cure time, which is $\ln v = C Z + x$, where $\underline{v}$ is the total required cure time,

repetitively comparing at said frequent periodic intervals in the computer the calculated total required cure time and the elapsed time for each said press, and

opening each said press automatically when its elapsed time has reached its calculated total required cure time.

6. The method of claim 1 wherein each said frequent interval is no longer than approximately one second.

7. A method of manufacturing precision molded articles from selected synthetic rubber compounds with the aid of a digital computer, comprising:

providing said computer with a data base for a molding press to be used in the molding, 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,

installing prepared unmolded synthetic rubber of one said compound in a molding press cavity,

closing said press,

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

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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

$$\ln v = C Z + x$$

where $\underline{v}$ 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,

opening the press automatically when a said comparison indicates equivalence, and

removing the resulting precision molded article from the press.

8. The method of claim 7 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.

9. The method of claim 7 including in addition,

providing the computer with a mold temperature set point for each mold and a constant of proportionality with which a range of permissible mold temperature variation may be calculated,

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calculating at frequent periodic intervals in the computer said range of permissible mold temperature variations,

comparing at frequent periodic intervals in the computer said calculated range of permissible mold temperature variation and the actual temperature (Z) in the press, and

controlling the mold heater from said computer to keep the mold temperature (Z) within said calculated range of the set point.

10. The method of claim 9 wherein the frequent periodic interval is approximately 10 seconds.

11. A method of manufacturing precision molded articles from selected synthetic rubber compounds in an openable rubber molding press having at least one heated precision mold, comprising:

(a) heating said mold to a temperature range approximating a predetermined rubber curing temperature,

(b) installing prepared unmolded synthetic rubber of a known compound in a molding cavity of a predetermined geometry as defined by said mold,

(c) closing said press to mold said rubber to occupy said cavity in conformance with the contour of said mold and to cure said rubber by transfer of heat thereto from said mold,

(d) initiating an interval timer upon the closure of said press for monitoring the elapsed time of said closure,

(e) heating said mold during said closure to maintain the temperature thereof within said range approximating said rubber curing temperature,

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(f) constantly determining the temperature of said mold at a location closely adjacent said cavity thereof throughout closure of said press,

(g) repetitively calculating at frequent periodic intervals throughout closure of said press the Arrhenius equation for reaction time of said rubber to determine total required cure time v as follows:

$$\ln v = cz + x$$

wherein c is an activation energy constant determined for said rubber being molded and cured in said press, z is the temperature of said mold at the time of each calculation of said Arrhenius equation, and x is a constant which is a function of said predetermined geometry of said mold,

(h) for each repetition of calculation of said Arrhenius equation herein, comparing the resultant calculated total required cure time with the monitored elapsed time measured by said interval timer,

(i) opening said press when a said comparison of calculated total required cure time and monitored elapsed time indicates equivalence, and

(j) removing from said mold the resultant precision molded and cured rubber article.

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CONCISE EXPLANATION OF THE INVENTION

The invention relates to accurate and automatic control of the molding time for rubber compounds and the automatic opening of rubber-molding presses when the cure is calculated to be complete.

Much time-temperature cure data for rubber compounds is known, and each manufacturer of rubber products usually has some of this material at his disposal. The usual way of operating rubber-molding presses is for the operator to load them manually and for the operator then to close the press. Closure of the press operates a timer which has been preset for a time at which cure should be completed in view of what is supposed to be the temperature of the mold.

However, even though the mold temperature is thermostatically maintained, it is not likely to be identical with the supposed temperature. The actual temperature, and the correction of the temperature by the thermostat may take some time.

For example, the amount of time that the press is open during the operator's loading of the press varies, and the longer the press is open, the cooler the mold is when it is closed and again starts heating. Thus, it may be many degrees below its nominal temperature when the mold is first closed, and it may take a substantial amount of time for the mold to reach this nominal temperature. The thermostats are usually actuated within a plus or minus 2% to cause the device

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to heat until it reaches the nominal temperature, but this is not sufficient to assure that that temperature has been maintained as an average during the entire molding operation--as a matter of fact, it rarely if ever has.

Because of these inaccuracies, the practice in the industry has been to calculate the cure time as the shortest time in which one can be absolutely certain that all parts will be cured with any reasonable amount of mold-opening time during unloading of the previous batch and reloading. Therefore, the rubber will tend to be overcured in almost every instance, because the worst cure time will not be so often met with. Moreover, if there are times in which the mold is opened longer than was thought or in which the mold temperature for some other reason did not rise in time, then even the nominally "worst time" will not be long enough, and some batches will be undercured.

This practice has had two serious economical effects: in the first place, many batches have to be discarded when after tests they have been found either to be undercured or overcured beyond the tolerance limits. In the second place, the molds have been kept occupied and have been closed much longer than they have needed to be to obtain the best results. So fewer products could be molded per unit time and per hour of operator work, and there has been substantially less production than would have been possible had the actual cure time been known and followed by the mold.

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By accurate and constant calculation and recalculation of the correct mold time under the temperatures actually present in the mold, the material can be cured accurately and can be relied upon to produce very few rejections, perhaps completely eliminating all rejections due to faulty mold cure. Furthermore, the mold and the operator can be much more efficiently employed.

In the invention, a surveillance system is maintained over the mold to determine the actual mold temperature substantially continuously, for example, every ten seconds, and to feed that information to a computer of well known type. The computer has data storage banks containing the time-temperature cure data for the compound or compounds being used; in some cases, the stored data includes additional cure data, such as variations in batch charateristics. The pertinent stored data and the elapsed time information are fed at frequent intervals to the computer. The computer then continually recalculates on the basis of the temperature changes, and the elapsed time, and the time-temperature cure data, and arrives every ten seconds at a new time-temperature cure curve for that particular batch then being cured which the computer compares with the elapsed time every second; then, when the calculated cure time equals the elapsed cure time, the computer signals the opening of the mold to an electromechanical device which immediately opens the mold.

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The invention is applicable to a wide range of synthetic elastomers being cured and to their being molded for many uses. Much of the data verifying the invention has been obtained in the manufacture and cure of synthetic elastomer radial shaft seals. Butyl rubbers, acrylic rubbers and others have been concerned. The tests have shown that the method works on all of them.

Fig. 1 illustrates a simple example in which a single mold is involved and in which the information is relatively static.

A standard digital computer may be employed. It has a data storage bank of suitable size which, of course, may vary when many molds are used and when more refinements are employed. However, the relatively simple case of Fig. 1 achieves results that are vast improvements over what has been done up to now.

Thus, in the manufacture of synthetic elastomer oil seals, some actual data has showed that about 12.2% of time could be saved by using this invention; in other words, the molds could be in use for 12.2% more time than they had been theretofore. These data also showed that the percent rejects could be reduced by about 45% in this particular plant. These are significant results.

The data bank of the computer is provided with a digital input into which the time-temperature cure data for the compound involved is fed. All the data is available to the computer upon call, by random access, and the call can be automatic depending upon the temperature actually involved.

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In other words, the computer over and over questions the data storage, asking, what is the proper time of cure for the following summation of temperatures? The question may be asked each second, and the answer is readily provided.

The mold is closed manually, as in the present practice, since this is the best way to assure that everything has been placed properly into the mold. The operator, however, has no other duties than to remove the cured articles from the mold, to put in the "prep" or blanks which are to be molded and cured, to make sure that every cavity is properly filled, and then to close the mold. He does not have to concern himself about the temperatures or cure time, because all that is taken care of automatically.

Once the mold has been closed manually, it initiates a timer in the computer, via a digital signal, which feeds the elapsed time of mold closure to the computer constantly or in a digital fashion. Thus, once each second the computer can be aware of the amount of time involved, and this can be made even more frequent if that is desired. A point of difference from the prior art, however, is that the timer itself does not directly actuate the opening of the mold, and the mold time is not a set time.

The actual mold temperature is fed to the computer on a substantially continuous basis, for example, every ten seconds. Thermocouples, or other temperature-detecting devices, located directly within the mold cavity may read the temperature at the surface where the molding compound touches the

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mold, so that it actually gets the temperature of the material at that surface. The computer then performs series of integrations to calculate from the series of temperature readings and from the time-temperature cure data a proper cure time and to compare that cure time with the elapsed time. Recalculation continues until the time that has elapsed since mold closure corresponds with the calculated time. Then, the computer actuates the mold-opening device and the mold is automatically opened.

Once again, it should be stressed that the computer is not simply working on one time-temperature curve, it is working on a whole series of them, so that the proper compensation is made for the changes of temperature that occur within the mold. This makes it possible to get a substantially exact cure time. Therefore, when the cure is calculated as complete it will be complete.

The relatively simple system of Fig. 1 is easily expanded within the capability of many present-day computers. For example, the computer can be used to operate a whole series of molds--50 or 60 molds--each one of them receiving the attention of the computer once a second, at which time the elapsed cure time and the calculated cure time are checked for equality.

Data storage can be expanded by including in the data storage bank the time-temperature cure data for all compounds and for past batches of various compounds. Random access enables the data for any particular compound to be made available to the computer upon request, which the computer makes when it is told what compound is being used.

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Furthermore, the rheometer test can be made for each batch of the compound to determine the minimum torque and maximum torque as well as intermediate torque levels and temperature, all of which are used to determine cure time in accordance with the Arrhenius equation as explained hereinbelow. This means that each batch can be differentiated and corrections made on the basis of data in the data storage bank which the computer has access to, so that the rheometer data for the batch are fed into the computer each time a new batch is being used in the system. Thus the constant C referred to below is determined for each particular batch of compound being cured. It can even be used for different batches used in different parts of the same plant, that is, in different molds; the computer can take care of that, too, all within well-known capabilities.

Another factor which affects the time and temperature of curing is that of the mold geometry, and particularly the maximum thickness of the element to be molded. This factor is set out as constant x referred to hereinbelow, and for each mold and compound such data is fed into the computer to enable the computer to calculate the Arrhenius equation. The rule here is that the thickest part of the molded compound has to be completely cured. Knowing the thickest part and the dimensions of it, the results can be much more accurate than otherwise.

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Thus, in the system of Fig. 2, each time a mold is closed, even though it is a different time from the closure of every other mold, it starts an elapsed timing situation within the computer per the time-temperature curve and in accordance with the actual mold temperature for each mold. With this information and the other information already mentioned, the computer continuously, for example, every ten seconds, recalculates the proper time-temperature cure and arrives at the cure time, as before stated. When this cure time for the integrated series equals the elapsed time, then each mold is separately opened at its proper elapsed time on the signal from the computer.

Fig. 3 shows a computer program flow chart for the system illustrated in Fig. 2. In Fig. 3 the computer function steps are indicated within rectangles, whereas the logic steps or questions are shown within diamond-shaped parallelograms. A timer-based interrupt 11 initiates the program once every second. Upon program initiation, the computer scans and retrieves from data storage within the computer certain operating data for the first press in the sequence of presses controlled by the computer. This function step, indicated by reference numeral 12, makes available data concerning the press mold configuration constant, the activation energy constant for the material being cured, the mold temperature set point, the constant of proportionality required to determine a temperature control range, and the total elapsed time, if any, that the press has been closed up to the instant of this step. Having available the foregoing information, the computer reaches a logic decision 21, whether the press

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is closed. If the press is not closed, i.e., the press is open, the program sequences directly to a calculation 41 of temperature control range data, to be subsequently discussed. If the press is closed, a program subroutine to control cure time is followed.

In this subroutine, the computer first updates at 31 the amount of time that this particular press has been closed. Next, the current mold temperature is measured at 32 by thermocouple or other heat sensing means within the mold and the measurement is converted to digital information and read by the computer. The total elapsed closure time and the current temperature, along with the data previously retrieved from data storage are then used by the computer at 33 to calculate the total press closure cure time as a function of the Arrhenius equation:

$$\ln v = C Z + x$$

In this equation:

<u>ln</u> is the symbol for natural logarithm,

<u>v</u> is the total required cure time and end point for press closure,

<u>C</u> is the activation energy constant, a unique figure for each batch of each compound being molded, determined in accordance with the present invention by rheometer measurements of the batch,

<u>Z</u> is the present mold temperature at 32, and

<u>x</u> is a constant dependent upon the geometry of the particular mold of the press.

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This Arrhenius equation is numerically solved as follows:

$$v = e^{(cz + x)}$$

$$= 1 + \frac{(cz + x)}{1!} + \frac{(cz + x)^2}{2!} + \frac{(cz + x)^3}{3!}$$

Once a value for v, the end point time has been calculated, the computer determines at 34 whether the total elapsed time as updated at 31 is equal to or greater than the calculated end point time. If the updated time at 31 equals or exceeds the calculated end point time at 33, then a control signal is generated at 35 to open the press automatically, thereby completing one scan of the press closure control subroutine. If this time has not yet been reached, the subroutine is for the moment completed and the program continues, but the subroutine will be repeated later, usually about once per second.

Whether the full cure time has not been reached or whether it has, the next step is the calculation at 41 of mold temperature control range data. This step may be performed as a subroutine in each scan of the press, or preferably, it may be performed with every tenth scan, or once every ten seconds. The calculation of the mold and temperature control range data is accomplished pursuant to the following algorithm:

$$\text{Heater on/off state} = \text{Signum} \left| e(t) \cdot K \right|$$

wherein

e(t) is the difference between the mold temperature set point and the present mold temperature and

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K is a constant of proportionality set to provide the desired proportional control of the heater.

The computer next determines at 42 whether the mold heater current temperature is beyond the calculated temperature control range. If the current temperature is too high, a signal is generated at 43 to turn the mold heater off. Likewise, if the current mold temperature is too low, a control signal is generated at 43 to turn the mold heaters on. In this manner, the computer maintains close control over actual mold temperature to maintain it within a range of temperatures closely approaching and equalling the set point temperature.

The program next causes the computer to ascertain at 51 whether any change in batch data from the rheometer connected to the computer is awaiting transfer to storage. If new batch data are awaiting transfer to data storage update, the computer passes these update data at 62 to the correct storage address within the computer.

From time to time, new data concerning press mold configuration, batch characteristics, and other system parameters are entered manually by the computer control operator through a control console. Thus, on each program cycle, the computer determines at 61 whether any new data concerning the press are awaiting entry from the console. In the event of new console data, the computer then acts at 62 to transfer the data to the correct storage address within the computer data storage.

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Finally, the program asks the computer to determine at 71 whether the press being controlled at the moment is the last press in the total program control sequence. If the press is the last one, the computer waits at 73 for the next program control sequence to be initiated by the timer-based interrupt 11. In other words, the presses are open for product delivery and reloading. However, if another press is to be scanned and controlled within the present program control sequence, the computer proceeds at 72 to act for all such presses and repeats the above-described program routine for those presses, commencing with step 12. With the speed and capacity of presently available computers it is possible to scan and control as many as sixty different presses within the one-second total program control sequence.

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THE REJECTION

The Final Rejection is reproduced verbatim:

"1. This action is responsive to applicant's communication filed April 21, 1976.

"2. Claims 1-11 are now in this case,

"3. Claims 1-11 are rejected under 35USC101 as being drawn to non-statutory subject matter as discussed in paragraph 5, paper no. 2. New claim 11 is subject to the same deficiencies as claims 7-10 in that the so-called 'physical' steps such as heating the mold, closing the press, heating the mold and opening the press are conventional and necessary to the process and cannot be the basis for patentability.

"4. Applicant's arguments have been considered but are not convincing. As applicants correctly state, the Supreme Court in the case of Dann v. Johnston, decided the case on the issue of obviousness under 35 USC 103 and did not discuss the issue raised by 35 USC 101. However, the Examiner cannot agree with applicant's conclusion that such action results in an implication that the Court was somehow acquiescing in the CCPA position on 35 USC 101. The Supreme Court's decision was actually a reversal of the CCPA decision which leaves standing the Board of Appeals decision regarding the patentability of the claims, i.e. that the claims are not patentable.

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"5. This action is made FINAL."

(signed)

JOSEPH F. RUGGIERO
EXAMINER
GROUP ART UNIT 236

Paragraph 5 of paper No. 2 (referred to in paragraph 3 of the Final Rejection) reads as follows:

> *"5. Claims 1-10 are further rejected under 35 USC 101 as being drawn to non-statutory subject matter. Claims 1-6 recite a series of steps for operating a rubber molding press in conjunction with a digital computer. A close inspection of the claims reveals that all of the claimed method steps involve either the inputting of data to the computer, the operation of the computer on such data, and the provision of an output signal by the computer in response to such operation. All of these steps are carried out by the computer under control of a stored program. New claims 7-10 recite the additional 'physical' steps of installing rubber in the press and the subsequent closing of the press; however, these steps are conventional and necessary to the process and cannot be the basis of patentability. It remains the Examiner's position therefore, that applicants' claims define and seek protection on a computer program for operating a rubber molding press. Such has been held to be non-statutory subject matter by the Supreme Court in Gottschalk v. Benson, 175 USPQ 673."*

ARGUMENT

Although there was a rejection on art in the parent case, this rejection was withdrawn. There was also a rejection even in this continuation case, under §112--that, too, has been withdrawn. The rejection now is §101 alone.

The rejection of the claims as being drawn to non-statutory subject matter is not in accordance with, and is in effect contrary to, Gottschalk v. Benson, which is reproduced in the Appendix to this brief. Justice Douglas, who wrote that opinion, has not been considered to be liberal on patent

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matters, but he did say the following: *"It is said that the decision precludes a patent for any program servicing a computer. We do not so hold."* The Justice Douglas statement does not support the rationale of the Examiner, *"...a computer program...has been held to be non-statutory subject matter by the Supreme Court in Gottschalk v. Benson..."* The present application is not at all factually analogous to the subject matter considered in Benson.

This Application does not Claim a Computer Program

The Examiner in paragraph 5 of paper No. 2 said:

> *"It remains the Examiner's position therefore, that applicants' claims define and seek protection on a computer program for operating a rubber molding press. Such has been held to be non-statutory subject matter by the Supreme Court in Gottschalk v. Benson, 175 USPQ 673."*

The Examiner's position has no factual basis. The application does not even disclose a computer program. How could it claim one? The claims are all stated to be directed to *"A method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer"* (Claim 1), *"A method of operating a plurality of rubber-molding presses simultaneously curing precision molded compounds in conjunction with a computer"* (Claim 5), *"A method of manufacturing precision molded articles from selected synthetic rubber compounds with the aid of a digital computer"* (Claim 7), or *"A method of manufacturing precision molded articles from selected synthetic rubber compounds in an operable rubber molding press having at least one heated precision mold"* (Claim 11). Note that

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claim 11 doesn't even mention a computer.

A computer program alone will not mold rubber articles. The present invention will mold rubber articles and will do so more efficiently and effectively than has heretofore been possible.

Applicants seek to improve the molding of rubber articles, and one thing they do is to employ a computer to help perform the process. So long as the computer does its part, the details of the computer and the particular program are unimportant. What the program is may widely vary.

Does the Examiner believe that all processes which include use of a computer are per se unpatentable? Then he is at odds not only with the opinion in Gottschalk v. Benson but also with the decisions before and after Benson.

Gottschalk v. Benson is a narrow decision best limited in application to the narrow issue there confronting the Supreme Court. Its narrowness has been noted

(1) by the Court of Customs and Patent Appeals:

> *"The issue considered by the Supreme Court in Benson was a narrow one, namely, is a formula for converting binary coded decimal numbers into pure binary numerals by a series of mathematical calculations a patentable process?"*
>
> In re Christiansen, (CCPA 1973)
> 478 F.2d 1392, 1394
> 178 USPQ 35,37;

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(2) by the Trial Division of the Court of Claims:

> *"Nor are defendant's arguments regarding the software any more persuasive. While Gottschalk v. Benson, 409 US 63, 175 USPQ 673 (1972) held that computer programs were not patentable per se, claim 1 is clearly directed to a combination of elements and not just to a program."* [Very Low Frequency "Omega" Navigation System including a programmed computer for calculation of position from digitized radio signals.]
>
> Decca Ltd. v. United States
> 188 USPQ 167,173.

(3) by the Supreme Court itself:

> *"As we observed* [in Benson], *'[t]he claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use.' ...our limited holding...* [in Benson] *was that respondent's method was not a patentable 'process' as that term is defined in 35 USC §100(b)."* (Emphasis supplied)
>
> Dann v. Johnston (1976)
> ____ US ____, 189 USPQ 257, 259.

Despite the unmistakable opportunity to clarify and expand the Gottschalk v. Benson decision, the Supreme Court has in the Johnston case, deliberately chosen not to do so thereby relegating Benson to the great number of decisions useful only in situations presenting the same fact situation.

As to what constitutes statutorily patentable subject matter, the Examining Corps is referred, by paragraph 706.03(a) of the Manual of Patent Examining Procedure, to the decisions of the U.S. Supreme Court, Court of Customs and Patent Appeals and the Board of Appeals.

> *"Decisions have determined the limits of the statutory classes...."*

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A review of those decisions, in light of Gottschalk v. Benson, supra, persuasively demonstrates the impropriety of the Examiner's rejection under Section 101 in the present application.

At the outset it should be noted that Justice Douglas in Benson considered the factual situations in seven prior decisions of the Supreme Court, all of which resulted in findings of patentable subject matter. In O'Reilley v. Morse, 15 How. 62, the process of using electromagnetism to produce distinguishable signs for telegraphing was held to be a statutory process. In The Telephone Cases, 126 U.S. 1, 534, Alexander Graham Bell's method for putting a continuous current in a closed circuit into a certain specified condition suited to the transmission of vocal and other sounds was held to define patentable subject matter. So also, in Corning v. Burden, 15 How. 252,267, the use of chemicals and physical controls to transform raw materials was held to be statutory subject matter. In Cochran v. Deener, 94 US 780, although no special machinery was claimed in a process for manufacturing flour, the Court had no trouble in finding the claimed subject matter patentable regardless of how the process might be carried out. Expanded Metal Co. v. Bradford, 214 US 366, sustained a patent on a process for expanding metal. Smith v. Snow, 294 U.S. 1, and Waxham v. Smith, 294 U.S. 20, upheld a patent for artificial incubation of eggs.

In a recent decision of the Court of Claims, Trial Division, the Government's arguments regarding unpatentability of software were rejected. The patent sued upon covered the

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Governments' Very Low Frequency Radio Navigation System called "Omega", a system which utilized time synchronized transmitters, and a receiver, analog to digital converters, and a programmed general purpose digital computer aboard a vessel or aircraft. In that case, Judge Cooper reasoned:

> *"While Gottschalk v. Benson, 409 US 63, 175 USPQ 673 (1972) held that computer programs were not patentable per se, claim 1 is clearly directed to a combination of elements and not just to a program. Nor does claim 1, as applied to Omega, read only on the program in the computer. Indeed, as defendant's* [United States'] *expert testified at trial, the program accomplishes nothing by itself; it must be mechanized to achieve the navigational functions for which the Omega system is designed."*
>
> Decca Ltd v. United States
> (Ct.Cl.Tr.Div. 1976)
> 188 USPQ 167,173.

In the present application, although the Examiner has repeatedly argued that the novelty of the invention resides in the computer program, this is not the case. Obviously, the computer program cannot alone accomplish precision molding of compounds. As stated in the Decca case, *"the program has to be mechanized to achieve the navigational functions."* In the present case for *"navigational"*, substitute *"precision molding of compounds"*, and the principle of the decision remains. It is the mechanization of the process claimed in the present application which supplies its novelty and patentability, just as it was in the Decca case. The steps specified in the claims on appeal are not suited to be carried out mentally. The repetitive calculations and comparisons called for in the claims are beyond the ability of a human operator and thus require mechanization, just as mechanization was required in the so-called Omega system considered in the Decca case, supra.

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In Gottschalk v. Benson, Justice Douglas, in speaking of what does make a process claim patentable, quoted from Cochran v. Deener, supra:

> *"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."*
> (Emphasis added)

Justice Douglas then said that

> *"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."*

Claims 7 to 10, which definitely relate to the treating of the material, are therefore introduced. However, even though claims 1 through 6 relate to the control of a press or of a plurality of presses, they also act upon the material which is put into the mold, to produce a different state or thing. In other words, the synthetic rubber begins as a piece of *"prep"*, an uncured annulus of elastomer, and it ends up being a precision-molded oil seal or similar product. Therefore the claims in this application come under exactly what Justice Douglas said is a patentable process.

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APPLYING THE CASES TO THE CLAIMS

In each of claims 1, 5, and 7, the first step is providing the computer with a data base. All these data have particular applicability to the *"transformation and reduction of an article to a different state or thing."* The activation energy constant depends upon the batch of the compound, and the constant (X) depends upon the geometry of the particular mold of the press. The natural logarithm conversion data is not relied on alone for patentability but is necessary to handle the calculations relating to the data.

New claim 7 recites as the second step *"installing prepared unmoldd synthetic rubber of one said compound in a molding press cavity."* This clearly is an act performed on a material or article. The third step, *"closing said press"* is also clearly not part of *"computer programming."* Both are important physical steps.

The second step in claim 1 and the fourth step of claim 7 is the initiation of the interval timer upon closure of the press. This is not part of a *"computer program."*

The third step of claim 1 and the fifth step of claim 7 call for a constant determination of the temperature in the mold--not in the computer.

The information is given to the computer in the fourth step of claim 1, the second step of claim 5, and the sixth step of claim 7. In claim 5 the third step is to inform *"the*

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computer of the batch of the compound being molded in each mold", and the fourth step is that of *"constantly informing the computer of the elapsed time that the compound has been in each mold."* These steps are quite physically embodied.

Next in all of claims 1, 5, and 7, the computer then does the necessary repetitive calculation. The claims have given the Arrhenius equation, but no assertion is made that the Arrhenius equation is patentable, because it has long been known. This necessary step is stated in order to make the claim complete.

The subsequent repetitive comparing in the computer is important. It states what the computer is called upon to do in order for the result to follow.

Finally, the last step of claims 1 and 5 and the next-to-last in claim 7, call for <u>opening the press</u> automatically; this is a physical opening. Moreover, the articles that were put into the press before the initiation of the timer are now in a different state or are a different thing. Claim 7 follows with the step of physically *"removing the resultant precision-molded article from the press."*

Claims 2, 3, 4, 6, 8, 9, and 10 all depend on one of these independent-form claims. Thus, it should be clear that <u>Gottschalk v. Benson</u>, instead of being authority for calling the subject matter of the claims non-statutory, is actually persuasive authority for indicating that the kind of subject matter covered by the claims is statutory subject matter.

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Claim 11 is even more clearly allowable over §101.

The point is again stressed that the opinion of Justice Douglas in Gottschalk v. Benson indicates clearly and specifically that transformation of an article to a different state or thing is the clue to the patentability of a process under 35 U.S.C. 101. Under this test, the claims on appeal constitute patentable subject matter and ought to be allowed.

Respectfully submitted,

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Appendix
Gottschalk v. Benson case
175 USPQ 673

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All communications respecting this application should give the serial number, date of filing and name of the applicant.

PAPER NO. 9

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RUGGIERO 236
08/06/75 602,463
James R. Diehr, et al

MAILED
FEB 23 1977
TRADEMARK OFFICE

332-53

DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES

Before the Board of Appeals

RECEIVED
SEP 29 1977
BOARD OF APPEALS

Robert E. Wickersham, for Appellant

Examiner's Answer

This is an appeal from the final rejection of claims 1-11. No claims have been allowed.

A correct copy of the appealed claims 1-11 appear on pages 1-7 of appellants' brief.

Description of the Invention

The invention is described on page 8 through 19 of appellants' brief.

No References Have Been Relied On

The Grounds of Final Rejection

Claims 1-11 are rejected under 35 U.S.C. 101 as being drawn to non-statutory subject matter.

Reasons for the Rejection

The claims are drawn to a method of operating a rubber-molding press in which, under control of a

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programmed computer, repeated measurement of the mold temperature are taken, the computer operates on such data to calculate the required cure time in accordance with the measured temperature and indicates when the elapsed cure time equals the calculated cure time. The several steps recited in the claim which are not performed by computer such as "installing a compound in a molding press", "heating the mold" and "opening the mold" are conventional and necessary to any prior art method of operating a rubber-molding press. Therefore, any novelty in the claims must lie in the method steps which define a computer program for taking repeated temperature measurements from the mold and calculating cure time in response to said measurement data. Claim 11 is somewhat different from claims 1-10 in that the use of a digital computer is not claimed. However, this is not seen to alter the above result since steps "b" through "i" are strictly for use in a digital computer. There is nothing in the specification to support any other substantial practical application except in connection with a digital computer. The Supreme Court of the United States in Gottschalk v. Benson et al, 175 USPQ 673, indicated that a program that has no substantial practical application except in

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connection with a digital computer is not patentable under 35 U.S.C. 101. Furthermore, the Supreme Court noted, by quoting from the Report of the President's Commission on the Patent System, policy matters raised against the patenting of computer programs but declined to decide such policy matters and refused to extend the patent statutes to embrace computer programming. As a result, the instant claims are directed to subject matter which the Supreme Court has declined to extend patent protection absent a considered action by Congress.

Response to Allegations and Arguments

The first point which appellants make is that since the application does not disclose a computer program, one could not be claimed. This argument is completely inconsistent with appellants' position throughout the prosecution of this application. Appellants have consistently, until now, maintained that they have indeed disclosed a computer program, in the form of flow charts in Fig. 3A and 3B, which would enable one of ordinary skill in the art to practice the invention. It is the Examiner's position that it is this program that is appellant's contribution to the prior art and that such is not patentable under 35 U.S.C. 101 in view of the Supreme Court decision in Benson.

Appellants further argue that a computer program alone will not mold rubber articles and the claimed process must be considered in its totality. While the Examiner accepts the fact that certain additional steps are needed to enable a program to control a rubber-molding process, such steps (as exemplied by the claimed process) as heating a mold and opening and closing of the press are steps which are necessary to any prior art rubber-molding process. As such, they cannot be the basis for patentability. It is noted that appellants process does not produce a different product than the prior art but merely one that is increased in quality due to the frequent monitoring of the mold temperature. It is the computer program which enables appellant to constantly recheck mold temperature and recalculate cure time based on such temperature measurements; however, regardless of the novelty or inportance of such discovery it is not patentable under 35 U.S.C. 101.

Appellants next contend that the Benson decision was a limited one and should be limited to the particular facts in that case. The Examiner agrees that the issue presented in Benson (namely, was the method claimed a process within the meaning of section 101?) was a limited one and the Court narrowed its holding to that issue. Thus the part of the decision noted by appellants was merely a denial by the Court that there was an intent to extend its holding beyond the limited issues presented, or that it had decided any of the other classes of problems concerning programs and computers. The effect of a denial is no decision on these issues, and not an affirmative holding in any sense.

Even though the Court decided a limited issue in Benson, it discussed the patentability of digital computer programs in the last two paragraphs of the decision. While this discussion may not have the force of a legal holding, it represents an attempt by the Supreme Court to provide direction for the evaluation of claims directed to digital computer programs. Where the Supreme Court's thinking on an issue is evident, it would seem appropriate to adopt its view when the issue is squarely presented. Thus the same policy matters for denying patent protection to the claims in Benson are also present here and should lead to the same result.

Appellants further cite a decision by the Court of Claims, Trial Division in Decca Ltd. v. United States, 188 USPQ 167 in support of their position. Appellants cite language which states that a program accomplishes nothing by itself and needs to be mechanized to achieve the desired functions and it is this machanization that gives the claims in this present case their novelty and patentability. While the Examiner agrees with the truism that a program needs to be mechanized to perform its desired functions, such mechanization is achieved when it is loaded into a digital computer. While the appellants attempt to extend the Court of Claims reasoning to the effect that just as a program requires "mechanization"

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to achieve its functions, so does the process in the instant case require "mechanization", such is not seen to affect the Examiner's position with regard to the claims. As discussed previously, the process here is "mechanized" by performing conventional and necessary steps which would be performed in any rubber-molding process, i.e. inserting a compound in the mold, closing the mold, heating the mold and opening the mold. The remaining steps of the claims are mechanized when the program defined thereby is loaded into the computer. As stated previously, it is the program which is appellants contribution to prior art rubber-molding process and such cannot form the basis patentability.

CONCLUSION

For the reasons set forth above, it is respectfully submitted that the final rejection of claims 1-11 was proper and should be affirmed.

Joseph F. Ruggiero
JOSEPH F. RUGGIERO
EXAMINER
GROUP ART UNIT 236

RUGGIERO:mrt

CONFEREES: C.E.ATKINSON
M.A.MORRISON

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of)
JAMES R. DIEHR, II and
THEODORE A. LUTTON)
Serial No. 602,463) BEFORE THE BOARD OF APPEALS
Filed August 6, 1975)
For DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES) APPEAL NO. 332-53
Group Art Unit 236)
Examiner: Joseph F. Ruggiero)

APPELLANT'S REPLY BRIEF

Pursuant to Rule 193(b) [37 CRF 1.193(b)], the appellant files herewith a reply brief directed to the new points of argument raised in the Examiner's Answer, mailed February 23, 1977.

I.

The Subject Matter on Appeal Claims a Combination of Mutually Interactive, Essential Elements

The appellant is not claiming a programmed digital computer, although the application on appeal contemplates that a digital computer under the control of a written program, in cooperation with other machinery, constitutes the best mode of carrying out the invention. Nothing in the claims of the present application precludes "mechanization" of the present invention with, e.g., hard-wired logic circuitry. With such circuitry (which is the electrical equivalent of a programmed general purpose computer) the theoretical basis of the Examiner's rejection evaporates.

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This application does not claim the invention of a computer program. As the Examiner admits (Examiner's Answer, page 4, lines 7-9). The present invention provides a tangible, precision molded product which is <u>improved</u> in relation to products of the prior art, because of the greater accuracy of cure. The computer <u>program</u> does not and cannot make the improved product, and the improved product can be made without any computer program whatsoever, e.g., if a hard-wired control system were implemented.

Applicant has no wish to bring in the extraneous issue of whether computer programs are patentable or unpatentable. The Examiner's substantial disregard of the claimed overall combination of steps of the method claimed, and his apparent obsession of the idea of "guilt-by-association-with-a-computer-program" is both erroneous and unnecessary.

II.

The Application Describes an Engineered System, Not a Computer Program

In the appellant's view, a computer program constitutes a sequence of instructions which are understandable by a particular computer and which tell the computer how to receive, store, process, and deliver information. No such program has been set forth in the specification of the instant application, and the Examiner has properly ruled that no such program need be set forth. The flow charts in Figs. 3A and 3B constitute an enabling disclosure for the system of the present invention. They leave the person of ordinary skill in the art free to implement the invention in accordance with the best mode applicable to his particular situation.

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It is no surprise that the Examiner has characterized the flow charts of Figs. 3A and 3B as a "program." The Examiner appears to have committed himself to the position of casting the present invention into an unfitting mold of the so-called computer program rejection. However, this characterization of the invention is inaccurate, as can be seen by reading the claims, in particular Claim 11.

III.

The BENSON Case does not support the Examiner in This Appeal

The Examiner places his entire support for rejection of the claims on appeal on certain gratuitous dicta of the Supreme Court in the Benson decision (175 USPQ 673), dicta of applicability, if at all, only to the factual situation under consideration in the Benson case, a case quite unlike the factual situation of the application on appeal. As the Examiner should know, the invention in Benson did not provide an improved tangible product. In fact, Mr. Justice Douglas spells out elsewhere in the same decision much more pertinent dicta that state that when a claimed method physically alters a product, it falls within Section 101 and can be patented, as long as it also meets Section 102, 103, and 112.

The Benson decision should be viewed more as a whole, for then the cited dicta will not mislead the Examiner into rejecting an otherwise allowable patent application because a preferable implementation of the invention might or can include a programmed computer, in order to bring about the best mode of mechanization of the invention.

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See In re Chatfield (CCPA 1976) 191 USPQ 730, 733: ". . . the mere labelling of an invention as 'a computer program' does not aid in decision making...." Also see, In re Noll (CCPA 1976) 191 USPQ 721.

IV.

Automatic Mechanization Is Novel and Patentable

The mechanization process being claimed is the invention; it is not conventional to the prior art. The steps claimed are preferably performed as a novel combination, using machinery automatically to produce a superior product. This is a classic instance of statutory subject matter as defined by the Congress in 35 USC §101.

V.

Conclusion

The new points raised by the Examiner do not materially aid or strengthen his erroneous rejection relied upon on this appeal. Claims 1-11 define patentable subject matter and ought to be allowed by this Board.

Respectfully submitted,

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BOARD OF APPEALS

Appeal No. 332-53 RD

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF APPEALS

Ex parte James R. Diehr, II
and
Theodore A. Lutton

- - -

Application for Patent filed August 6, 1975, Serial No. 602,463, a Continuation of Serial No. 472,595, filed May 23, 1974, now abandoned; and which is a Continuation-in-Part of Serial No. 401,127, filed September 26, 1973, now abandoned. Direct Digital Control of Rubber Molding Presses.

Robert E. Wickersham for appellants.

Before Burns and Spencer, Examiners-in-Chief, and Craig, Acting Examiner-in-Chief.

Burns, Examiner-in-Chief.

This is an appeal from the final rejection of claims 1 through 11, constituting all of the claims presently in the case. Disclosure is directed to a method of operating a rubber-molding press, best understood from a consideration of representative claim 1:

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

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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

$$\ln v = C Z + x$$

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.

A single rejection has been lodged against the claims under 35 U.S.C. 101, the examiner maintaining that the claims are directed to non-statutory subject matter. We have reviewed the arguments advanced by appellants in their brief and reply brief, together with the statement of the rejection and response provided by the examiner in his final rejection and answer. We agree with the examiner.

Beginning on page 22 of their brief, appellants urge that their application does not disclose a computer program and that, thus, they could not claim one. They point to the several preambles of the independent claims 1, 5, 7 and 11. While we might agree that appellants have provided no program listing as part of their disclosure, we would observe that there are many ways in which a program may be disclosed. Figures 3-A and 3-B, with the attendant textual description on pages 9-13 of the specification, are, we think, an appropriate description of a program sufficient for the person of ordinary skill in the art to create the machine readable program code acceptable to the computer. This appears to be substantiated by the affidavit of Ekland submitted by appellants, and we note that no rejection under 35 U.S.C. 112, paragraph 1, as to insufficiency of the disclosure has been urged by the examiner.

We have reviewed the cases cited by appellants, in particular Gottschalk v. Benson et al., 409 US 63, 175 USPQ 673 (1972), hereinafter Benson, and In re Christensen, 478 F.2d 1392, 178 USPQ 35 (CCPA, 1973). We have also had available for consideration the newly decided case by the USSC, Parker v. Flook, 437 US ---, 198 USPQ 193 (1978), hereinafter Flook.

Turning to the claims, we agree with appellants that steps are included which are not part of a computer program. We take exception, however, to appellants' arguments on pages 28 and 29 of the brief as to what constitutes part of a computer program.

In claim 1, the only non-programming step which we perceive is:

> "constantly determining the temperature (Z) of the mold ... ".

This step, we note, appears to be within the prior art as described in "Background of the Invention", specification pages 1-3.

Steps found in the prior art such as these will

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not lift the Benson/Flook proscription, In re Christensen, supra; In re Chatfield, 545 F.2d 152, 191 USPQ 730 (CCPA, 1976); and In re Richman, 563 F.2d 1026, 195 USPQ 341 (CCPA, 1977).

The step of "opening the press automatically ... " appears to fall in the post-solution category which will not render the claims statutory, see Flook. We would add that proper execution of such a step requires the appropriate program instructions in the recited preceding steps, and thus may be considered as program dependent.

Steps, such as those of claim 1, which provide the computer with data base or with signals representing parameters sensed, such as:

> "constantly providing ... (Z)", or
>
> "initiating an interval timer in said computer ... ",

all require instructions written into the program without which the computer will not accept data or initiate any of its internal timers.

That appellants' system performs operations involving an algorithm, solving a mathematical problem, as addressed in Benson and Flook, is apparent, see for example claim 1, "repetitively calculating ... " and "repetitively comparing ... ".

In claims 2 and 8, "measuring ... " appears to be a non-programming step, but of the data gathering category, while "automatically updating said data base ... " clearly requires the presence of program instructions.

In claims 3, 4, 9 and 10, the first three steps, namely, "providing ... ", "calculating ... ", and "comparing ... " require programming instructions.

The step of "controlling ... ", found in claims 3 and 9, is post-solution in character and is subject to our remarks above.

As for claims 5 and 6, all of the steps require program instructions.

With regard to claim 7:

"installing ... ",

"closing said press ... ",

"constantly determining the temperature ... ",

"opening the press ... ", and

"removing ... article",

all appear to be conventional steps known in the art. The remainder of the steps in this claim are directed to the computer program.

In claim 11, steps (a), (b), (c), (e), (f), (i) and (j) appear to be conventional molding process steps, while steps (d), (g) and (h) set forth the program.

It is our view that the only difference between the conventional methods of operating a molding press and that claimed in appellants' 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.

We think that appellants' contribution, regardless of claim format, is a computer program of the character which the USSC has indicated, in both Flook and Benson, is outside the bounds of 35 U.S.C. 101.

We have had occasion to make reference, severally, to the steps of the claims which represent prior art, and also to the steps which constitute the computer program. In so doing however, we do not consider that we have in any way dissected the claim. Discussion of the various features

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or components of the claims would not appear to be inconsistent with the view that a patent claim must be considered as a whole, see Flook. We will sustain the rejection.

The decision of the examiner is affirmed.

AFFIRMED

Examiner-in-Chief)
)
Examiner-in-Chief) BOARD OF APPEALS
)
Examiner-in-Chief)
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