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IN THE UNITED STATES PATENT OFFICE

1½ B/B

In the Application of

JAMES R. DIEHR and THEODORE A. LUTTON

Continuation of: Serial No. 472,595

Filed May 23, 1974

AUG 5 1975

For DIRECT DIGITAL CONTROL
OF RUBBER MOLDING PRESSES

Group Art Unit 236

Examiner Joseph F. Ruggiero

Mailed Copies 10-9-75

Commissioner of Patents

Washington, D. C. 20231

Dear Sir:

PRELIMINARY AMENDMENT

Please amend the application as follows:

In the specification:

Page 1:

line 15, replace "this material" with --these data--

Page 6:

line 2, delete "by random access,"

line 22, before "second" insert --each calculation cycle, e.g., once each--

Page 7:

line 27, before "once" insert --, e.g.--

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In the specification

Page 9:

line 22, replace "retrives" with --retrieves--

Page 10:

line 24, replace "compounded" with --compound--

In the claims

Please rewrite claim 1 as follows:

Sub D' --1. ((Amended)) A method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer, comprising:

providing [a] said computer with [time-temperature cure data for the compound being molded in the press] 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 [at every instant] during molding,

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D'cont'd

constantly providing [keeping] the computer [informed as to] with the temperature (Z) [of the mold cavity],

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 [lnv] v is [the natural logarithm of] the total required cure time,

[C is the activation energy constant unique to each batch of compound being molded,

Z is the present temperature of the mold, and

x is a constant dependent upon the geometry of the particular mold of the press,]

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 [the] said elapsed time, and

opening the press automatically when [the] a said comparison indicates [completion of cure] equivalence.--

Please rewrite claim 2 as follows:

--2.(Amended) The method of claim 1 including measuring the [time-temperature cure data] 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 [each] said press as measured by said rheometer.--

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Omit

Please rewrite claim 5 as follows:

Sub D2 --5. (Amended) A method of operating a [series] plurality of rubber-molding presses simultaneously curing precision molded compounds in conjunction with a computer, comprising:

providing [the] said computer with[time-temperature cure data for the compounds to be molded,] 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,

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 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 [the] each said press automatically when

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[the] its elapsed time has reached [the] its calculated total required cure time.

Please add the following claims:

--6. (To follow claim 1) 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,

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),

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D3 cont'd

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,

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,

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

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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.

R E M A R K S

The amendments to the specification are those presented in Serial No. 472,595 in the amendment dated March 13, 1975. They correct certain typographical errors and clarify the meaning. No new matter is presented.

Four new claims have been added to cover the specific aspect of the invention relating to making precision-molded synthetic rubber compounds.

These Remarks respond inter alia to the Final Rejection of the Examiner dated May 14, 1975 of the parent application, Serial No. 472,595. Therein the Examiner objected to the specification under 35 U.S.C. 112 and rejected claims 1-6 under 35 U.S.C. 112 as drawn to insufficient disclosure and also under 35 U.S.C. 101 as drawn to non-statutory subject matter. The Examiner did not in that action reject claims 1-6 on prior art under either 35 U.S.C. 102 or 35 U.S.C. 103. Applicants infer that the Examiner has now recognized the unobvious differences of the present invention over the cited prior art and that the issue is to Sections 101 and 112.

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A new affidavit under Rule 132 is presented showing that reduction to practice of the invention need not take a long time so long as one is not setting up a complete factory. The new affidavit answers questions raised in the Final Rejection of the parent application, Serial No. 472,595, as to the reasonableness of the time it would take for a reader of this application to reduce the invention to practice, as stated in prior affidavits filed in said parent application and incorporated into this continuation application by reference thereto (copies attached hereto). As the accompanying new affidavit shows, the invention could be reduced to practice in only about six weeks if one were to use only one molding press with one type of mold cavity to make one type of product and were to use only one compound for it. One would still have to get data for that compound and feed it to the computer. It would still take some time to adapt that one press, but it is apparent that such time would be much less than the time actually taken in adapting sixty presses, involving two-hundred mold cavities, for fifty different product types and thirty different compounds. The time estimate in the earlier affidavits under Rule 132 was based on the use of that large number of products, mold cavities, and so on. The new affidavit shows how relatively simple the invention is, as compared with application of the invention to an entire factory.

Re: Paragraph 5 of the "Final Rejection" of May 14, 1975

The rejection of the claims as being drawn to non-statutory subject matter is not in accordance with, and is in

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effect contrary to, Gottschalk v. Benson. Justice Douglas, who wrote that opinion, has not been considered to be liberal on patent 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 is contrary to the statement by the Examiner, "Computer programs have been held to be non-statutory subject matter by the Supreme Court in Gottschalk v. Benson..."

Moreover, Justice Douglas, in speaking of what makes a process claim patentable, quotes from Cochran v. Deener, 94 U.S. 780, "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." Justice Douglas then says 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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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 unmolded 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 calls 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 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.

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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, calls for opening the press 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."

The other claims all depend on one of these three independent-form claims. Thus, it should be clear that Gottschalk v. Benson, 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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Re: Paragraph 6 of the Final Rejection

In paragraph 6, the Examiner refers to the affidavits which had earlier been presented under Rule 132. He first disposes of the Ekland affidavit, which was corroborative of applicants' first affidavit under Rule 132 by saying, without any authority for the statement, that it is questionable whether the 6-months' limitation could be considered reasonable. To make a statement like this, according to Patent Rule 107, the Examiner should set forth more than a mere allegation.

Furthermore, the significance of the six-month period has been overlooked. The Ekland affidavit was based on the same material as that stated in detail in the first affidavit under Rule 132 by the applicants, which goes through the times involved step by step and explains both why it took applicants 14 months and how the time can now be substantially shortened. As noted above, even the shortened version set forth in that affidavit was for instituting a complete program for a complete factory. There were sixty presses, which take up a considerable area of floor space--a complete factory full,--and each of these sixty machines holds a number of mold cavities and is used by two hundred sets of such cavities, only one set being in use at any one time. Thirty compounds were used, and fifty different types of articles were made, as disclosed in the accompanying Second Affidavit Under Rule 132, filed along with this paper. Thus, it will be seen that a much shorter time (only six weeks) is involved in reducing to practice the invention set forth in claims 1 and 7. "Reasonableness of time" should be considered on a reasonable basis.

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While the Examiner might have considered it unreasonable for one familiar with the instant-disclosure to take six months to reduce the claimed invention to practice--i.e., to apply it to one machine with one cavity to one type of molding compound, he should have noted that the six-months' period estimated (as well as the fourteen-months' actual period taken) was for the entire factory of sixty presses with many products, many mold cavities, and several molding compounds.

The Examiner, in the bottom paragraph of page 3 of the "Final Rejection" in Serial No. 472,595, appears to challenge long-standing practice and possibly to confuse "the invention" with the entire technological complex related to the invention. As proven by the new Rule 132 affidavit, applicants' "working program listing" which "applicants chose to withhold...from the application" is largely comprised of a huge mass of data applicable only to applicants' assignee's molds, presses, products, and compounds, almost all of which are proprietary.

Applicants' affidavits show that they have disclosed the process of the invention "in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains...to make and use the same." It also "sets forth the best mode contemplated by the inventor of carrying out his invention."

The affidavits and application show that one skilled in the computer programming art can expeditiously prepare a working program tailored to press geometries and compounds quite different from those known to the inventors. The

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original affidavit by applicants under Rule 132 disclosed that the flow sheet is itself basically a program and that the only difference between the flow sheet as a program and the form taken by the program when it gets into the computer is translation into a suitable computer language, whether that be Basic Assembly language or Fortran, or whatever is available. That affidavit shows that any operator who knows such language can translate the flow sheet program into computer language and place it in the computer. Most of the time involved in "programming" the computer was simply the heavy load of placing the large amount of data required into the machine itself, and this is comparable to giving a typist a long document to type.

What the Examiner calls, "withholding a disclosure of the complex means necessary to achieve that result", is of questionable value to competitors as to enabling them to practice the invention--since their products are at present sufficiently different and their compounds and molds are also different-- but of considerable harm to applicants' assignee, because the competitors would find out things about that assignee's products and compounds which have no relation to the present invention. Moreover, such a program--some hundreds of pages-- would overload the printing office and cost applicants an issue fee of thousands of dollars--all with no real public benefit and without complying any more than has already been done with the Statute.

If the issue is one of preventing undue experimentation, then the application does that. Applicants cannot

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be expected to present enough data so that competitors with their different products would not have--with or without the "program"--to determine data for each of their products, their compounds, their molds, and so on. Outside of compiling such data, the competitor would--and will if the patent issues--be able to use the flow sheet (plus the still needed data) to compile a program with little or no experimentation.

The final paragraph of the Examiner on page 4 is interesting but appears to be immaterial. The Examiner has given no citation to support this argument, and it appears that the Examiner, in talking about a program, is equating a specific program to the obvious measure of producing a computer translation of what is, in effect, a program already.

Respectfully submitted,

Robert E. Wickersham

Attorney for Applicants
Robert E. Wickersham
Reg. No. 16,150
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Attachments:

RULE 132 AFFIDAVIT
Diehr and Lutton
March 6, 1975

RULE 132 AFFIDAVIT
Joseph D. Ekland
March 7, 1975

RULE 131 AFFIDAVIT
with Exhibits A-G
Diehr and Lutton
March 3, 1975

SECOND RULE 132 AFFIDAVIT
Diehr and Lutton
July 18, 1975

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IN THE UNITED STATES PATENT OFFICE

In the Application of

JAMES R. DIEHR and THEODORE A. LUTTON

Continuation of: Serial No. 472,595

Filed May 23, 1974

For DIRECT DIGITAL CONTROL
OF RUBBER MOLDING PRESSES

Group Art Unit 236

Examiner Joseph F. Ruggiero

Commissioner of Patents

Washington, D. C. 20231

Dear Sir:

SECOND RULE 132 AFFIDAVIT

JAMES R. DIEHR, II and THEODORE A. LUTTON, being first duly sworn, depose and say:

THAT in our "Rule 132 Affidavit" dated March 7, 1975, in application Serial No. 472,595, the data stated and the estimate of time to reproduce our invention was all based on a complete factory installation involving sixty presses, as stated in the affidavit, and (as not stated there) 200 mold cavity types, each installable in any of the sixty presses, to manufacture 50 different product types, from 30 different compounds;

THAT if one were to make only one product type on one press from a single compound, the estimates of approximate

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times actually involved would be considerably shortened, as follows:

Selection of standard computer hardware	one man day
Design of modification of existing press (unchanged)	two man weeks
Actual installation and checkout of the hardware	three man days
Collection and insertion into the computer of parameters and data	five man days
Design of the application code of the computer program in Basic Assembly language, including programming of the Arrhenius equation	three man weeks
Total time involved	approximately six man weeks

THAT most of the time involved from initial start to full production involves placing in the computer a huge mass of data;

THAT actual "programming" in the sense of placing the computer in condition to perform the necessary manipulations of the data plus the values fed in during operation is a relatively simple matter which any skilled programmer with the patent specification and drawings before him could readily perform;

THAT the program shown in the flow sheets, Figs. 3A and Fig. 3B, is actually a "program" so far as the programmer is concerned and that to apply the "program" of Figs. 3A and 3B to a computer merely involves translation of the symbolic flow sheet into FORTRAN which anyone skilled in FORTRAN can do, or else it involves translation of the symbolic flow sheet into Basic Assembler Language (MSP-7) or some other suitable language which anyone skilled in that language can do as a substantially

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routine matter once he has the flow sheet of Figs. 3A and 3B and once the data has been properly stored in a conventional manner in such a computer;

THAT applicants' assignee uses the invention in the field of precision molded synthetic rubber products, especially for lip-type rotary shaft seals;

THAT many of the products and the manufacturing methods for making these products are patented, that others are the subject matter of pending patent applications, and that still others were the subject matter of now expired patents, all of which are proprietary products and methods of applicants' assignee;

THAT the synthetic rubber compounds used in manufacture are mostly proprietary compounds of applicants' assignee;

THAT the presses are purchased from press manufacturers but the molds are made by applicants' assignee;

THAT applicants' present invention is applicable to the manufacture of precision molded products of anyone, whether proprietary or not;

THAT the invention itself, the subject matter of the claims, has been fully disclosed in the above-identified patent application, but that actual practice of the method will depend upon the products to be made, the manufacturing

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processes employed, the characteristics of the molds and of the presses, and the synthetic rubber compounds to be used;

THAT a machine printout of the completed computer program as reduced to practice included 16,000 separate instructions as well as 6 tables of data and conversion factors, the listing thereof requiring 300 pages; and

THAT of those 300 pages of the printout, fully three-fourths thereof ~~(or whatever it is)~~ comprises proprietary data uniquely applicable to applicants' assignee's molds, presses, products and molding compounds, and that said proprietary data is not needed by other persons to understand or practice the present invention.

Further, affiants saith not.

Dated at Southfield, Michigan, this 18th day of July, 1975.

James R. Diehr, II

Theodore A. Lutton

Subscribed and sworn to before me this 18th day of July, 1975.

Sharon Mando
Notary Public

SHARON MANDO
Notary Public Wayne County, Mich.
Acting in Oakland County, Mich.
My Commission Expires Aug. 28, 1977

My commission expires:

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602,463

IN THE UNITED STATES PATENT OFFICE

In the application of

JAMES R. DIEHR, II and THEODORE A. LUTTON

Serial No. 472,595

Filed May 23,. 1974

For DIRECT DIGITAL CONTROL OF
RUBBER MOLDING PRESSES

Group Art Unit 236

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Dear Sir:

RULE 132 AFFIDAVIT

JAMES R. DIEHR, II and THEODORE A. LUTTON, being first duly sworn, depose and say:

THAT they are Senior Technical Analyst for the Corporate Engineering Group and Central Manufacturing Engineering Manager for the Rubber and Plastics Group, respectively, of Federal-Mogul Corporation, assignee of the above-entitled application, and that they were each so employed at the time the invention described and claimed therein was made;

THAT they have read the Office Action of January 24, 1974, in the parent application, Serial No. 401,127, filed September 26, 1973, and the statute set forth in 35 U.S.C. 112;

THAT they have recommended to the attorney of record certain clarifications and additions to the specification of the above-entitled application, which have been incorporated into the continuation-in-part application, entitled above, including the flow chart set forth as new Fig. 3;

THAT they have read the Office Action of December 17, 1974;

THAT, for reasons set forth herein below it is affiants best belief the specification meets the requirements of 35 U.S.C. 112 and would enable one of ordinary skill in the art of programming to practice the invention, including the design of the application code, within a reasonable time not exceeding six months.

THAT they carried out their invention with a small general purpose IBM System/7 computer having multilevel hardware interrupt and process input/output capabilities; that the system was designed to control 60 standard rubber molding presses utilizing existing in-place control circuitry such as thermocouples and timer switches; and that commercially available items such as relays were used to enable computer control press operations such as high current electrical heater elements;

THAT six analog inputs, five digital outputs and two digital inputs each requiring sixteen thousand words of on-line storage were employed; and that for data files containing synthetic rubber cure data and batch data an additional two and a half million words of memory storage was provided by the inclusion of two standard disc storage modules; and that operator-computer communication was provided through a standard key board/printer device;

THUS, as illustrated by the Figures in the present application, the internal organization of the computer problem was interpretive, with the user portion of the program made up of tables of parameters and the application code passing across these tables to determine the specific computer control operation, and that each table was designed so that each press was represented by a single fixed length record containing all of the parameters necessary to control the operation and regulation of the subject press;

THAT the selection of the standard computer hardware required about

two man weeks;

THAT the design of the modification of the existing presses required about two man weeks;

THAT the actual installation and checkout of the hardware utilized by their invention required about eight man weeks;

THAT the collection and insertion into the computer of parameters and data applicable to all sixty molding presses in the manufacturing facility owned by the assignee of this invention required about six man months;

THAT the design of the application code of the computer program in Basic Assembler language, including programming of the Arrhenius equation, was completed in about fifty man weeks.

THAT Basic Assembler language is also customarily referred to in the trade as MSP-7, which is the abbreviated form of the designation Macro System Program - 7;

THAT the total time required from initial conception to successful testing and reduction to practice of our invention was approximately fourteen man months.

THAT two programming personnel were involved in the work outlined above, and spent a total of approximately 2000 hours;

THAT the level of skill for such programmers is no more than that held by any Basic Assembly language programmer;

THAT, given the information now found in the specification, the total time required from initial start through full scale production on all sixty presses would be reduced from the initial fourteen man months to approximately seven man months; and

FURTHERMORE, THAT the design of the application code could be done in

FORTRAN; and

THAT the level of skill necessary to program in FORTRAN is less than that required for basic Assembler language, and consequently, could also have accomplished in substantially less time than that stated above for a series of as many presses as can be scanned in the time needed by the computer to implement the algorithim, which said scanning time is dependent upon computer internal speed and peripheral device speed, as is well known to those of ordinary skill in the art.

Further, affiants saith not.

Dated at Southfield, Michigan, this 6th day of March, 1975.

James R. Diehr, II

Theodore A. Lutton

Subscribed and sworn to before me this 6th day of March, 1975.

Notary Public
Kaye L. Lang, Livingston County, MI.
Acting in Oakland County, MI.

My commission expires: 8-23-78

IN THE UNITED STATES PATENT OFFICE

In the application of

JAMES R. DIEHR, II and THEODORE A. LUTTON

Serial No. 472,595

Filed May 23, 1974

For DIRECT DIGITAL CONTROL OF
RUBBER MOLDING PRESSES

Group Art Unit 236

Commissioner of Patents and Trademarks

Washington, D. C. 20231

Dear Sir:

A F F I D A V I T

JOSEPH D. EKLAND, being first duly sworn, deposes and says:

THAT he is Manager, Manufacturing Systems, Manufacturing Engineering Services at Federal-Mogul Corporation;

THAT at the time the parent application of the above-entitled application was filed (the parent application being Serial No. 401,127, filed September 26, 1973) he was employed by IBM Corporation as Senior Marketing Representative;

THAT throughout his twelve years employment with IBM Corporation his work responsibilities consisted of the design of process controls and application of digital computers thereto including hardware selection and further including programming design and implementation;

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THAT his technical background further includes the degrees of BEE from Rensselaer Polytechnic Institute, 1960, and MSEE, Purdue University, 1962;

THAT he has studied the above-entitled patent application, the parent patent application, the official Office Action of December 17, 1974, and the provisions of 35 U.S.C.112;

THAT he considers himself to be thoroughly familiar with the invention as described and claimed in the above-entitled application, including the details of programming as set forth therein; and

THAT to affiant's best belief the specification in the continuation-in-part application meets the requirements of 35 U.S.C. 112 and would enable one of ordinary skill in the art of programming to practice the invention, including the development of the complete program, within a reasonable time, not exceeding six months.

Further affiant saith not.

Joseph D. Ekland

Joseph D. Ekland

Subscribed and sworn to before me this 17th day of March, 1975.

Sharon Mando

Notary Public

My commission expires:

SHARON MANDO
Notary Public Wayne County, Mich.
Acting in Oakland County, Mich.
My Commission Expires Aug. 28, 1977

IN THE UNITED STATES PATENT OFFICE

In the Continuation-in-Part Application of

JAMES R. DIEHR, II and THEODORE A. LUTTON

Serial No.: 472,595

Filed: May 23, 1974

For: DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES

Group Art Unit: 236

Examiner: Joseph F. Ruggiero

Commissioner of Patents

Washington, D.C. 20231

Dear Sir:

STATE OF MICHIGAN)
) ss.
COUNTY OF OAKLAND)

RULE 131 AFFIDAVIT

JAMES R. DIEHR, II and THEODORE A. LUTTON being duly sworn depose and say:

THAT they are the inventors who on September 26, 1973, filed the parent application Serial No. 401,127, of which the above identified application is a continuation-in-part thereof;

THAT they completed their invention, having made drawings, computer programs, and operative units thereof and disclosed the same to others including Robert E. Wickersham, in this country long prior to September 17, 1973, the filing date of the application from which U.S. Patent No. 3,819,915 matured;

THAT long prior to September 17, 1973, James R. Diehr, II prepared writings disclosing their invention, photostatic copies of said writings being attached hereto as Exhibits A1 and A2, B1 and B2, C1 and C2. Exhibits A1 and A2 are block diagrams of their invention, Exhibits B1 and B2 are two pages of general program flow chart; and, Exhibits C1 and C2 are two pages of computer program of record data for each press controlled by their invention;

THAT long prior to September 17, 1973, the invention was reduced to actual practice at the Van Wert Laboratory, National Seal Division, FEDERAL MOGUL CORPORATION, the assignee of record of the present invention; that at the time of said actual reduction to practice and long before September 17, 1973, James R. Diehr, II recorded data from the practice of said invention and then prepared written analyses comparing said invention with prior art practices; that photostatic copies of said written analyses are attached hereto as Exhibits D and E; that in these exhibits the notation S/7 signifies System/7, the popular name affiants ascribe to their invention; that Exhibit D records the time savings for each press operation realized by their invention over the regular calculated cure time (CCT) of the prior art; and, that Exhibit E records the savings in machine hours realized by their invention over the regular machine control method of the prior art;

THAT their parent patent application identified hereinabove was prepared by Robert E. Wickersham and forwarded to them via their resident patent counsel within two weeks prior to September 17, 1973; and that affiants are informed and believe and thereon state that Exhibit F is a copy of the letter of transmittal by which the application was forwarded

to them by Mr. Wickersham; and further that their joint declaration in their parent application was executed on September 14, 1973, a copy thereof being attached hereto as Exhibit G;

THAT they do not know and do not believe that their invention has been in public use or on sale in this country, or patented or described in a printed publication in this or any foreign country for more than one year prior to their application; and they have never abandoned their invention;

Further affiants saith not.

James R. Diehr, II

Theodore A. Lutton

Sworn to and subscribed before me by the above-named applicants, this 3rd day of March, 1975.

Kaye L. Lang
Notary Public
Kaye L. Lang, Livingston County, MI
Acting in Oakland County, MI

My commission expires: 8-23-78

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Figure 2.

System 17 - Heated Platen Control

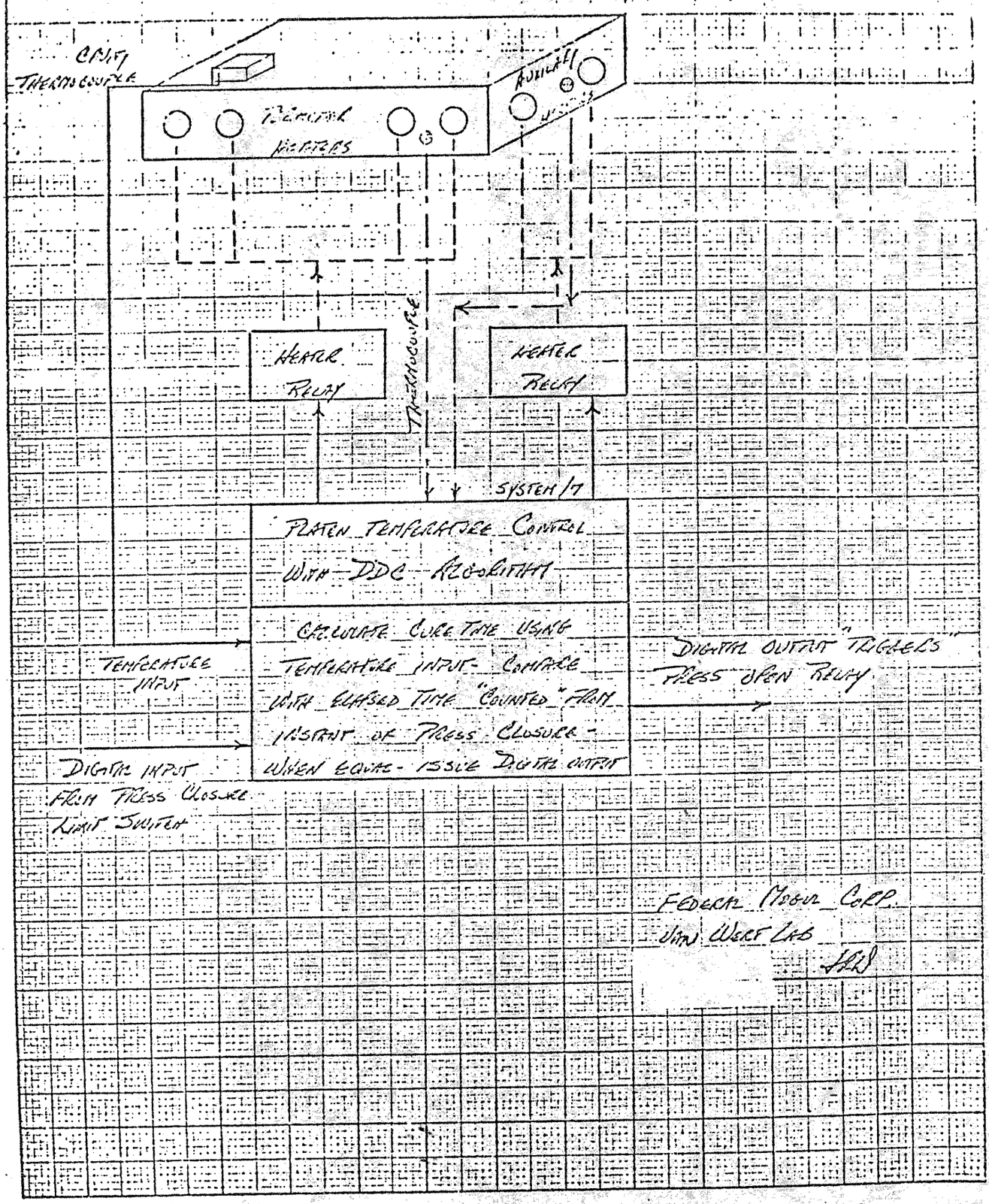

Exhibit A1

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Figure 12

CONFIGURATION - RHEOMETER
SYSTEM/7 INTERFACE
VW LAB

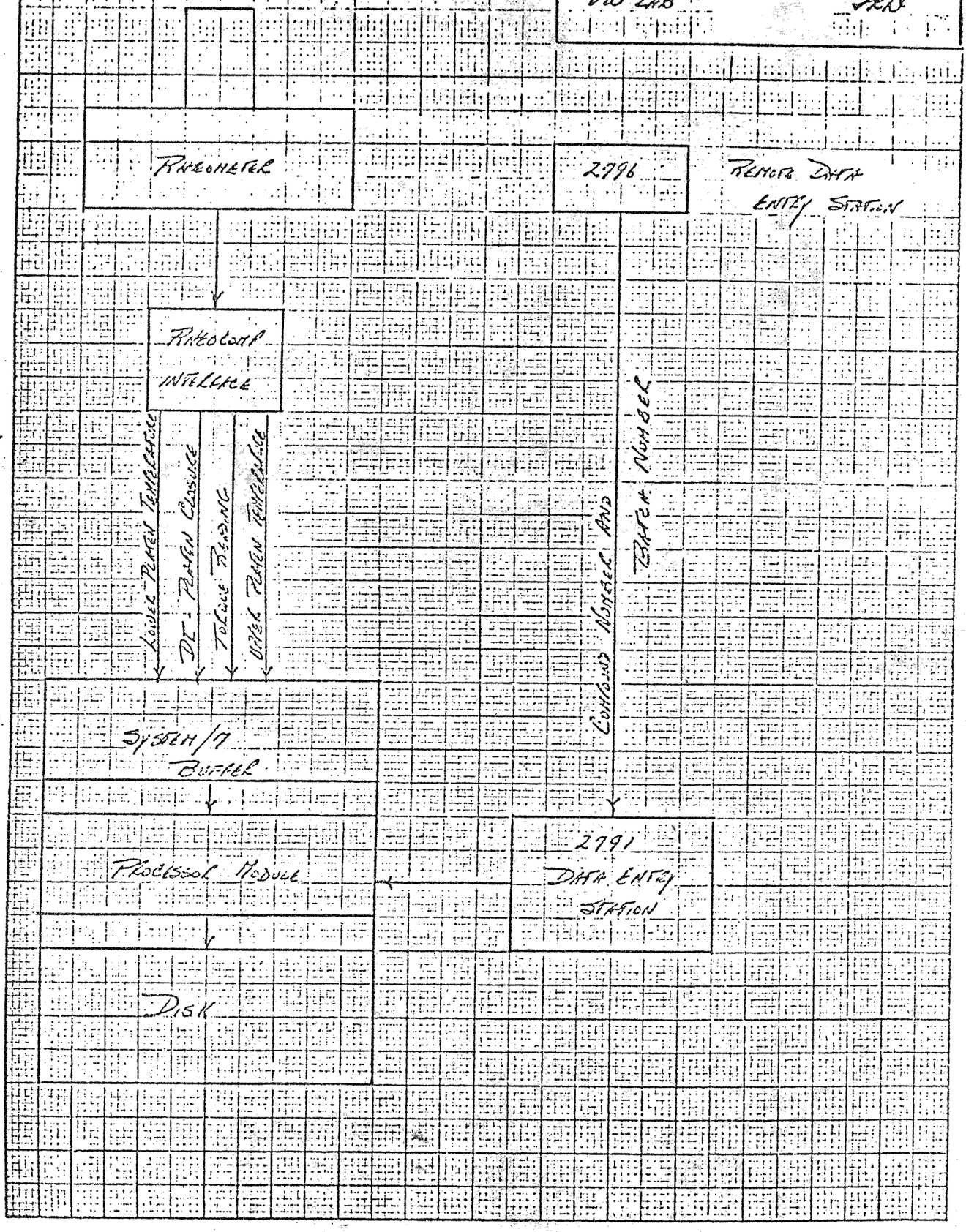

Exhibit A2

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GENERAL FLOWCHART:
SYSTEM/7 PROGRAM
ORIENTATION

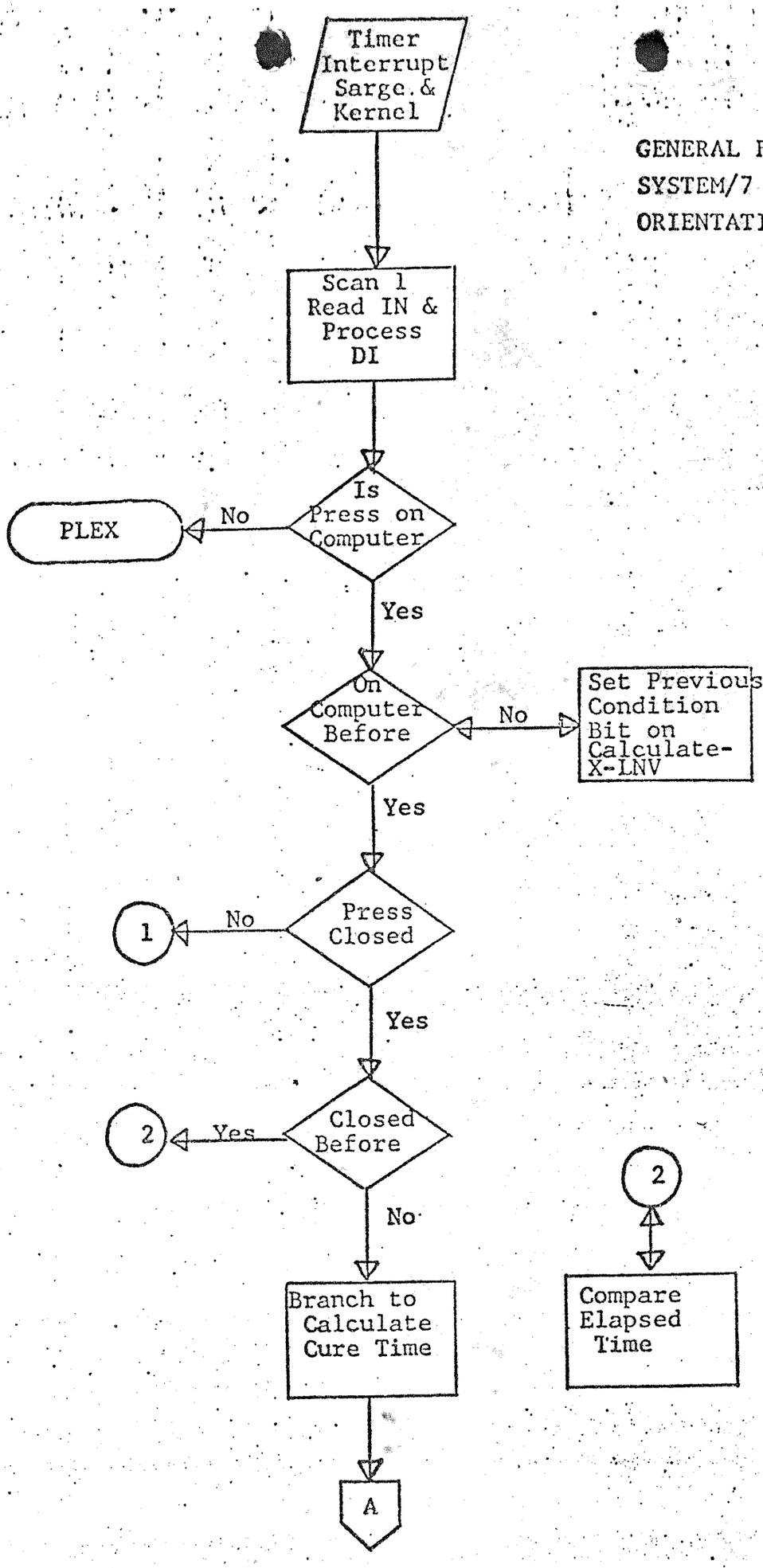

Exhibit B1 602,468

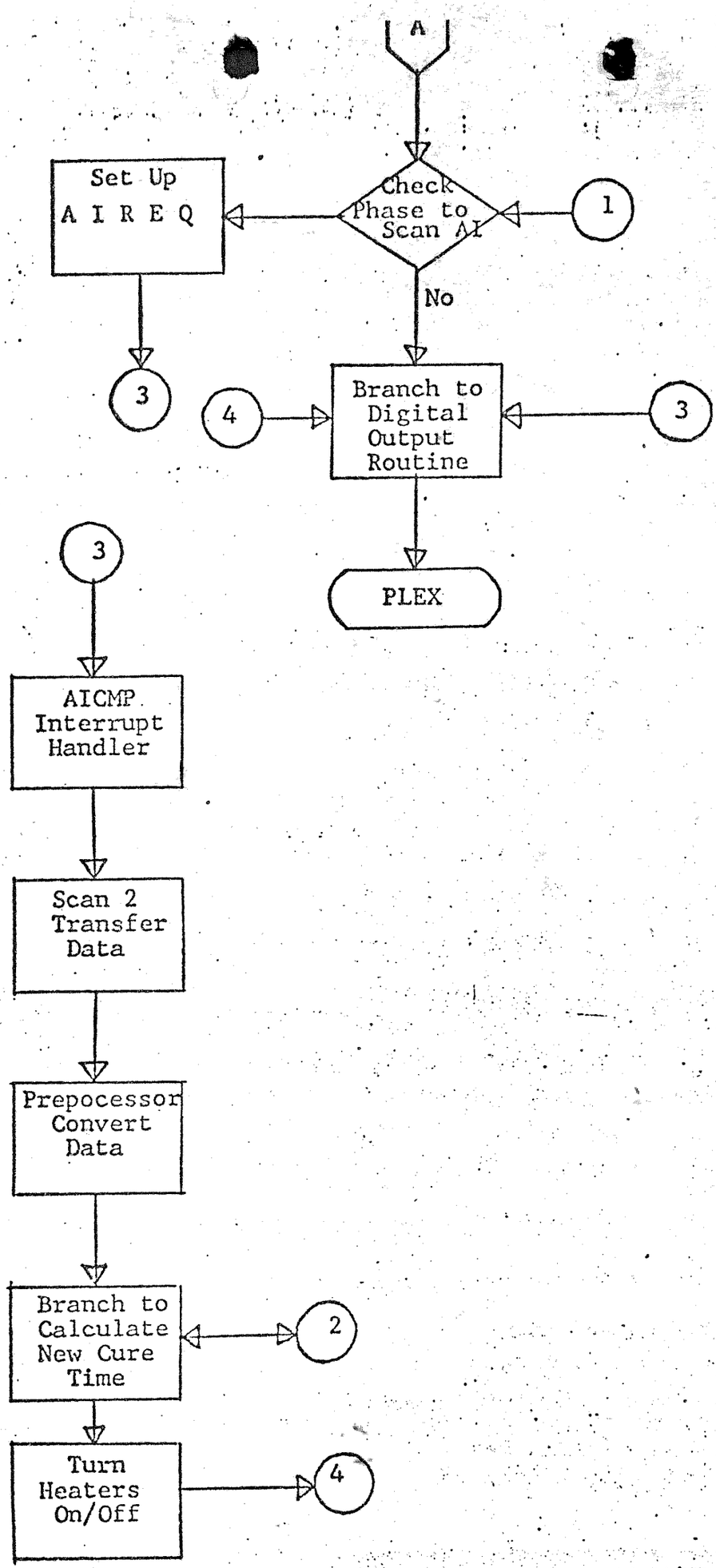

Exhibit B2

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TABLE III

PRESS RECORD

WORD NUMBER	WORD NAME	BIT NAME	BIT No.	No. of BITS	DESCRIPTION
0				16	PRESS NUMBER
1	LWD #1	LSERV	0	2	SERVICE BITS: 00, 01, 11
					10 = INSERVICE; 11 = SERVICE + RUNNING
		LTIMDL	2	1	TIME DELAY
		LISUB	3	4	INPUT SUBROUTINE
		LPREV	7	1	PREVIOUS CONDITION - IN-OUT SERVICE
		LCYCL	8	4	CYCLE TIME
		LPHAS	12	4	PHASE
2	LWD #2	LFILT	0	2	FILTER OPTION
		LFCON	2	4	FILTER CONSTANT
		LDSPL	6	4	DISPLAY INFORMATION
		LEUNT	10	3	DECIMAL POINTS FOR ENGG. UNITS
		LECOD	13	2	ENGINEERING CODES
		LPREV	15	1	PREVIOUS CONDITION - RUNNING
3	LWD #3	LMEAS	0	16	MEASUREMENT ADDRESS (AI'S)
4	LWD #4	LTC #1	0	16	UPPER CENTER TEMPERATURE
5	LWD #5	LTC #2	0	16	LOWER " "
6	LWD #6	LTC #3	0	16	TOP PERIMETER "
7	LWD #7	LTC #4	0	16	LOWER " "
8	LWD #8	LTC #5	0	16	TOP AUXILARY "
9	LWD #9	LTC #6	0	16	LOWER " "
10	LWD #10	LLIMT	0	13	LOW LIMIT ALARM
		LLACT	14	2	ACTION ON THE ALARM
11	LWD #11	LHLMT	0	13	HIGH LIMIT ALARM
		LHACT	14	2	ACTION ON THE ALARM
12	LWD 12	LALRM	0	2	INPUT ALARM STATUS
		LDEAD	2	2	DEAD BAND 01 = 3.125% 10 = 6.25% 11 = 12.5%
		LLMTC	4	2	LIMIT COUNTER
		LRATC	6	2	INPUT RATE COUNTER
		LCHGL	8	2	RATE OF CHANGE LIMIT

KEUFFEL & ESSER CO.

TABLE II FIRE

PRESS RELOAD (CONT.)

WORD NUMBER	WORD NAME	BIT NAME	BIT No.	No. of BITS	DESCRIPTION
12	LWD12	LPRIM	10	1	PRESS IN PRIM?
		LMESS	11	4	MESSAGE INFORMATION
			15	1	NOT USED
13	LWD13	LALGO	0	5	ALGORITHM OPTIONS
		LINUT	5	1	INVERTED OUTPUT
		LLAFT	6	1	LARGE TIME COUNTER
14	LWD14	LBLK1	0	16	VALVE OF 1ST ASSOCIATED BLOCK
		LDEVR	10	4	VALVE OF DEVIATION - CONTROL
		LOUTP	14	2	OUTPUT ON/OFF. PRESS OPEN
15	LWD15	LSETP	0	16	PERIMETER SET POINT
16	LWD16	LOADR	0	16	OUTPUT ADDRESS
17	LWD17	LGAIN	0	16	PROPORTIONAL GAIN
18	LWD18	LCOMP	0	16	COMPOUND IDENTIFICATION
19	LWD19	LRSET	0	16	RESET ACCUMULATION
20	LWD20	LINGC	0	4	INTEGRAL GAIN CONSTANT
		LDIRD	4	8	DI ADDRESS
		LHOUT	12	4	HEATER OUTPUT
21	LWD21	LACEC	0	16	ACTIVATION ENERGY CONSTANT (2)
22	LWD22	LCOCN	0	16	COMPOUND CONSTANT (0)
23	LWD23	LTEMA	0	16	AVG TEMPERATURE VALUE (T_{N-1})
24	LWD24	LTIME	0	16	CURE TIME CALCULATED (W_{N-1})
25	LWD25	LTHIC	0	16	RUBBER THICKNESS (4)
26	LWD26	LACEN	0	16	~~ACE~~ ~~ACEC~~ ACTIVATION ENERGY (1)
27	LWD27				NOT USED
28	LWD28	LLINT	0	16	INTERCEPT (3)
29	LWD29	LCANI	0	16	CURRENT TEMPERATURE INTERP (T_2)
30	LWD30	LLSYN	0	16	SYNTHETIC NUMBER
31	LWD31	LSETA	0	16	HEATER SET POINT ADJUSTED

Exhibit C2

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Cure Time Analysis

Flange	CCT Set Point	CCT Time	5/7 Set Point	5/7 Time	Δ	Calculated Δ[1]
C42-5262 B	395	2'01"	400	1'31"	-30	-30
C93-7281 A	405	2'11"	420	1'42"	-29	-31
L34-5448 J	370	1'55"	380	1'45"	-10	-10
L34-5643 A	370	1'52"	380	1'47"	-5	-10
C64-5262 A	380	1'57"	380	1'49"	-8	-20
V7-6318 B	405	2'43"	410	2'25"	-18	-22
B86-3592	415	1'37"	430	1'15"	-22	-25
B86-5448	415	1'37"	430	1'17"	-20	-25
C93-7456	425	2'7"	420	1'40"	-27	-31
L34-6620	370	1'52"	410	1'45"	-7	-10
L34-4570	370	1'52"	380-400	1'49"	-3	-10
L34-4480	370	1'55"	370-390	1'45"	-10	-10
C39-7528	390	2'11"	410-430	1'50"	-21	-31
B86-5030	400	1'34"	440-460	1'17"	-17	-23
C39-4095	390	2'4"	410-430	1'50"	-14	-27
B86-4095	415	1'34"	450-470	1'27"	-7	-23
L34-4616	370	1'52"	390-410	1'48"	-4	-10
B86-6835	420	1'34"	450-470	1'22"	-12	-23
C44-3954	415	1'26"	450-470	1'21"	-5	-13
B86-6620	415	1'34"	450-470	1'29"	-5	-25
C39-7540	405	2'4"	430-450	1'49"	-15	-23
B86-5240	415	1'34"	450-470	1'23"	-11	-23
B86-4136	415	1'34"	450-470	1'24"	-10	-23
C39-7634	405	2'4"	430-450	1'52"	-12	-21
B86-4775	420	1'23"	450-470	1'15"	-8	-20
C44-4371	415	1'26"	450-470	1'18"	-8	-13
B86-5104	415	1'34"	450-470	1'20"	-14	-23
B86-4412	420	1'23"	450-470	1'15"	-8	-20

1 - Based on one [illegible] one [illegible] vs. 100% [illegible] of press and not [illegible] during cycle.

Exhibit D

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CURE TIME MINUTES

FURNACE	Job % Required	Job % 5/7	Machine Hours / 100 Pcs. Required	Machine Hours / 100 Pcs. 5/7	Job Size	Savings Machine Hrs.
2-5262	69.1	82.8	0.222	0.185	10,000	3.7
3-7281	51.7	61.5	1.509	1.270	7,000	16.7
4-5448	51.7	55.0	0.580	0.548	15,000	4.8
4-5515	47.1	50.0	0.520	0.450	18,000	12.6
4-5262					800	
7-6318	56.1	62.2	0.274	0.246	17,250	4.83
6-3592	56.1	67.5	0.499	0.415	2,600	2.18
6-5448					500	
3-7456	82.8	96.5	0.751	0.645	2700	2.86
4-6620	58.2	61.0	0.325	0.306	8600	1.64
8-4595	51.7	52.9	0.580	0.545		
4-4480	72.7	77.0	0.211	0.200		
9-7528	64.6	77.5	0.634	0.529	2500	2.62
6-4085	80.2	95.0	0.180	0.152	1060	0.30
39-4085	68.0	80.0	0.226	0.193	5500	1.82
6-5030	47.4	56.5	0.489	0.411		
4-4616	56.9	60.5	0.325	0.307	1100	0.20
6-6835	62.7	75.0	0.250	0.211	150	0.06
44-3754	71.2	78.0	0.180	0.164	10,000	1.60
6-6620	62.0	75.0	0.278	0.230	1650	0.08
39-7540	34.2	39.0	1.352	1.180	1100	1.90
86-5240	62.0	74.0	0.278	0.234	5000	2.20
86-4136	50.5	60.0	0.445	0.374	1000	0.71
39-7634	27.9	32.0	1.355	1.190	2500	4.13
6-4715	86.6	100.0	0.166	0.142	5500	1.33
44-4871	67.2	74.0	0.276	0.250	1000	0.26
86-5104	62.0	74.0	0.278	0.234	1320	0.60
86-4612						
				Total Pieces	121,030	
				Total Savings		67.12

Exhibit E

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602,463

September 4, 1973

Robert F. Hess, Esq.
Patent Counsel
Federal-Mogul Corporation
P. O. Box 1966
Detroit, Michigan 48235

Re: Patent Application on DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES
OWE Case No. 319

Dear Bob:

Enclosed are two copies of the drawings and specification for the above case incorporating Jim Diehr's changes.

We do not have Jim's address for the enclosed assignment and also need his address, as well as his citizenship status, noted on the enclosed declaration.

Upon receipt of the above signed documents, we will forward this application to the Patent Office for filing.

Sincerely,

Robert E. Wickersham

REW:ilf

Enclosures

cc: Mr. Alfred S. Berens (w/encl.)
Mr. James R. Diehr, II

Exhibit F

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DECLARATION COMBINED WITH POWER OF ATTORNEY

We, the undersigned James R. Diehr, II. and Theodore A. Lutton declare that we are respectively a citizen of the United States of America residing at Troy, Michigan and Birmingham, Michigan respectively; that we have read the foregoing specification and claims and we verily believe we are the original, first and sole inventors of the invention in DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES described and claimed therein; that we do not know and do not believe that this invention was ever known or used before our invention thereof, or more than one year prior to this application; or in public use or on sale in the United States more than one year prior to this application; that this invention has been patented in any country foreign to the United States on an application filed by us or our legal representatives or assigns more than twelve months before this application; and that no application for patent on this invention has been filed by us or our representatives or assigns in any country foreign to the United States, except as follows: NONE.

And we hereby appoint ROBERT E. WICKERSHAM of Owen, Wickersham & Erickson, 310 Sansome Street, San Francisco, California, 94104, Registration No. 16,150 and telephone number 415/781-6361 our attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith.

And we declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Wherefore we hereby subscribe our names to the foregoing specification and claims, declaration and power of attorney this 14th day of September, 1973.

Inventor James R. Dicke II
First Name Middle Name Last Name

Post Office Address (2379 Waltham Drive
(Troy, Michigan 48084

Inventor Richard A. Sutton
First Name Middle Name Last Name

Post Office Address (15668 Dunblaine
(Birmingham, Michigan 48009

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U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

Paper No. 43

Ruggiero 236
08/06/75 602,463
James R. Dierh II, et al

Robert E. Wickersham
Owen, Wickersahm, et al
433 Calif. St., 11th Floor
San Francisco, Calif. 94104

Mailed 12 6 75

This is a communication from the Examiner in charge of your application.

Commissioner of Patents and Trademarks

☑ This application has been examined.

☐ Responsive to communication filed _____

☐ This action is made final.

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE 3 MONTH(S) _____ DAYS FROM THE DATE OF THIS LETTER.

PART I

The following attachments(s) are part of this action:

a. ☑ Notice of References Cited, Form PTO-892.

b. ☐ Notice of Informal Patent Drawing, PTO-948.

c. ☐ Notice of Informal Patent Application, Form PTO-152.

d. ☐

PART II

Summary of Action

1. ☑ Claims 1-10 are presented for examination.

2. ☐ Claims _____ are allowed.

3. ☐ Claims _____ would be allowable if amended as indicated.

4. ☑ Claims 1-10 are rejected.

5. ☐ Claims _____ are objected to.

6. ☐ Claims _____ are subject to restriction or election requirement.

7. ☐ Claims _____ are withdrawn from consideration.

8. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 OG. 213

9. ☐ Since it appears that a discussion with applicant's representative may result in agreements whereby the application may be placed in condition for allowance, the examiner will telephone the representative within about 2 weeks from the date of this letter.

10. ☐ Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.

11. ☐ Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.

12. ☐ Other

PTOL 326 (7/75)

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602,463

1. This application has been examined and this action is responsive to applicant's preliminary amendment filed along with the application.

2. The specification is objected to as containing insufficient disclosure under 35 USC 112. The instant invention is disclosed and claimed to be one involving a general purpose digital computer properly programmed to calculate the correct cure time for a rubber-molding press and to open such press accordingly. Ageneral purpose computer by itself would be incapable of carrying out any operatioh until its sequence of internal interconnections has been added thereto by the preparation and loading of a program into the interaal memory of the computer. The instant disclosure does not identify any program whih will cause the computer to carry out the necessary functions. Although applicants have provided a flow chart, it is noted that such flow chart is not a program and only suggests operations from the point of view of desired results.

3. Claims 1-10 are now in this case.

4. Claims 1-10 are rejected as being drawn to insufficient disclosure as discussed in paragraph 2, above.

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, theses 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.

6. Applicants' arguments have been considered but are not convincing to overcome the above rejections. In parent application S. N. 472,595, applicants submitted a Rule 132 affidavit which detailed a factory installation of the invention involving 60 presses and concluded that the time required to achieve production would be 7 months. In response to the Examiner's position that such a time span for implementation of the invention was outside the bounds of "undue experimentation", the applicants have filed an additional Rule 132 affidavit. This affidavit includes an estimate of a 6 man week time span for implementation of the invention if only a single press were involved. However, it must be pointed out that such an estimate is merely an opinion and few if any facts have been presented to support such a conclusion. The Examiner remains of the positon that such evidence is not sufficeint to overcome the rejection on insufficient disclosure.

7. Patents A-E are cited of interest but are not applied agains t the claims.

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

Ruggiero/dmcb
557-2871
12/2/75

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TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PO-892 (REV. 4-74) U.S. DEPARTMENT OF COMMERCE PATENT OFFICE

SERIAL NO.	GROUP ART UNIT	ATTACHMENT TO PAPER NUMBER
472,595	236	

NOTICE OF REFERENCES CITED

☐ Check here if this is a supplemental citation. *(Do not prepare an additional folder.)*

APPLICANT(S): J. R. OIEHR ET AL

U.S. PATENTS

*		PATENT NO.	DATE	PATENTEE	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE
	A	3659974	5-1972	NEUGROSCHL	264	40 X	
	B	3718721	2-1973	GOULD ET AL	264	40	
	C	3819915	6-1974	SMITH	235	151 X	9-17-1973
	D	3579265	5-1971	BRITTAIN	264	315 X	
	E	3649729	3-1972	DAVIS ET AL	264	40	
	F						
	G						
	H						
	I						
	J						
	K						

FOREIGN PATENTS OR PUBLISHED APPLICATIONS

*		PATENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG	PERTINENT PP. SPEC.
	L								
	M								
	N								
	O								
	P								
	Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

R	
S	
T	
U	

EXAMINER	DATE	
RUGGIERO	11-18-1975	☐ CHECK HERE IF FOREIGN EXCHANGE

* ATTENTION R.P.S.: Do not furnish copy if this box is checked.

60

USCOMM-DC 50860 P71

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RECEIVED
APR 21 1976
GROUP 230

In the Application of

JAMES R. DIEHR, II and THEODORE A. LUTTON

Serial No. 602,463

Filed August 6, 1975 April 19, 1976

For DIRECT DIGITAL CONTROL OF
RUBBER MOLDING PRESSES

Group Art Unit 236

Examiner: Joseph F. Ruggiero

Commissioner of Patents and Trademarks

Washington, D. C. 20231

Dear Sir:

A M E N D M E N T

In response to the Official Action of January 26, 1976, please amend the application as follows:

In the claims:

Please add the following claim:

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,

LAW OFFICES
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& ERICKSON
PATENT, TRADEMARK
& COPYRIGHT LAW
433 CALIFORNIA STREET
11TH FLOOR
SAN FRANCISCO 94104
(415) 781-6361

(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,

(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.

LAW OFFICES
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R E M A R K S

The Examiner is thanked for having graciously held an interview with Applicants' attorney, Robert E. Wickersham, on March 24, 1976, with Joseph D. Ekland (Manager, Manufacturing Systems, Manufacturing Engineering Services of the Assignee) and Jay Cantor (Mr. Wickersham's Washington Associate) present.

The application and the Office Action of January 26, 1976, were discussed. As the objection and rejection under 35 U.S.C. 112 were discussed, and Mr. Ekland took notes on the proper substance of an affidavit to rebut the objections noted. The enclosed Affidavit is the result, and it is believed that it shows that the application does disclose quite sufficient material to enable one skilled in the art to carry out the invention. Therefore, it is believed that the application does comply with 35 U.S.C. 112.

As to 35 U.S.C. 101, the Examiner indicated that he was writing for the decision in Dann v. Johnson, recently decided by the U. S. Supreme Court. That Court, however, did not decide the issue raised by 35 U.S.C. 101 but instead rested its opinion only on 35 U.S.C. 103, as to obviousness of that particular invention. An implication might be that the Court saw no reason to disturb the C.C.P.A.'s conclusions as to 35 U.S.C. 101. Note the Court's reliance on an issued computer patent without questioning that that patent was properly issued.

The attention of the Examiner is once again drawn to the fact that the opinion of Mr. 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.

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This matter was also discussed with the Examiner at the interview.

Newly presented claim 11 was shown to the Examiner at the interview. At that time he did not believe that it would help in overcoming the §101 rejection, but it is enclosed anyway so that he can reconsider it in the light of the present status of the law (after Dann v. Johnson).

Applicants urge that the application should be allowed and request reconsideration by the Examiner.

Respectfully solicited,

Robert E. Wickersham
Reg. No. 16,150
Attorney for Applicants
(415) 781-6361

Enclosure - Affidavit

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GROUP 230

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of Group Art Unit: 236

JAMES R. DIEHR, II and THEODORE A. LUTTON

Serial No: 602,463

Filed: August 6, 1975

For: DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

AFFIDAVIT

I, Joseph D. Ekland, being first duly sworn, depose and say:

1. THAT I am a graduate of Rensselaer Polytechnic Institute, B.E.E. (Computer Design) and Purdue University, M.S.E.E. (Control Theory);

2. THAT I am a Registered Professional Engineer for Control Systems in the State of California;

3. THAT I have been professionally employed for the past 14 years in applying digital technology to the control of physical processes, including employment these last 2 1/2 years with Federal-Mogul Corporation, assignee of the subject invention as its Manager, Manufacturing Systems, Manufacturing Engineering Services, as previously stated in affiant's affidavit submitted in connection with now abandoned parent case Serial No. 472,595;

4. THAT during this 14 year time I have programmed computers in several languages, designed computer based systems, and managed groups that programmed and designed systems;

5. THAT one of the functions of my position is to estimate resources required to do the job assigned and I have considerable experience in doing this. Several references to program estimation are:

(A) The Economics of Computer Programming, A.M. Piertrasanta. Brandon/systems press. 1969

(B) FSD Programming Prospect Management Guide, P.W. Metzger. I.B.M. Corporation 1970

(C) "Estimating Resources for Large Programming Systems", J. D. Aron. Federal Systems Center, I.B.M. Corporation. FSC 69-5013, 1969

(D) The Mythical Man-Month, F. P. Brooks, Jr., Addison-Wesley Publishing Co., 1975

I believe a fair evaluation of the message conveyed by these authors in the above referenced publications is that while very large and somewhat standard programs are amenable to concise estimates, small and special program estimates are very subjective;

6. THAT I have often worked with installations in which the people assigned were not professional programmers. The rationale for these assignments is that application experience is more important than programming knowledge and that programming is a technique that may be acquired quickly by a person of logical thought;

7. THAT this was the case at the Federal-Mogul Corporation plant in Van Wert, Ohio where the subject invention was first implemented. The man chosen as the programmer was an Engineering Aide with a high school diploma and no further formal technical training. This man received three weeks formal computer training and was then assigned to the project as the programmer. Five months after his assignment, the programming was complete to control four presses doing both temperature regulation and end-point calculation and control. The key to this success was that the programmer took direction very well and did not try to superimpose his ideas over the system designer's but did exactly as instructed;

8. THAT the system as installed at the Van Wert, Ohio facility is considered an economic success in that Federal-Mogul Corporation has publically claimed a 20% increase in product and a 15% reduction in scrap rate.

9. THAT I am familiar with Fig. 3 A & B of the above identified application;

10. THAT from these figures and the written specifications of the above application, a reasonably skilled programmer would have no difficulty in preparing a computer program in any of the standard computer languages for

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use in any standard computer of suitable capacity;

11. THAT I feel the project estimate given by Mr. James R. Diehr II and Theodore A. Lutton in their Rule 132 Affidavit dated 6 March 1975 and submitted with application amendment of August 5, 1975 is a fair and accurate estimate:

12. THAT to support the aforegoing statements (9, 10, 11) I furnish the following narrative which such a programmer might first prepare, and an example of this program as translated into FORTRAN.

FLOWCHART NARRATIVE (REF: Fig. 3-A)

11) Hardware timer interrupts system and starts scan cycle.

12) Data on press status and analog temperature data read into press.

21) Test input bit switch to determine if press is closed. If yes, go to 31). If no, go to 41).

31) Add ΔT time to accumulator associated with this press.

32) Fetch thermocouple data on temperature of this mold.

33) Calculate V=Antilog N (C*Z+X) where Z is value from 32) and C and X are constants.

34) Compare V with accumulator in step 31). If yes, go to 35). If no, go to 41).

35) If closure time (accumulator) were greater, open press.

41) Calculate $e = \frac{\text{set point - measured value}}{\text{dead band}}$ and truncate at the decimal point.

42) If e has a value >1, go to 43). If not,go to 51).

43) Test e = SP-MY for sign.

If negative turn heater off.

If positive turn heater on.

51) Test A switch to determine if there is a batch data entry.

If yes, go to 52).

If no, go to 61).

52) Calculate batch Arrhehius Constant C for the equation $C = \frac{\text{Ln } V - X}{Z}$ and store with compound and batch numbers.

61) Check status word for Console Interrupt. If interrupt switch is Positive, go to 62). If negative, proceed to 71).

62) Identify incoming data by press number and store data in press record location.

71) Check present press record number with press record end pointer. If press record number equals end pointer, go to 73). If press record number does not equal end pointer, go to 12).

A general FORTRAN type program to indicate method (not including dimension statements, etc.):

```
40      Enter   N = 0
50              N = N + 1
100             Call DI (IDA(N), IDI(N))
                Call AIS (6,IAIS(N))
                IF (IDI(N)) 200,400, 400
200             IACUMT(N) = IACUMT(N) - IDLT
                IZ = CALL TEMCON (IAIS(N))
                 Z = CALL FLOAT (IZ)
                 V = CALL EXP(C * Z + X)
               IV(N)= CALL FIX (V)
                IF (IACUMT (N) - IV(N)) 300, 400, 40
300             CALL DO (IDOA(N), IDO (N))
400             IE = (ISP(N) - IMV(N)/IDB(N)
                IF (IE) 500,600,700
500             CALL DO (IDOC(N), IDO1)
                GO TO 600
700             CALL DO (IDOC(N), IDO2)
600             IF (IB) 800,900,900
800             TEMP = CALL LOG N (V)
                C = (TEMP - X)/Z
900             IF (IC) 10, 20, 20
 10             CALL DISPLAY SUBROUTINE
 20             IF (N - I LAST) 30, 30, 40
 30             CALL EXIT
```


602,463

Further affiant saith not.

Joseph D. Ekland

Joseph D. Ekland

Subscribed and sworn to before me this 14th day of April, 1976.

Sharon Mando

Notary Public

SHARON MANDO
Notary Public Wayne County, Mich.
Acting in Oakland County, Mich.
My Commission Expires Aug. 23, 1977

My commission expires:

-5-

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602,463

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Ruggiero 236
08/06/75 602,463
James R. Diehr, II Et Al

Paper No. 6

Robert E. Wickersham
Owen, Wickersham &
Erickson
433 Calif. St., 11th Flr.
San Francisco, Calif. 94104

MAILED

Mailed

JUL 8 1976

GROUP 230

This is a communication from the Examiner in charge of your application.

Commissioner of Patents
and Trademarks

☑ This application has been examined.

☑ Responsive to communication filed APRIL 21, 1976. ☑ This action is **made final.**

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE

3 MONTH(S) _____ DAYS FROM THE DATE OF THIS LETTER.

PART I

The following attachments(s) are part of this action:

a. ☐ Notice of References Cited, Form PTO-892. b. ☐ Notice of Informal Patent Drawing, PTO-948.

c. ☐ Notice of Informal Patent Application, Form PTO-152. d. ☐

PART II

Summary of Action

1. ☑ Claims 1-11 are presented for examination.

2. ☐ Claims _____ are allowed.

3. ☐ Claims _____ would be allowable if amended as indicated.

4. ☑ Claims 1-11 are rejected.

5. ☐ Claims _____ are objected to.

6. ☐ Claims _____ are subject to restriction or election requirement.

7. ☐ Claims _____ are withdrawn from consideration.

8. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 OG. 213

9. ☐ Since it appears that a discussion with applicant's representative may result in agreements whereby the application may be placed in condition for allowance, the examiner will telephone the representative within about 2 weeks from the date of this letter.

10. ☐ Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.

11. ☐ Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.

12. ☐ Other

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602,463

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 35USC103 and did not discuss the issue raised by 35USC101. 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 35USC101. 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.

5. This action is made FINAL.

Ruggiero/jnb
(703) 557-2871
7/1/76

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

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602,463

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	

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 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 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 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:

ln is the symbol for natural logarithm,

v is the total required cure time and end point for press closure,

C 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,

Z is the present mold temperature at 32, and

x 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."

A R G U M E N T

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 unmoldéd 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 opening the press 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 Gottschalk v. Benson, 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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PAPER NO. 9

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

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332-53

• DIRECT DIGITAL CONTROL •
OF RUBBER MOLDING PRESSES

Before the 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

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"

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 Filed August 6, 1975 For DIRECT DIGITAL CONTROL OF RUBBER MOLDING PRESSES Group Art Unit 236 Examiner: Joseph F. Ruggiero	BEFORE THE BOARD OF APPEALS APPEAL NO. 332-53

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 improved in relation to products of the prior art, because of the greater accuracy of cure. The computer program 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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109 602,463

Group 236

Paper No. 11

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:

602,463

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

112 602, 463

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

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
(Acting)

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115

602,463

#15

United States Court of Customs and Patent Appeals

Mandate

No. 79-527

IN THE MATTER OF THE APPLICATION

OF

JAMES R. DIEHR, II
and THEODORE A. LUTTON

Serial No. 602,463

ON APPEAL from the Board of Appeals
This CAUSE having been heard and considered, it is
ORDERED and ADJUDGED: Reversed

DATED August 9, 1979
Petition for rehearing denied; October 18, 1979.

A TRUE COPY GEORGE E. HUTCHINSON,
TEST:
CLERK, UNITED STATES COURT OF CUSTOMS
AND PATENT APPEALS
CERTIFIED THIS 25th DAY OF October 19 79

BY George E. Hutchinson

Supreme Court of the United States

No. 79-1112

Sidney A. Diamond, Commissioner of Patents and Trademarks,

Petitioner,

v.

James R. Diehr, II and Theodore A. Lutton

ON WRIT OF CERTIORARI to the United States Court of Customs and Patent Appeals.

THIS CAUSE came on to be heard on the transcript of the record from the above court and was argued by counsel.

ON CONSIDERATION WHEREOF, it is ordered and adjudged by this Court that the judgment of the United States Court of Customs and Patent Appeals in this cause is affirmed.

March 3, 1981

A true copy ALEXANDER L. STEVAS
Test:
Clerk of the Supreme Court of the United States
Certified this 2nd day of April, 1981
By Deputy

3.81

#18/D
mcquade
4-5-82

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

September 25, 1981

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Dear Sir:

AMENDMENT

After the Supreme Court's Decision

Please enter 9/f

During the hearings at the Board of Appeals, the Court of Customs and Patent Appeals, and the U.S. Supreme Court there seemed to be no question as to what the claims meant. However, from the comments of some attorneys since then, it appears that, in the opinion of some, the claims do not literally say what everyone involved up to now has interpreted them as meaning. Therefore, the following amendments, fully supported by the application, are offered in the hope that they will clarify the meaning of the claims even to very critical readers and will therefore conform the literal meaning to the very meaning assumed by all the board members, judges, and justices

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that have considered the case.

Please rewrite claims 1, 5, 7 and 11 as follows:

(Twice Amended)

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

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

natural logarithm conversion data (ln),

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

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

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

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

constantly providing the computer with the temperature (Z),

repetitively [calculating] performing in the computer, at frequent intervals during each cure, integrations to calculate from the series of temperature determinations the Arrhenius equation for reaction time during the cure, which is

$$\ln v = CZ + x$$

where v is the total required cure time,

repetitively comparing in the computer at [said] frequent intervals during the cure each said calculation of the total required cure time calculated with the Arrhenius equation

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D1 cont'd

and said elapsed time, and

opening the press automatically when a said comparison indicates [equivalence] completion of curing.

(Twice Amended)

D2

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,

repetitively [calculating] performing for each said press at frequent periodic intervals during each cure in the computer, integrations to calculate from the series of temperature determinations the Arrhenius equation to determine the total required cure time, which is $\ln v = CZ + x$, where 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

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

(Twice Amended)

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,

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] performing in the computer, at frequent intervals during each cure, integrations to calculate from the series of temperature determinations the Arrhenius equation for reaction time during the cure, which is

$$\ln v = CZ + x$$

where v is the total required cure time,

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D3 Cancelled

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 completion of curing [equivalence], and

removing the resulting precision molded article from the press.

D4

(Amended)

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,

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

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(g) repetitively [calculating] performing at frequent periodic intervals throughout closure of said press integrations to calculate from the series of temperature determinations 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 completion of curing [equivalence], and

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

D 4 Cont'd

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R E M A R K S

Claims 1, 5, and 7, as they stood prior to this amendment and as they went up to the Supreme Court, can be found in the preliminary amendment of August 5, 1975. Claim 11 can be found in the first amendment of April 19, 1976, following a first official action in this continuation application. The Examiner may want to refer to these papers.

As explained above, these amendments are being made to clarify the claims, actually conforming them to their meaning as understood throughout the prosecution of the application and in the appeals in the CCPA and the Supreme Court.

Claim 1 is amended to recite the step of repetitively performing integrations to calculate the Arrhenius equation from the series of temperature determinations. Previously, that portion of the claim recited simply "repetitively calculating in the computer ... the Arrhenius equation ... [by the formula] $\ln v = CZ + x$ where v is the total required cure time", and repetitively comparing each v calculation and the elapsed time.

This would be technically incorrect, if it were interpreted to mean that each calculated v value is based only upon the most-recent temperature determination, taking no account of all past variations in temperature. Such an interpretation is at odds with the remainder of the claim and with the entire application. The result would be erratic and inaccurate openings of the molds, probably occurring with a local increase in temperature as if the temperature had been at that increased valve all along, rather than the result to which the invention is directed. The point of the amendment is to guard against such an interpretation and to assure correct

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interpretation of the claims.

This amendment to claim 1 clarifies the manner in which the calculations are performed, i.e. with integrations to take into account all of the series of temperature determinations up to the point of each integration. This is as disclosed in the specification at page 7, lines 5 through 8. It is also emphasized at page 7, lines 13 through 19. See also page 6, lines 4 through 6.

Another amendment to claim 1 is the removal of the word "said" in the first line of the next-to-last paragraph. As claim 1 stood, it might have been interpreted as equating the "frequent intervals" in that paragraph with the "frequent intervals" above in the "repetitively calculating" paragraph. However, it may be that the comparison of the most-recently calculated total cure time with the elapsed time occurs much more frequently than the occurrence of the actual calculations. For example, see page 3, lines 21-25 in the specification, where it is stated that the calculations may occur every ten seconds, but the comparisons every second. The inclusion of the word "said" by amendment to the claim August 5, 1975, was inadvertent, and it should be deleted, even though it has created no problems in the proceedings up through the Supreme Court.

Finally, claim 1 concluded with the molding press being opened when a comparison indicates equivalence. However, precise equivalence would rarely occur, and what was intended was that the mold press open when sufficient time has elapsed. This would usually be slightly more than sufficient time, since the comparisons are made at finite intervals (e.g., one second) and precise equivalence would almost always occur between comparisons. Although the claim was certainly understood in

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the way it was intended, it is preferred that amendment be made to clear up any possible doubts. Thus, the claim is amended to say that the molding press is opened when a comparison indicates "completion of curing".

Claim 5 is amended in the same manner as claim 1, with respect to the first two amendments made there, for the same reasons. In the last line of claim 5, different wording was used to define when the mold press is opened; so this does not require amendment.

Claim 7 is amended as claim 1, in all three areas, for the same reasons explained above with respect to claim 1.

Claim 11 is amended in paragraph (g) similarly to claim 1. Two paragraphs below, a clause defining the term Z is deleted, because Z is already defined above. In paragraph (h) no change is necessary, because the phrase "said frequent periodic intervals" is not included here. It is stated that a comparison occurs for each repetition of the calculation involving the Arrhenius equation, and this certainly would not preclude the comparisons occurring more frequently than the calculations.

In paragraph (i), the same amendment is made as was made at the ends of claims 1 and 7.

These amendments are believed to correct and clarify the claims, without changing the subject matter as found to be allowable in the Supreme Court appeal. It is respectfully requested that the amendments be entered and that the application be passed to allowance.

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UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
05/602,463	08/08/75	DIEHR	

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EXAMINER	
RUGGIERO, J	
ART UNIT	**PAPER NUMBER**
236	19

DATE MAILED: 03/23/82

This is a communication from the examiner in charge of your application.

COMMISSIONER OF PATENTS AND TRADEMARKS

1. ☐ THIS IS AN ATTACHMENT TO THE NOTICE OF ALLOWANCE AND BASE ISSUE FEE DUE

2. ☒ All of the claims being allowable, PROSECUTION ON THE MERITS IS CLOSED in this application in view of: (If not attached hereto, a Notice of Allowance or other appropriate communication will be sent in due course).

   a. ☐ Applicant's communication filed _____

   b. ☐ Interview summarized on attached EXAMINER INTERVIEW SUMMARY RECORD.

   c. ☒ Examiner's Amendment to the Record below. Should the changes and/or additions below be unacceptable to applicant, an appropriate amendment to the record may be proposed as provided by 37 C.F.R. 1.312. To ensure consideration of such an amendment, it must be submitted before or with the remittance of the Base Issue Fee.

   d. ☐ An Examiner's Amendment will follow.

   e. ☒ The allowed claims are 1-11

3. ☐ PROSECUTION ON THE MERITS REMAINS CLOSED. Should the changes and/or additions below be unacceptable to applicant, an appropriate amendment to the record may be proposed as provided 37 C.F.R. 1.312. To ensure consideration of such an amendment, it must be submitted before or with the remittance of the Base Issue Fee.

---------- EXAMINER'S AMENDMENT TO THE RECORD ----------

A. ☒ Note statement of reasons for allowance contained below. Any comments considered necessary by applicant regarding reasons for allowance must be submitted no later than the payment of the Base Issue Fee, preferably with it, to avoid processing delays. Such submissions should be clearly labeled: "Comments on Statement of Reasons for Allowance."

B. ☒ Note attached NOTICE OF REFERENCES CITED, PTO -- 892, which is part of this communication. The listed references are considered to be pertinent to the claimed invention, but the claims are deemed to be patentable thereover.

C. ☐ Note attached LIST OF PRIOR ART CITED BY APPLICANT, PTO-1449, which is part of this communication and serves as an acknowledgment of receipt of applicant's prior art statement. The references which were considered have been initialed on the form by the examiner, and the claims are deemed patentable thereover.

D. ☐ The formal drawings filed on _____ are acceptable.

E. ☐ The drawing correction request filed on _____ has been ☐ approved. ☐ disapproved.

F. ☐ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has: ☐ been received.
☐ not been received. ☐ been filed in parent application, serial no. _____
filed on _____

G. ☐ Note amendment to Specification, Claims and/or Drawing contained below.

The amendment filed September 28, 1981 has been entered.

See attached Statement of Reasons for Allowance

Joseph Ruggiero
JOSEPH F. RUGGIERO
EXAMINER
GROUP ART UNIT 236

ATTACHMENT TO PAPER NO. 19

STATEMENT OF REASONS FOR ALLOWANCE

SERIAL NO. 05/602,463

The claims patentably distinguish over the art of record by reciting in combination:

1) - the continuous determination of mold temperature at a location closely adjacent to the mold cavity,

2) - the repetitive calculation of the Arrenhius equation to provide a continuous, repetitive output representative of the state of cure in terms of total required cure time,

3) - the repetitive comparison of the total required cure time value with the value of an elapsed timer within the digital computer which is initially set at the closure of the molding press.

For example, the patent to Davis et al (3,649,729), while disclosing the continuous determination of the temperature at the boundary surfaces of an article to be molded, does not disclose the continuous comparison of a calculated total required cure time value with elapsed time.

The patent to Smith(3,980,743, which is a division of Ser. No. 137,427, April 26, 1971, Pat. No. 4,022,555), not previously of record, is cited of interest. The Smith patent is directed to a rubber curing method(exemplified by the prior art previously of record in the case) wherein the state of cure is calculated in terms of "cure equivalents" or "cure units", the value of which is compared with a predetermined number of "cure equivalents" or "cure units" as opposed to the recited comparison of calculated total required cure time with elapsed time. Further, the claims distinguish over Smith by reciting the measurement of temperature "at a location closely adjacent the mold cavity" which, as per page 10, paper no. 4 of parent S.N. 472,595, excludes use of a probe which projects into the mold such as disclosed by Smith.

Joseph F. Ruggiero

JOSEPH F. RUGGIERO
EXAMINER
GROUP ART UNIT 236

Any comments considered necessary by applicant must be submitted no later than the issue Fee and, to avoid processing delays, should preferably accompany the issue Fee. Such submissions should be clearly labeled *"Comments on Statement of Reasons for Allowance."*

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	SERIAL NO.	GROUP ART UNIT	ATTACHMENT TO PAPER NUMBER	
NOTICE OF REFERENCES CITED		602,463	236		
		APPLICANT(S) J. R. DIEHR, II ET AL			

U.S. PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE
✓	A	3 9 8 0 7 4 3	9-1976	SMITH	264	40.2	4-26-1971
	B						
	C						
	D						
	E						
	F						
	G						
	H						
	I						
	J						
	K						

FOREIGN PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG	PERTINENT PP. SPEC.
	L								
	M								
	N								
	O								
	P								
	Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

R	
S	
T	
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EXAMINER	DATE
RUGGIERO	3-23-1982

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)