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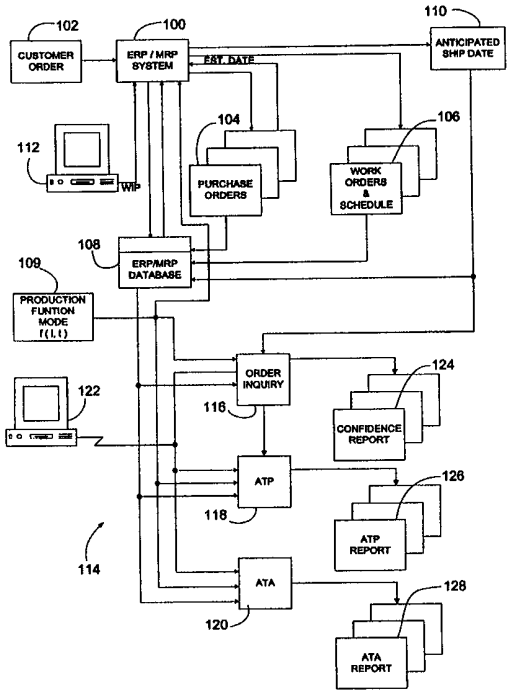
(54) Title: REMOTELY ACCESSIBLE COMPUTERIZED MANUFACTURING PROCESS AND INVENTORY CONTROL AUDITING AND QUERYING SYSTEM

(57) Abstract

A computerized manufacturing process and inventory auditing and querying system for a manufacturing operation which utilizes a computerized manufacturing process control program which processes customer orders, generates external purchase orders and internal work orders, manages inventory, and generates an anticipated ship date for the completion of the customer order, and which adjusts the anticipated ship date in consideration of work in process information which is entered into the system during the manufacturing process, comprises a user interface which receives a user query. This user interface ensures the integrity of this user query, and generates an audit request in response. The system also includes audit request processing modules which are responsive to audit request to calculate a confidence factor, a full lead time available–to–promise date, and the total quantity of manufactured parts which are available–to–assemble from current inventory. The confidence factor represents a probability of completing a customer order by the anticipated ship date generated by the computerized manufacturing process control program. The system allows for remote access and is continuously updated during the manufacturing process. Detail information regarding the calculation of the factor are also available.



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REMOTELY ACCESSIBLE COMPUTERIZED MANUFACTURING PROCESS AND INVENTORY CONTROL AUDITING AND QUERYING SYSTEM

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often located around the globe in different time zones, many of which operate on three shifts around the clock, it becomes important for customers to be able to obtain information regarding the pending status of an order at any time, twenty-four hours a day. Since it is not feasible for a human floor planner to be accessible twenty-four hours a day and to be cognizant of all of the factors, both internal and external, which affect the anticipated ship date for a highly engineered manufactured product, it becomes impossible, under the current state-of-the-art manufacturing technology, to provide customers with an analytical confidence report to allow them to effectively plan their own manufacturing and end customer delivery obligations.

Summary Of The Invention

It is therefore an object of the instant invention to overcome these and other known problems existing with the current state of computerized manufacturing process systems. More particularly it is an object of the instant invention to provide a computerized auditing and inquiry system which interfaces with a computerized manufacturing system to provide customers with a confidence report which will indicate a confidence level that the promised anticipated ship date for shipment of the manufactured components will be met. Further, it is an object of the instant invention that such a system be accessible remotely to its customers 24 hours a day 365 days a year.

It is a further object of the instant invention to provide customer item "available-to-promise" information to customers to allow better forecasting of their own manufacturing processes which may be dependent upon a manufactured product from another. Further, it is an

object of the instant invention to provide, by customer and manufacturer part number, full end lead time dates after receipt of an order for entry into the buyers manufacturing system.

It is a further object of the instant invention to make available in this remote continuous fashion customer "available-to-assemble" information which includes all manufactured and purchased parts necessary to complete a customer end item. Further, it is an object of the instant invention to provide information of the total quantity of a part which may be manufactured from the component inventory currently available and uncommitted to other customers.

In a preferred embodiment of the instant invention, a computerized manufacturing process and inventory control auditing and querying system is provided for a manufacturing operation. The manufacturing operation preferably utilizes a computerized manufacturing process and inventory control program which processes customer orders, generates external purchase orders and internal work orders, manages inventory, and generates an anticipated ship date for the completion of the customer order. This manufacturing process and inventory control program typically adjusts the anticipated ship date in consideration of work-in-process information which is entered into the system during the manufacturing process by distributed users. The manufacturing process and inventory control program generally utilizes at least one computer database for storage and retrieval of customer information, inventory control, operating schedule information, and part assembly information.

In a preferred embodiment, the computerized manufacturing process and inventory control auditing and querying system comprises a user interface which receives and ensures the integrity of a user query.

This interface generates an audit request in response to the user query. The system also comprises an audit request processor which calculates a confidence factor representing a probability of completing a customer order by the anticipated ship date generated by the computerized manufacturing process and inventory control program in reliance in part on a production function model used to calculate the actual process time required to complete a manufacturing order.

In a further preferred embodiment of the instant invention, the audit request processor interfaces with the computer database of the computerized manufacturing system and the production function model and extracts customer, inventory control, operation process time, operation scheduling, and part assembly information. Preferably, the audit request processor examines raw material availability information, manufacturing scheduling information, process time remaining for completion of the customer order information, and calendar time remaining before the anticipated ship date, to calculate the confidence factor as a function thereof. Preferably, the audit request processor displays raw material information, work in process information, requirements for and status of outside work information extracted from the computerized manufacturing system database to substantiate the calculated confidence factor.

In a highly preferred embodiment of the instant invention, the user interface further receives and ensures the integrity of another user query, generating a second audit request identifying at least one part. In this embodiment, the audit request processor is responsive to this second audit request for calculating a full lead time available-to-promise date for the part. To accomplish this, the audit request processor

examines the computerized manufacturing system database to determine what, if any, component parts are required to manufacture the part. It also extracts process time information from the production function model for each component part required to manufacture the part and combines the process times for completion of the part, assuming no availability of the parts, component parts, or raw material. The full lead time available-to-promise date is calculated as a function of these values.

In another preferred embodiment, the user interface further receives and ensures the integrity of a third user query, generating a third audit request in response which identifies at least one part. The audit request processor is responsive to this audit request for calculating a number of the parts which are available-to-assemble. The audit request processor examines the database of the computerized manufacturing system to determine what, if any, component parts are required to manufacture the part, and to determine what component parts are available. Preferably, the audit request processor calculates a number of the parts which may be manufactured from the given availability of component parts.

A preferred embodiment of the instant invention includes a method of remotely auditing and querying a computerized manufacturing process and inventory control system, comprising the steps of (a) receiving a user query containing user information; (b) extracting information from the computerized manufacturing process system relating to the user information; and (c) calculating actual process time for the user order; and (d) calculating a confidence factor based on the extracted information and the calculated actual process time information, the confidence factor representing a

probability of completing a customer order by an anticipated ship date previously generated by the computerized manufacturing process system. Additionally, a preferred method further comprises the steps of (e) receiving a second user query containing manufactured part information; (f) extracting information from the computerized manufacturing process system relating to the manufactured part information; (g) calculating actual process time for the customer order; and (h) calculating an available-to-promise date based on the extracted information, the available-to-promise date representing the total manufacturing lead time required to complete the manufactured part. Additionally, a preferred method further comprises the steps of (i) receiving a third user query containing manufactured part information; (j) extracting information from the computerized manufacturing process system relating to the manufactured part information; and (k) calculating a quantity of the manufactured part which is available-to-assemble based on the extracted information. This available-to-assemble quantity represents the total number of manufactured parts which may be completed with current inventory of component parts.

These and other aims, objectives, and advantages of the invention, will become more apparent from the following detailed description while taken into conjunction with the accompanying drawings.

Brief Description Of The Drawings

FIG. 1 is a block diagram illustrating the functional connection with an ERP/MRP computerized manufacturing system;

FIG. 2 is a communications schematic diagram

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100 is continually updated through work-in-process information transmitted by users of the manufacturing process through terminals 112 distributed throughout the manufacturing facilities. This work in process information is used by the ERP/MRP system 100 to monitor the progress of the manufactured product through the entire manufacturing system, including parts, orders, and deliveries from outside vendors.

A preferred embodiment of the system of the instant invention preferably interfaces with the existing computerized ERP/MRP system 100, which may be the Glovia™ system or other system as appropriate or desired. In any event, the selection of the particular ERP/MRP system 100 does not limit the scope of the instant invention. In a preferred embodiment of the invention, the manufacturing process and inventory control, auditing, and querying system 114 utilizes information in the storage and organizational structure of the ERP/MRP database 108 to avoid duplication and excess storage requirements for the required information used to process the outputs from the system 114. However, the system of the instant invention may also utilize its own internal database for storage and retrieval of required information as may be preferred.

Specifically, the computerized manufacturing process and inventory control auditing and querying system 114 includes an order inquiry module 116, a customer available-to-promise module 118, and a customer available-to-assemble module 120. Each of these functional modules are preferably implemented in software, although other implementations possible and are acceptable. Additionally, the use of the term "module" is not meant to limit the implementation of the instant invention to a particular programming technique, and any implementation or other means performing the

described functions are included in the scope of the invention. Each of these modules may be initiated by a customer input through a remote terminal location 122. Each of the modules 116, 118, and 120 of the system 114 extracts information from the ERP/MRP database 108 such as, for example, customer location information, inventory control information, and part assembly information. Additionally, the operation process time information may be extracted from the ERP/MRP database 108, or may preferably be extracted from a production function model 109 which calculates the actual process time to complete a manufacturing order based on actual historical performance as will be described more fully below. This information is used in conjunction with the customer input to generate confidence reports 124, available-to-promise reports 126, and available-to-assemble reports 128. Each of these reports contain information in response to certain queries initiated by the remote user 122 as will also be described more fully below.

The hardware architecture of the remote customer connection may take the form as illustrated in FIG. 2. As may be seen from this figure the remote customer terminal 122 is connected via modems 123 and 125 to the system data communications and terminal controller (DTC) 130 which performs the security functions of password and name authorization. The DTC 130 also performs certain data handling and formatting functions and passes the customer connection across the backbone 133, through any hub 131 which may be present, and through the HP9000 computer 132 which provides the connection to the mainframe 134 on which the ERP/MRP system 100 is resident. Remote customer accessing such as illustrated in this figure may be accomplished through the commercially available application program Procom™, or

other commercially available interfacing software packages.

Additionally, the remote customer access may be accomplished as illustrated in FIG. 3. As shown herein, the remote customer terminal 122 is connected via modem 123 through a traq net unit 136 which performs the security functions and audit trail generation, requiring a number and password to gain access thereto. The traq net 136 then passes the customer connection through the DTC 130 and HP9000 132 as described above, also requiring name and password security functions to be satisfied before connecting the remote user to the system network 138 which may be, for example, a Novell network. Once on the network 138, the customer then has access, typically through a menu selection, to the system mainframe 134 on which the ERP/MRP system 100 is resident.

In addition to these two illustrated methods of remote customer connection to the manufacturing process and inventory control auditing and querying system, remote customer connection may also be accomplished via the Internet as is known in the art. This interface may be accomplished through secured customer pages accessible only with appropriate password recognition as desired.

The functionality of the manufacturing process and inventory control auditing and querying system will now be described in association with FIGs. 4 through 8. Once the system is initiated 140, a customer request for access 142 is received 144 by the system. The system then performs the customer identity security functions 146 to ensure integrity and confidentiality of the manufacturing information which will be provided by the various reports as outputs from the system. Upon checking for a valid customer identification 148, a

termination screen 150 displaying, e.g., the customer service telephone number will be displayed if the input information is not valid. The system will then terminate the connection 152 with that particular user. If, however, a valid customer identification is obtained, the system will display the query selection screen 154. The remote customer then initiates a selection 156 which is received 158 by the system.

An embodiment of the instant invention provides for four options for the customer selection from the query selection screen. These selections include a termination from the system, in which case the system displays the exit screen 160 and proceeds thereafter to terminate the connection 162 with the remote user before ending its processing 164. Additionally, the remote customer may select the order inquiry function 166, the customer item available-to-promise function 168, or the customer item available-to-assemble function 170.

Upon selection of the customer order inquiry function 166 (see FIG. 5) the customer site location screen is displayed 172. From this customer site location screen the customer selects the appropriate site 174 which is received by the system 176. In response to the particular customer site selection received 176, the system extracts customer order information for the selected site 178 from the ERP/MRP database 108. Once the particular customer order information for the selected site has been extracted, the system then extracts the ERP/MRP information for that selected site 180 including inventory control information, purchase order information, and part assembly information. Additionally, the system extracts operation process time information for completion of the manufactured part from the production function model 109. At this point, the system calculates a confidence

factor for each of the orders logged in the ERP/MRP system for the particular selected site. This confidence factor calculation 194 requires two separate calculations to be performed as a prerequisite thereof.

First, the system calculates the purchased material schedule delta 182 which compares the scheduled purchased material in date with the actual calendar date. This calculation figures the calendar delta between the required date to start assembly of the manufactured item (the derivation of which will be described below) for the particular purchase order for the site selected by the user with the scheduled delivery date from the sub-component or raw material supplier. Based on this calendar delta information, the system then extracts 184 a probability index from a probability index table 186. The relationship between the calendar delta and the probability index is based on historical performance of the manufacturing facility, taking into account a myriad of factors, including staffing, work schedules, equipment maintenance, etc. This probability index is then input to the confidence factor calculation process block 194. The second input for the confidence factor calculation 194 comes from a calculation of the manufactured parts calendar delta ratio calculation 188 which compares the calendar delta of the date to shipment versus the actual process time for the manufactured part.

The determination of the actual process time for the manufactured part to be used to calculate the confidence factor is based on a production function model 109. This model 109 is based on the historical performance of each workstation in the manufacturing environment, and is updated periodically to ensure validity of the prediction data. Because the environment in a manufacturing facility is continuously

changing due to machine maintenance, set-up and down time, new equipment installation and training time, personnel vacations and sick time, *et cetera*, the model is preferably updated approximately every six months. The model utilizes a multiple regression technique to generate a mean prediction of the actual process time which will be required to complete a manufactured item taking into account a feed back production time error based on the prior prediction. Since the model is based on actual historical data from the prior period as modified by the feed back model data, real life effects such as actual machine set up time and personnel learning curves are reflected in the output as is evidenced by the variation of "actual process time" to complete a manufacturing task based on lot size of the order. A small order of a part will have a greater time per unit to complete than a larger run of the exact same part.

Referring again specifically to FIG. 5, the ratio which is calculated in process block 188 divides the time required for actual processing of the manufactured component by the calendar time left until the anticipated promised ship date for the manufactured part to the customer. Once this ratio has been calculated 188 the system extracts a probability index 190 from a probability index table 192. This probability index is then input to the confidence factor calculation 194 which averages these two probability indices to determine a confidence factor that the manufactured part will actually be shipped on the date promised with a given level of confidence. It should be noted that if there are no purchased components required, the purchased material schedule delta calculation 182 is not used in the confidence factor calculation 194. Once this information has been calculated it is then

displayed 196 on a confidence factor screen.

From the confidence factor screen, the customer may make a selection 198 (see FIG. 6) which will be received by the system 200. The first of the acceptable selections is to return 202 to the initial query selection screen 154 (see FIG. 4) from which the customer may then select any of the four available options. Alternatively, the customer may choose to display 204 the process detail information for any selected order included on the confidence factor screen. Once the customer has reviewed the process detail information for the selected order 204, he may return 206 to the confidence factor screen 196, from which he may select any of the available options including displaying process detail information for a different selected order.

Alternatively, the customer may select customer available-to-promise information for a particular selected order, in which case the system extracts 208 the selected part manufacturing information from the ERP/MRP database 108 and the production function model 109. This extracted information includes the inventory control information, operation process time information, and part assembly information for the selected order. The system then calculates the full lead time for the selected part 210, the excess stock availability for the selected part 212, and the forecast date for the selected part 214, all of which is then displayed 216 in an available-to-promise information screen for the selected part. From this available-to-promise screen for the selected part the customer may jump 206 back to the confidence factor screen 196 from which he may make any of the available selections including extracting available-to-promise information for a different selected part.

With reference again to FIG. 4, if upon receiving the query selection screen the customer chooses to select the customer available-to-promise option 168, a customer location and part number screen would be displayed 218 (see FIG. 7). From this screen the customer will input 220 a selected location and part number which will be received 222 by the system. The part number identifies a particular part for which the customer desires the available-to-promise information. Once this information has been received 220 the system then extracts 224 part number information from the ERP/MRP database 108 and actual processing time for the part from the production function model 109. From the part number manufacturing information the system then calculates 226 the full lead time assuming no availability of components or raw material for the part, the actual excess stock availability for the selected part 228, and an actual forecast date for the selected part 230. Once these calculations have been completed, the available-to-promise information will be displayed 232 to the remote customer. From this screen, the system receives 234 the customer input selection 236 which will allow the customer to either return 202 to the main query selection screen 154 (see FIG. 4), or will allow the customer to return 238 to the main customer available-to-promise location screen 218 from which the customer may enter a different part number on which he wishes the available-to-promise information to be calculated.

With reference again to FIG. 4, the other selection available to the customer from the main query selection screen in this exemplary embodiment of the instant invention is the customer available-to-assemble selection 170 (see FIG. 8). Upon selecting this function 170, the system displays a customer location

screen 240 which includes not only the customer site location but also input availability for part number information. From this customer location screen the system receives 242 the customer input 244 which includes both location and requested part number information. From this part number information the system extracts 246 information regarding that part number from the ERP/MRP database 108 and actual process time information from the production function model 109. From this extracted information, which includes part assembly information for the particular part number entered as well as operation process time for both internally manufactured and purchased component parts, the system calculates 248 the quantity available-to-assemble of the selected part number in view of the material available in the manufacturing process at the time. This information is then displayed 250 on the customer available-to-assemble screen. From this screen the system receives 252 customer input 254 which allows the customer either to return 202 to the main query selection screen 154 (see FIG. 4), or to return 256 to the input customer location screen 240 to allow the customer to query the quantity available-to-assemble information for other part numbers.

The probability index table 192 for the manufactured parts as used by the system in the calculation of the calendar delta ratio (see FIG. 5) is illustrated in FIG. 9. As may be seen from this figure, the probability index table 192 includes a sequence number, a start and an end number which defines a delta range, and a probability number indicated as a percentage, pre-selected to correspond to a particular sequence number range. As an example, if the time required to manufacture a particular component divided by the time left to the promise date is within the

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location. Once this customer item number has been input the system will generate the available-to-promise information as described above and display this information on the customer available-to-promise screen shown in FIG. 16. This screen displays the selected part as well as the calculated full lead-time by date and number of days from the receipt of an order. Also displayed on this screen are the forecast dates and quantities of parts which are currently in the ERP/MRP system to be manufactured and which may be available to this particular customer.

If, from the initial customer query screen (see FIG. 11), the customer had chosen available-to-assemble function, the screen illustrated in FIG. 17 would be displayed. As with the available-to-promise location screen, this screen also requires that the customer input part number information. After the customer has input the customer item number, the system calculates and displays all components required for the assembly of the particular selected customer item, the requirements for this assembly, the total of the required components on hand, the quantity of the required components per assembly of the selected part, the quantity actually available for use in an assembly for this particular customer, and the total quantity of parts which may be made from the quantity of components on hand.

Numerous modifications and alternative embodiments of the invention will be apparent to those skilled in the art in view of the foregoing description. Accordingly, this description is to be construed as illustrative only and is for the purpose of teaching those skilled in the art the best mode for carrying out the invention. The details of the structure and architecture may be varied substantially without departing from the spirit of the invention, and the

exclusive use of all modifications which come within the scope of the appended claims is reserved.

What Is Claimed Is:

1. A computerized manufacturing process and inventory audit and query system for a manufacturing operation, the manufacturing operation utilizing a computerized manufacturing process control program which processes customer orders, generates external purchase orders and internal work orders, manages inventory, and generates an anticipated ship date for the completion of the customer order, the manufacturing process control program adjusting the anticipated ship date in consideration of work in process information which is entered into the system during the manufacturing process, the manufacturing process control program utilizing at least one computer database for storage and retrieval of customer information, inventory control information, operation process time information, operating schedule information, and part assembly information, the computerized manufacturing process and inventory audit, and query system comprising:

user interface means for receiving and ensuring integrity of a first user query, said interface means generating a first audit request in response thereto; and

audit request processing means responsive to said first audit request for calculating a confidence factor, said confidence factor representing a probability of completing a customer order by the anticipated ship date generated by the computerized manufacturing process control program.

2. The system of claim 1, further comprising a production function model for calculating actual process time to complete a manufacturing order, and wherein said audit request processing means interfaces with the at

least one computer database and said production function model, said audit request processing means extracting customer, inventory control, operation process time, operation scheduling, and part assembly information therefrom.

3. The system of claim 2, wherein said audit request processing means examines raw material availability information, manufacturing scheduling information, process time remaining for completion of the customer order information, and calendar time remaining before the anticipated ship date, said audit request processing means calculating said confidence factor as a function thereof.

4. The system of claim 3, further comprising a first probability index storage table, said first probability index storage table associating ratio information with a first confidence probability; and

wherein said audit request processing means calculates a ratio of the operation process time required to manufacture said part to the calendar time remaining until the anticipated ship date, said audit request processing means extracting said first confidence probability information corresponding to said calculated ratio from said first probability index storage table, said confidence factor being calculated as a function thereof.

5. The system of claim 4, further comprising a second probability index storage table, said second probability index storage table associating calendar delta information with a second confidence probability; and

wherein said audit request processing means

calculates a schedule delta between a scheduled purchased material receive date and a required assembly start date, said audit request processing means extracting said first confidence probability information corresponding to said calculated ratio from said second probability index storage table, said confidence factor being calculated as a function thereof.

6. The system of claim 5, wherein said audit request means calculates said confidence factor as an average of said first confidence probability information corresponding to said calculated ratio and said first confidence probability information corresponding to said calculated ratio.

7. The system of claim 3, wherein said audit request processing means displays raw material information, work in process information, requirements for and status of outside work information extracted from the at least one database, said information substantiating said confidence factor.

8. The system of claim 2, wherein said user interface means further receives and ensures the integrity of a second user query, said user interface means generating a second audit request in response thereto, said second audit request identifying at least one part; and

wherein said audit request processing means is responsive to said second audit request for calculating a full lead time available-to-promise date for said part.

9. The system of claim 8, wherein said audit request processing means examines the at least one

database to determine what, if any, component parts are required to manufacture said part, said audit request processing means further extracting process time information from said production function model for each component part required to manufacture said part, said audit request processing means combining process times for completion of said part assuming no availability of said parts, component parts, and raw material, said full lead time available-to-promise date being calculated as a function thereof.

10. The system of claim 8, wherein said audit request processing means examines inventory information in the at least one database to determine if any of said parts are in existence and not identified for a particular customer order before said full lead time available-to-promise date, said audit request processing means displaying said information.

11. The system of claim 9, wherein said audit request processing means examines the work orders generated by the manufacturing process control program to determine if any of said part will be manufactured prior to said full lead time available-to-promise date, said audit request processing means displaying a number of any such parts.

12. The system of claim 2, wherein said user interface means further receives and ensures the integrity of a third user query, said user interface means generating a third audit request in response thereto, said third audit request identifying at least one part; and

wherein said audit request processing means is responsive to said third audit request for calculating a

number of said parts which are available-to-assemble.

13. The system of claim 12, wherein said audit request processing means examines the at least one database to determine what, if any, component parts are required to manufacture said part, and to determine what component parts are available, said audit request processing means calculating a number of said parts which may be manufactured given availability of said component parts.

14. A method of remotely auditing and querying a computerized manufacturing process system, comprising the steps of:

receiving a first user query containing user information;

extracting information from the computerized manufacturing process system relating to the user information;

calculating an actual process time to complete a customer order; and

calculating a confidence factor based on the extracted information and the calculated actual process time, the confidence factor representing a probability of completing a customer order by an anticipated ship date previously generated by the computerized manufacturing process system.

15. The method of claim 14, wherein said step of calculating a confidence factor comprises the steps of

calculating a ratio of total time required to complete the customer order to calendar time remaining until the anticipated ship date; and

extracting a first probability index from a first predetermined probability index table associating first

predetermined probability indexes with calculated ratios.

16. The method of claim 15, wherein said step of calculating a confidence factor further comprises the steps of

calculating a calendar delta between the scheduled purchased material receive date and the scheduled manufacturing start date;

extracting a second probability index from a second predetermined probability index table associating second predetermined probability indexes with calculated calendar deltas; and

averaging the first and the second probability indexes to determine the confidence factor.

17. The method of claim 14, further comprising the steps of

receiving a second user query containing manufactured part information;

extracting information from the computerized manufacturing process system relating to the manufactured part information;

calculating an actual process time to complete a customer order; and

calculating an available-to-promise date based on the extracted information and the calculated actual process time, the available-to-promise date representing the total manufacturing lead time required to complete the manufactured part.

18. The method of claim 17, further comprising the step of calculating excess stock availability of the manufactured part based on the extracted information.

19. The method of claim 17, further comprising the step of calculating a forecast date availability of the manufactured part based on the extracted information and the calculated actual process time.

20. The method of claim 14, further comprising the steps of

receiving a third user query containing manufactured part information;

extracting information from the computerized manufacturing process system relating to the manufactured part information; and

calculating a quantity of the manufactured part which is available-to-assemble based on the extracted information, the available-to-assemble quantity representing the total number of manufactured parts which may be completed with current inventory of component parts.

21. The method of claim 14, further comprising the steps of

receiving a fourth user query requesting process detail information regarding the confidence factor;

calculating a percentage of manufacturing work completed;

displaying a status of raw material required, the percentage of manufacturing work completed, and a necessity and status of any outside work required.

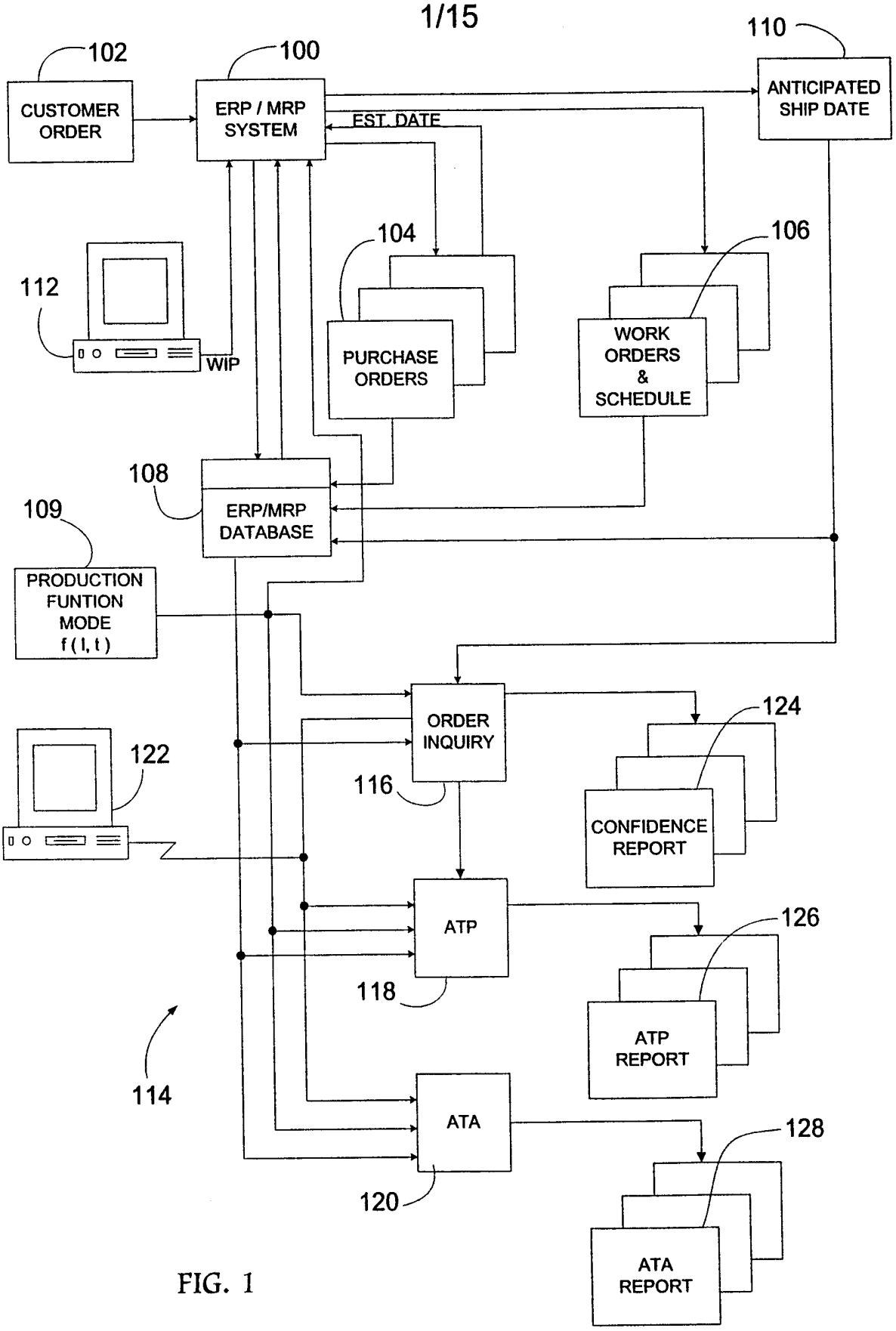

102
CUSTOMER ORDER
100
ERP / MRP SYSTEM
EST. DATE
110
ANTICIPATED SHIP DATE
112
WIP
104
PURCHASE ORDERS
106
WORK ORDERS & SCHEDULE
108
ERP/MRP DATABASE
109
PRODUCTION FUNTION MODE f(I, t)
ORDER INQUIRY
124
CONFIDENCE REPORT
122
116
ATP
126
ATP REPORT
118
114
ATA
128
ATA REPORT
120

FIG. 1

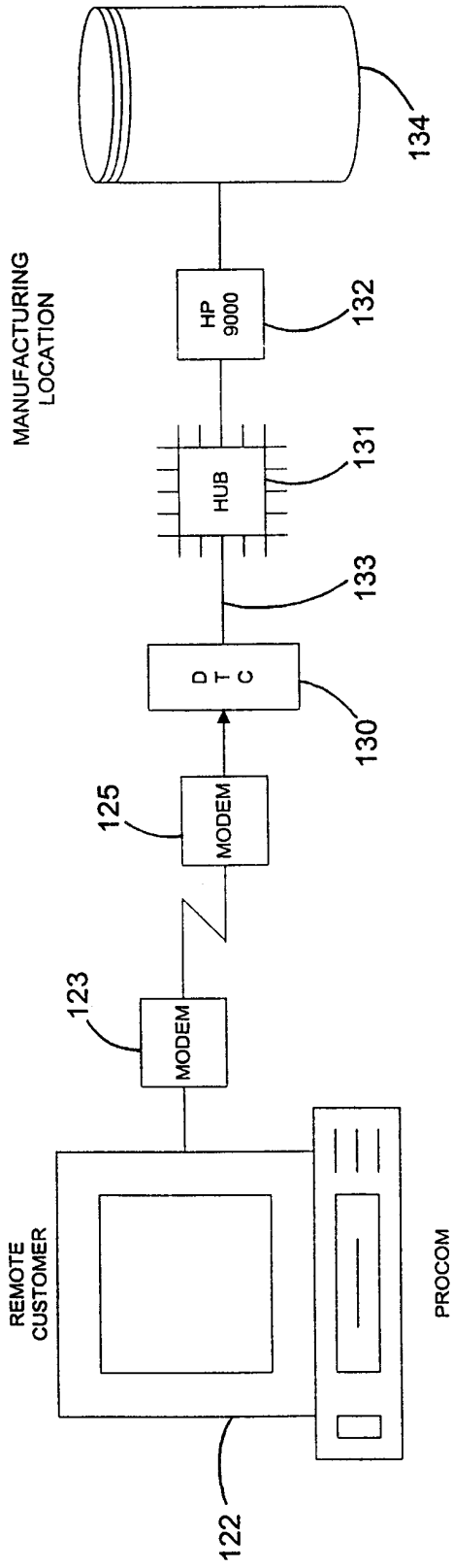

MANUFACTURING LOCATION
134
HP 9000
132
HUB
131
D T C
133
130
MODEM
125
MODEM
123
REMOTE CUSTOMER
PROCOM
122

FIG. 2

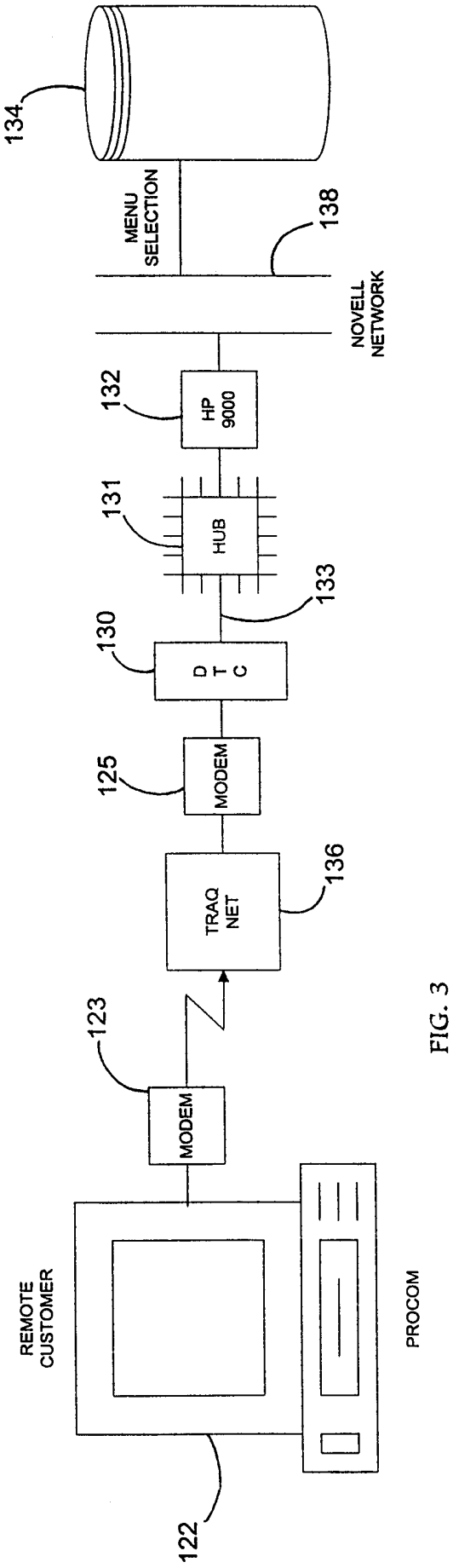

134
MENU SELECTION
138
NOVELL NETWORK
HP 9000
132
HUB
131
D T C
133
130
MODEM
125
TRAQ NET
136
MODEM
123
REMOTE CUSTOMER
PROCOM
122

FIG. 3

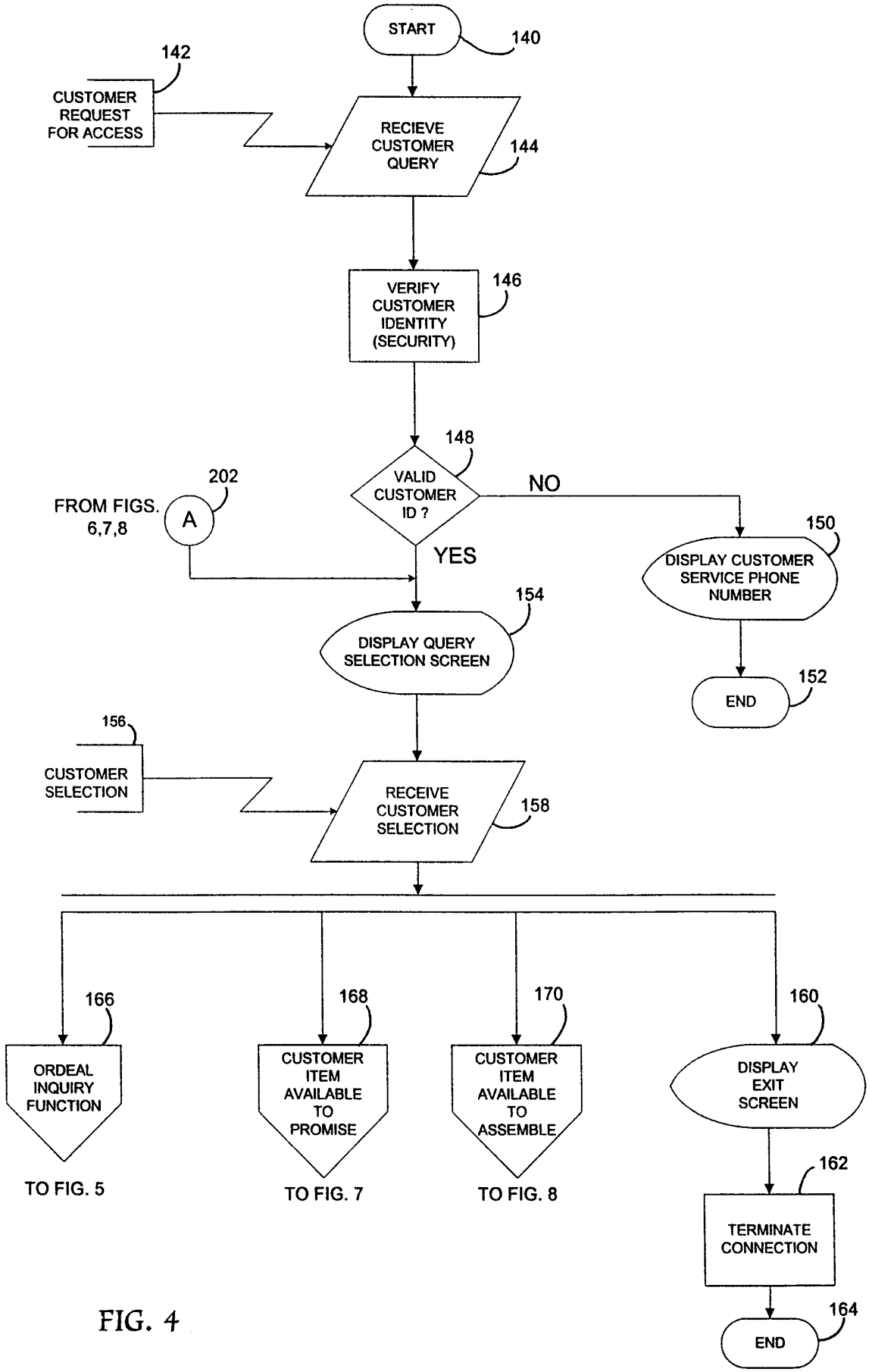

START
140
142
CUSTOMER REQUEST FOR ACCESS
RECIEVE CUSTOMER QUERY
144
VERIFY CUSTOMER IDENTITY (SECURITY)
146
148
VALID CUSTOMER ID ?
NO
YES
202
FROM FIGS. 6,7,8
A
150
DISPLAY CUSTOMER SERVICE PHONE NUMBER
152
END
154
DISPLAY QUERY SELECTION SCREEN
156
CUSTOMER SELECTION
RECEIVE CUSTOMER SELECTION
158
166
ORDEAL INQUIRY FUNCTION
TO FIG. 5
168
CUSTOMER ITEM AVAILABLE TO PROMISE
TO FIG. 7
170
CUSTOMER ITEM AVAILABLE TO ASSEMBLE
TO FIG. 8
160
DISPLAY EXIT SCREEN
162
TERMINATE CONNECTION
164
END

FIG. 4

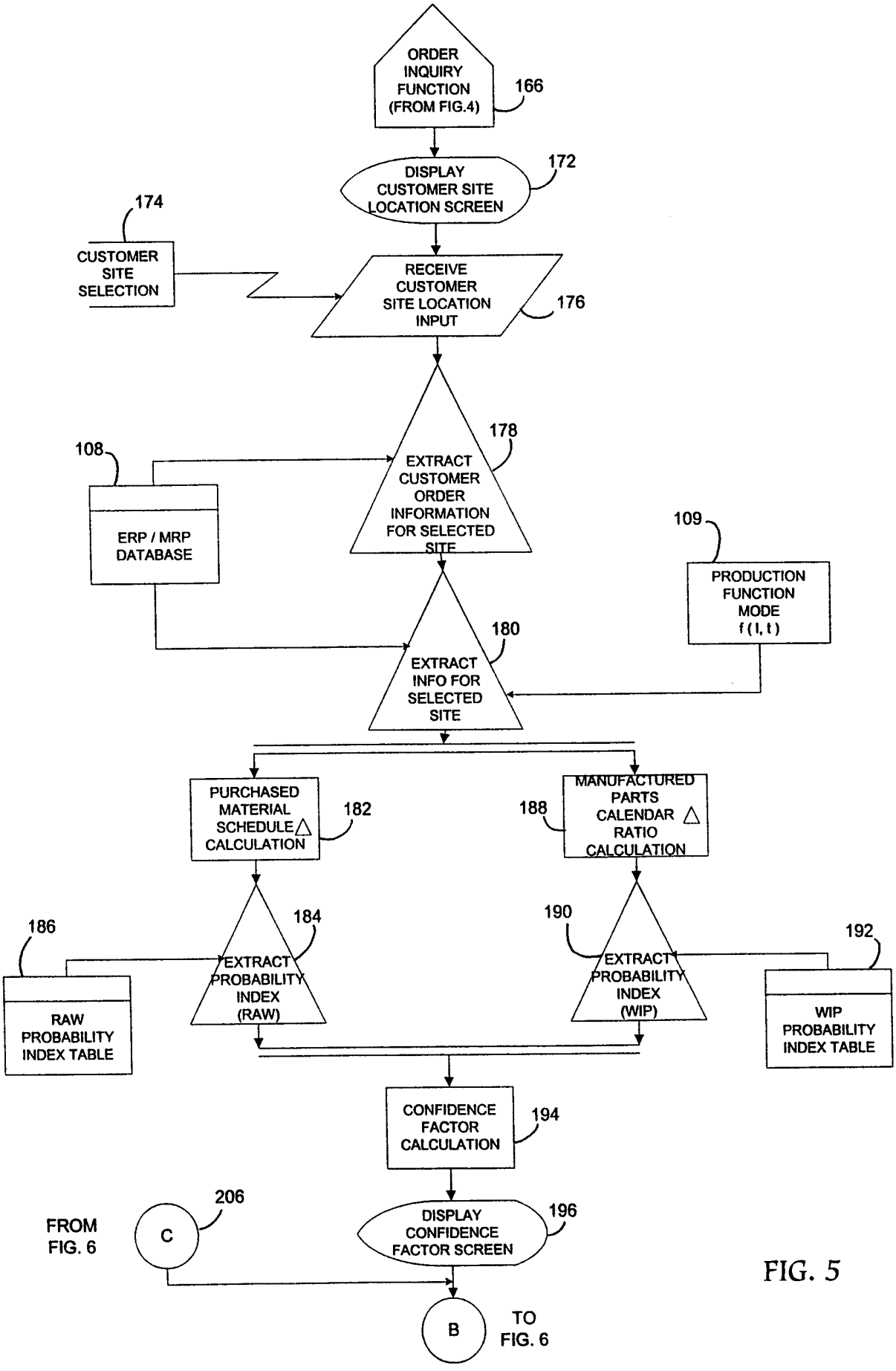

ORDER INQUIRY FUNCTION (FROM FIG.4)
166
DISPLAY CUSTOMER SITE LOCATION SCREEN
172
174
CUSTOMER SITE SELECTION
RECEIVE CUSTOMER SITE LOCATION INPUT
176
178
108
EXTRACT CUSTOMER ORDER INFORMATION FOR SELECTED SITE
ERP / MRP DATABASE
109
PRODUCTION FUNCTION MODE f(I, t)
180
EXTRACT INFO FOR SELECTED SITE
PURCHASED MATERIAL SCHEDULE CALCULATION
182
188
MANUFACTURED PARTS CALENDAR RATIO CALCULATION
186
184
190
192
EXTRACT PROBABILITY INDEX (RAW)
EXTRACT PROBABILITY INDEX (WIP)
RAW PROBABILITY INDEX TABLE
WIP PROBABILITY INDEX TABLE
CONFIDENCE FACTOR CALCULATION
194
206
FROM FIG. 6
C
DISPLAY CONFIDENCE FACTOR SCREEN
196
B
TO FIG. 6

FIG. 5

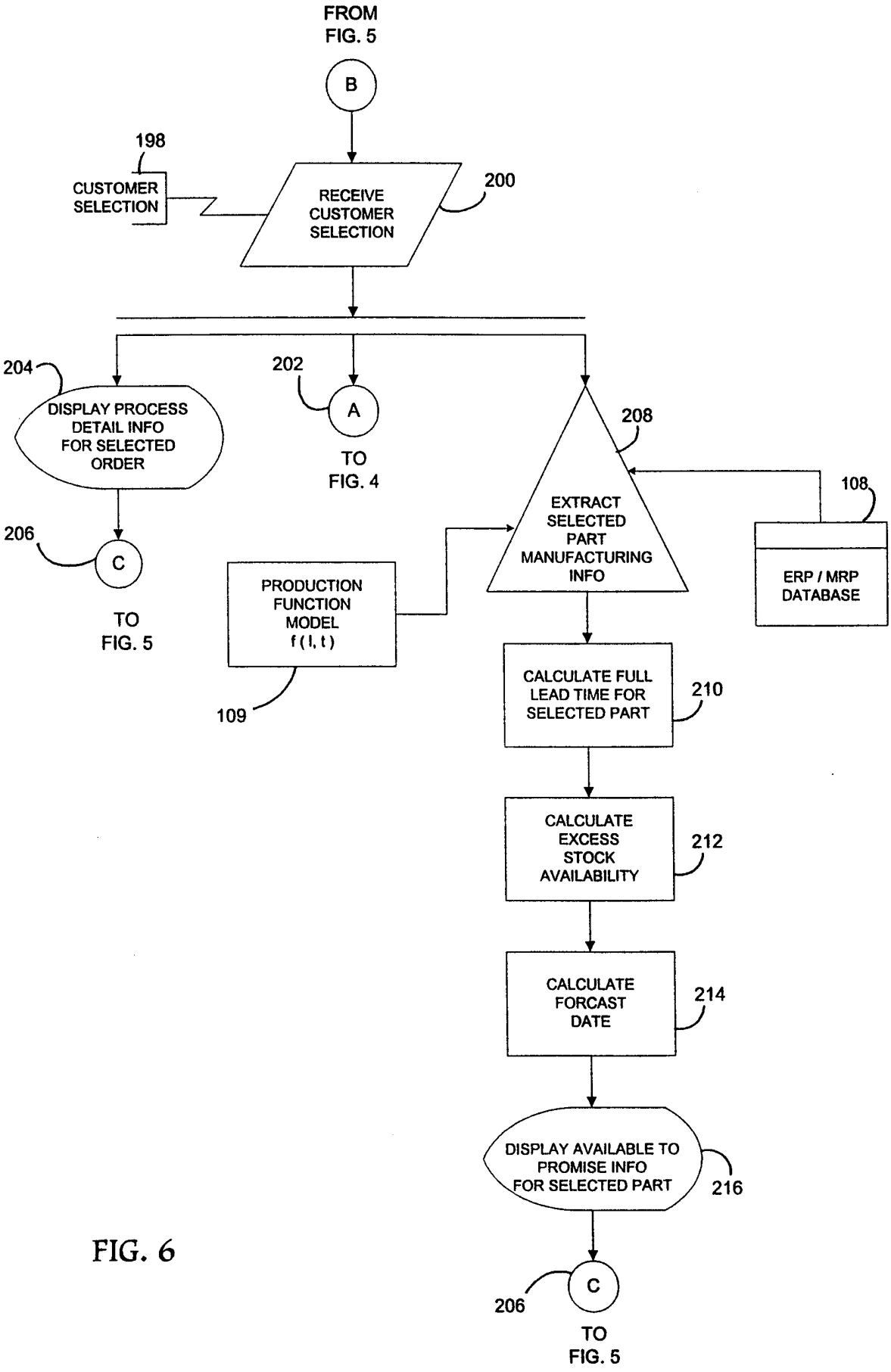

FROM FIG. 5
B
198
CUSTOMER SELECTION
RECEIVE CUSTOMER SELECTION
200
204
DISPLAY PROCESS DETAIL INFO FOR SELECTED ORDER
206
C
TO FIG. 5
202
A
TO FIG. 4
208
EXTRACT SELECTED PART MANUFACTURING INFO
108
ERP / MRP DATABASE
PRODUCTION FUNCTION MODEL f(I, t)
109
CALCULATE FULL LEAD TIME FOR SELECTED PART
210
CALCULATE EXCESS STOCK AVAILABILITY
212
CALCULATE FORCAST DATE
214
DISPLAY AVAILABLE TO PROMISE INFO FOR SELECTED PART
216
206
C
TO FIG. 5

FIG. 6

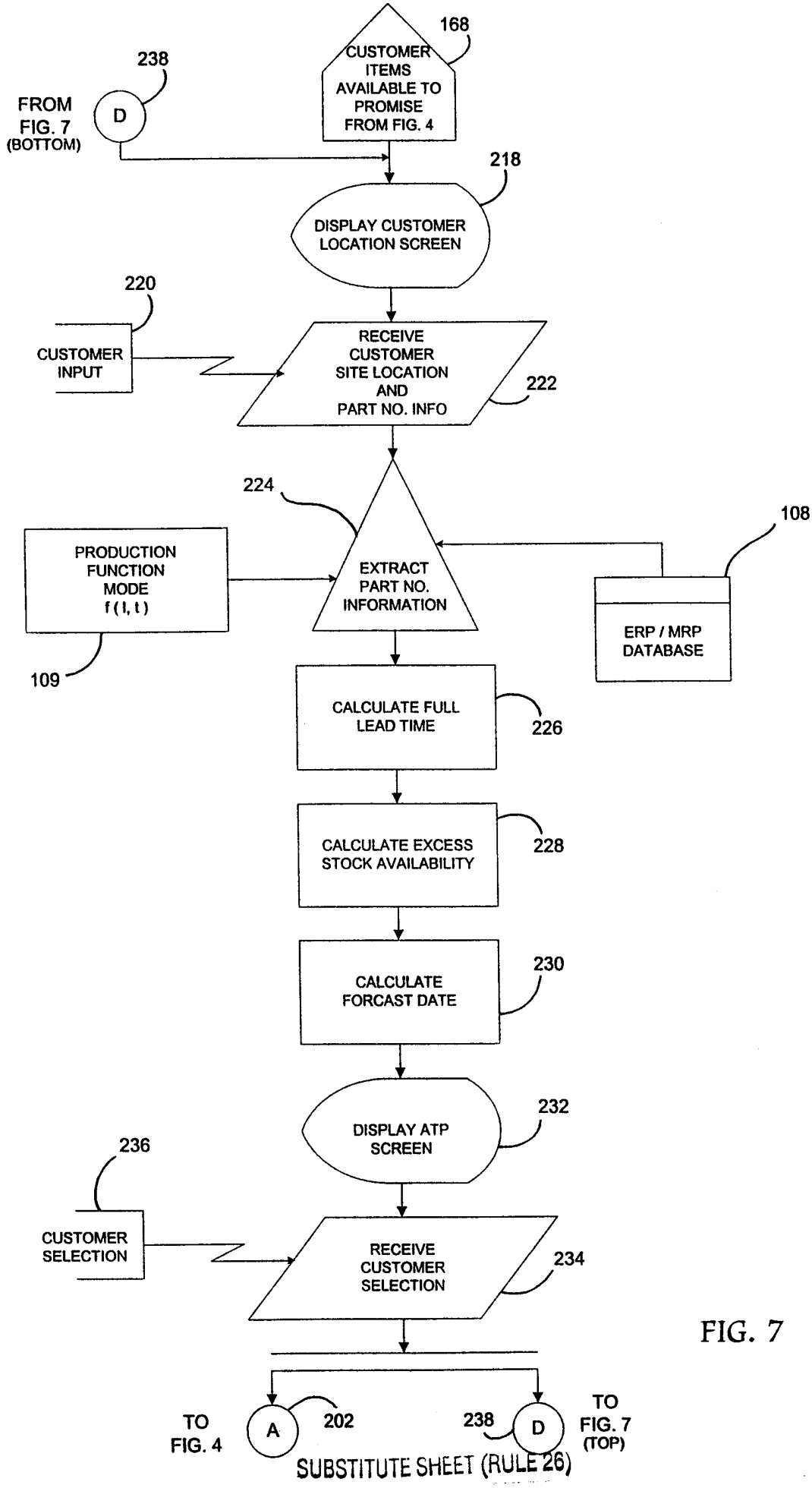

168
CUSTOMER ITEMS AVAILABLE TO PROMISE FROM FIG. 4
238
FROM FIG. 7 (BOTTOM)
D
218
DISPLAY CUSTOMER LOCATION SCREEN
220
CUSTOMER INPUT
RECEIVE CUSTOMER SITE LOCATION AND PART NO. INFO
222
224
PRODUCTION FUNCTION MODE f(I, t)
109
EXTRACT PART NO. INFORMATION
108
ERP / MRP DATABASE
CALCULATE FULL LEAD TIME
226
CALCULATE EXCESS STOCK AVAILABILITY
228
CALCULATE FORCAST DATE
230
DISPLAY ATP SCREEN
232
236
CUSTOMER SELECTION
RECEIVE CUSTOMER SELECTION
234
TO FIG. 4
A
202
238
D
TO FIG. 7 (TOP)

FIG. 7

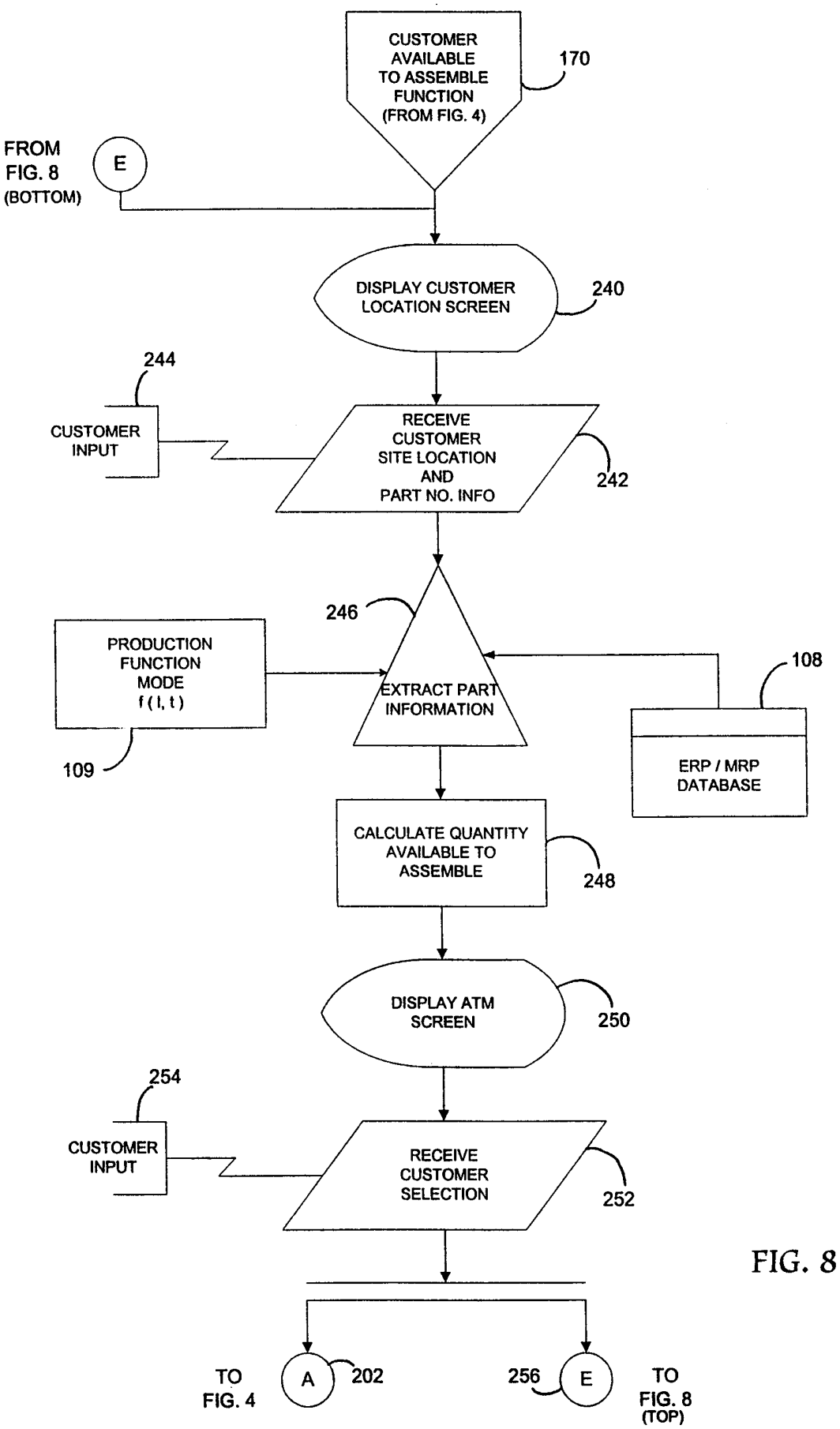

CUSTOMER AVAILABLE TO ASSEMBLE FUNCTION (FROM FIG. 4)
170
FROM FIG. 8 (BOTTOM)
E
DISPLAY CUSTOMER LOCATION SCREEN
240
244
CUSTOMER INPUT
RECEIVE CUSTOMER SITE LOCATION AND PART NO. INFO
242
246
PRODUCTION FUNCTION MODE f(I, t)
109
EXTRACT PART INFORMATION
108
ERP / MRP DATABASE
CALCULATE QUANTITY AVAILABLE TO ASSEMBLE
248
DISPLAY ATM SCREEN
250
254
CUSTOMER INPUT
RECEIVE CUSTOMER SELECTION
252
TO FIG. 4
A
202
256
E
TO FIG. 8 (TOP)

FIG. 8

192

PROBABILITY INDEX TABLE (WIP)			
SEQUENCE	START	END	PROBABILITY
001	.001	.100	100.00
.	.	.	.
.	.	.	.
.	.	.	.
N	1.001	999.000	1.00

FIG. 9

186

PROBABILITY INDEX TABLE (RAW)			
SEQUENCE	START	END	PROBABILITY
001	1.000	2.000	99.000
.	.	.	.
.	.	.	.
.	.	.	.
N	13.000	999.000	1.00

FIG. 10

FIG. 11

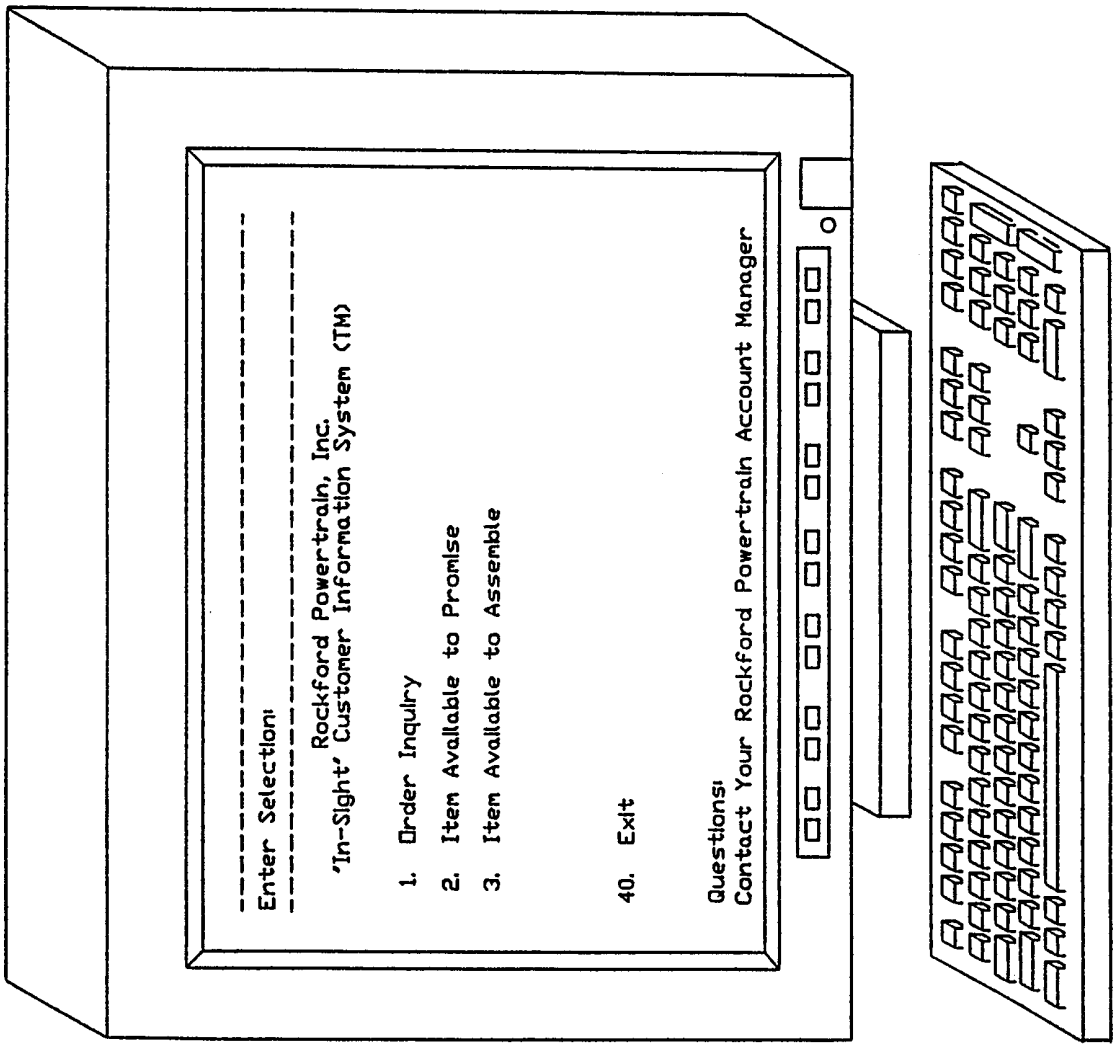

Enter Selection:
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
1. Order Inquiry
2. Item Available to Promise
3. Item Available to Assemble
40. Exit
Questions:
Contact Your Rockford Powertrain Account Manager

FIG. 12

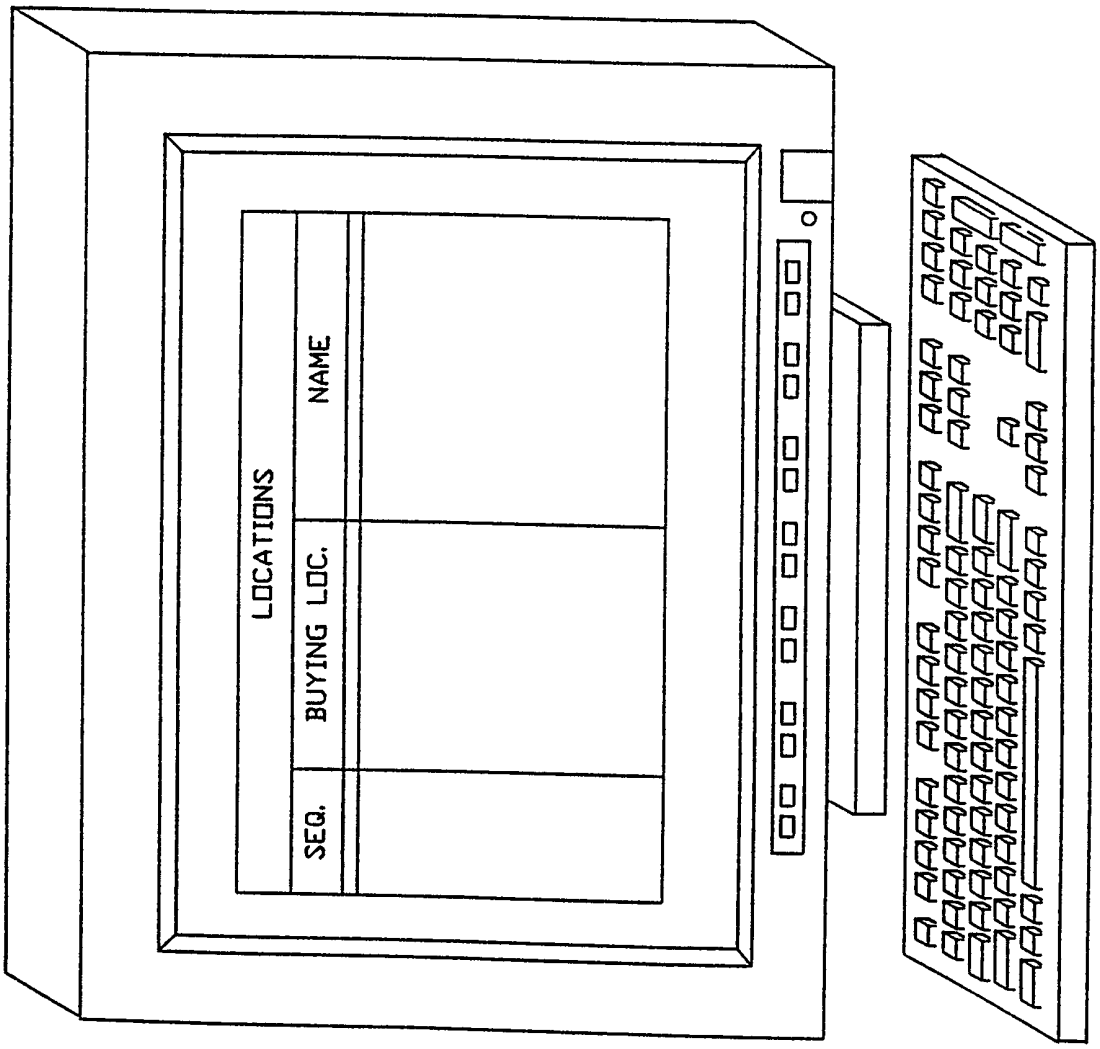


FIG. 13

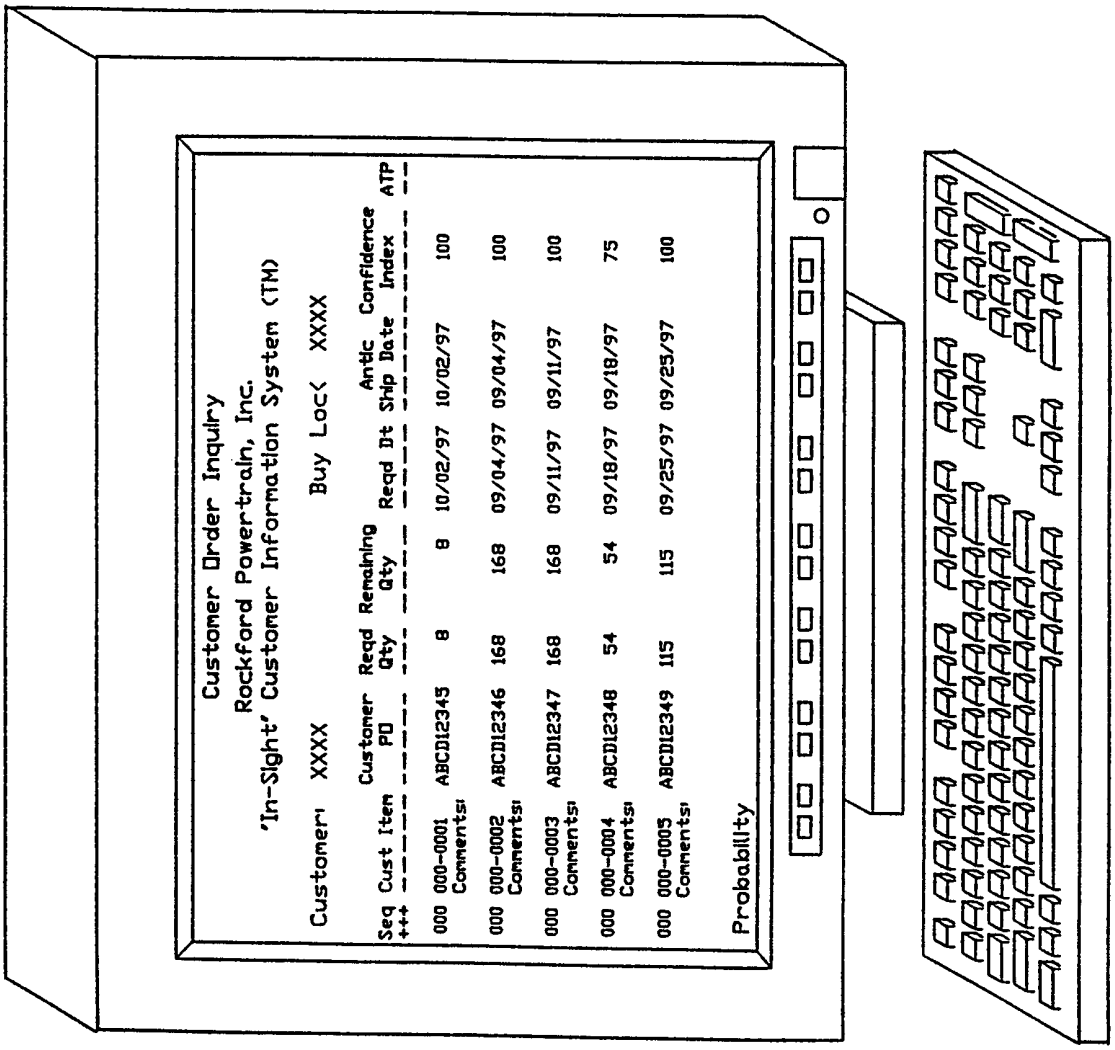

Customer Order Inquiry
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
Customer: XXXX Buy Lock XXXX
Seq Cust Item Customer PO Reqd Qty Remaining Qty Reqd Dt Antic Ship Date Confidence Index ATP
000 000-0001 ABCD12345 8 8 10/02/97 10/02/97 100
Comments:
000 000-0002 ABCD12346 168 168 09/04/97 09/04/97 100
Comments:
000 000-0003 ABCD12347 168 168 09/11/97 09/11/97 100
Comments:
000 000-0004 ABCD12348 54 54 09/18/97 09/18/97 75
Comments:
000 000-0005 ABCD12349 115 115 09/25/97 09/25/97 100
Comments:
Probability

FIG. 14

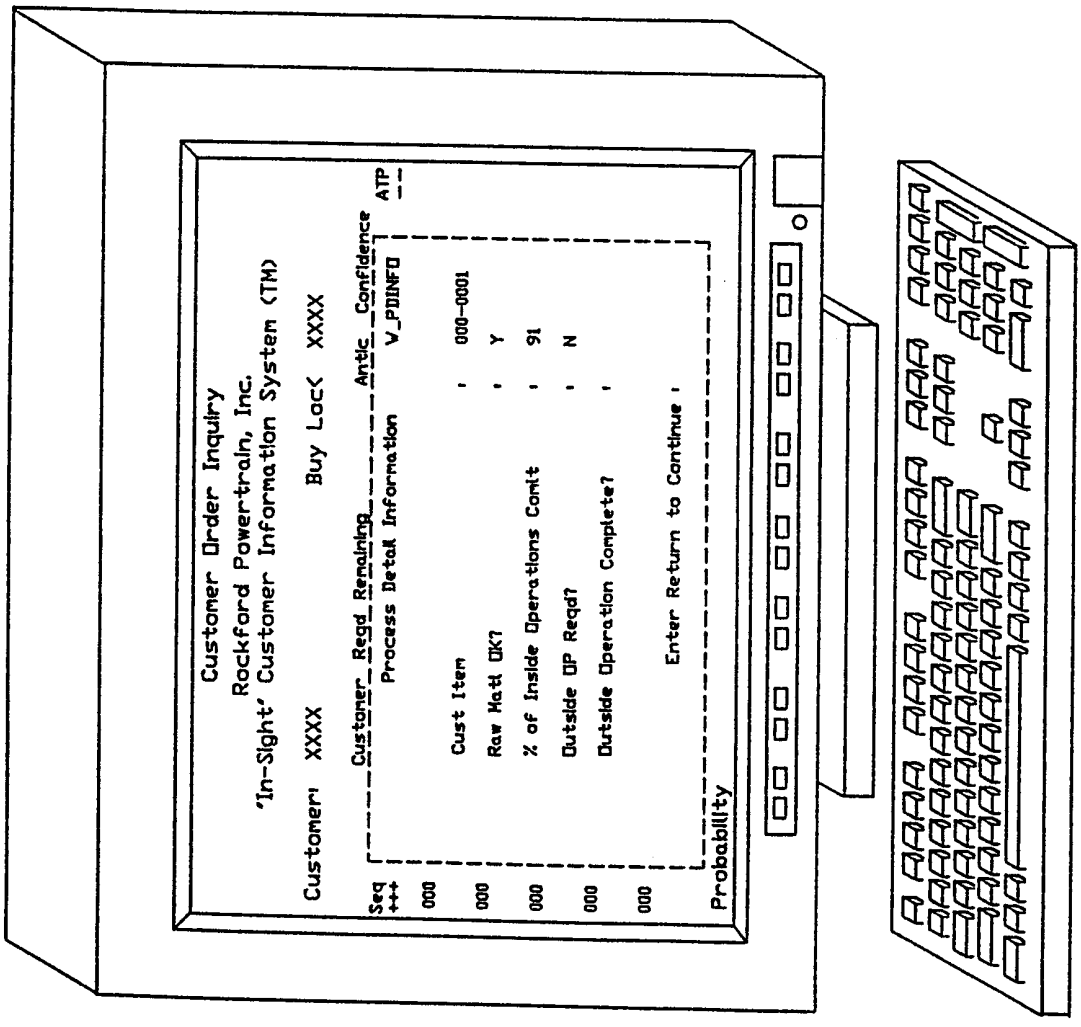
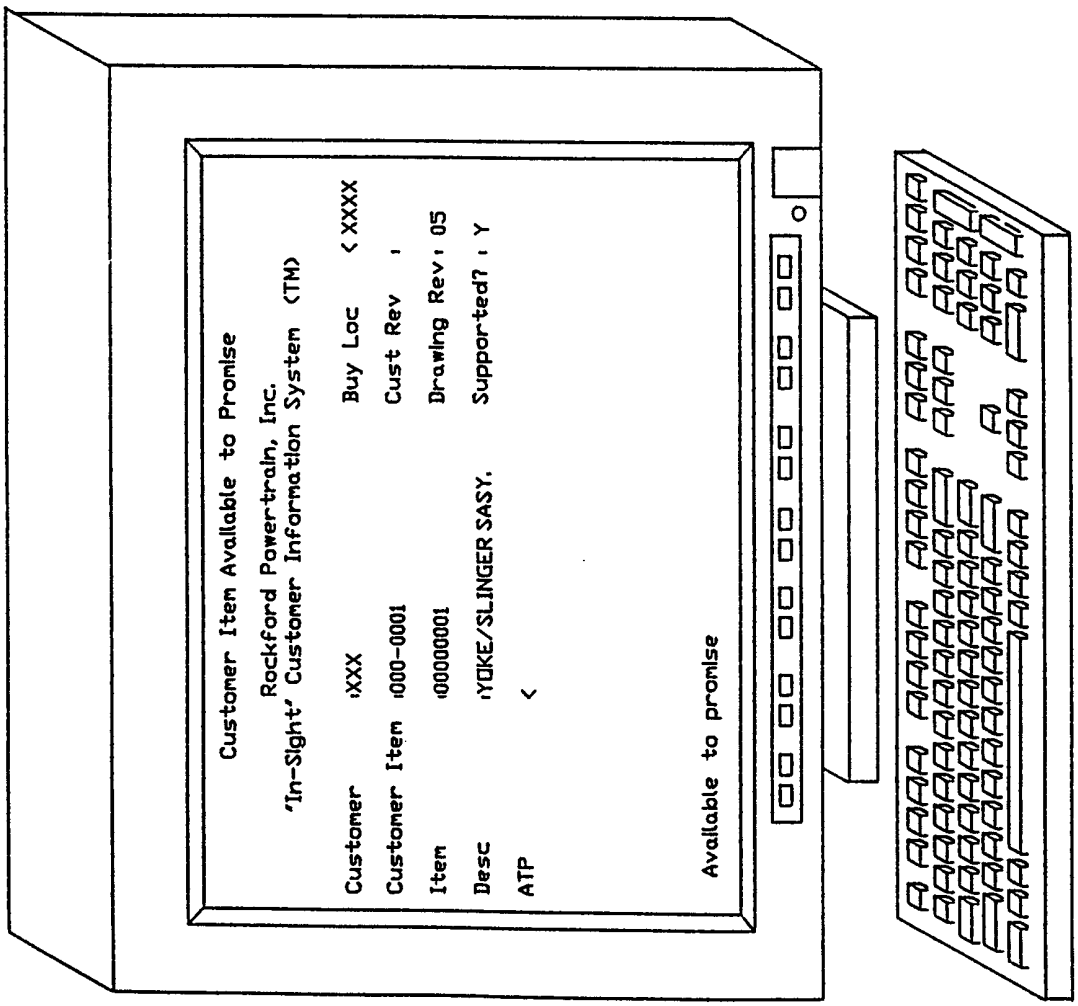

Customer Order Inquiry
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
Customer: XXXX Buy Lot< XXXX
Customer Reqd Remaining Antic Confidence
Process Detail Information V_PDINFO
ATP
Seq
+++
000 Cust Item 000-0001
000 Raw Matl OK? Y
000 % of Inside Operations Cmlt 91
000 Outside OP Reqd? N
000 Outside Operation Complete?
Enter Return to Continue
Probability

FIG. 15


Customer Item Available to Promise
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
Customer :XXX Buy Loc < XXXX
Customer Item :000-0001 Cust Rev :
Item :00000001 Drawing Rev: 05
Desc :YOKE/SLINGER SASY. Supported? : Y
ATP <
Available to promise

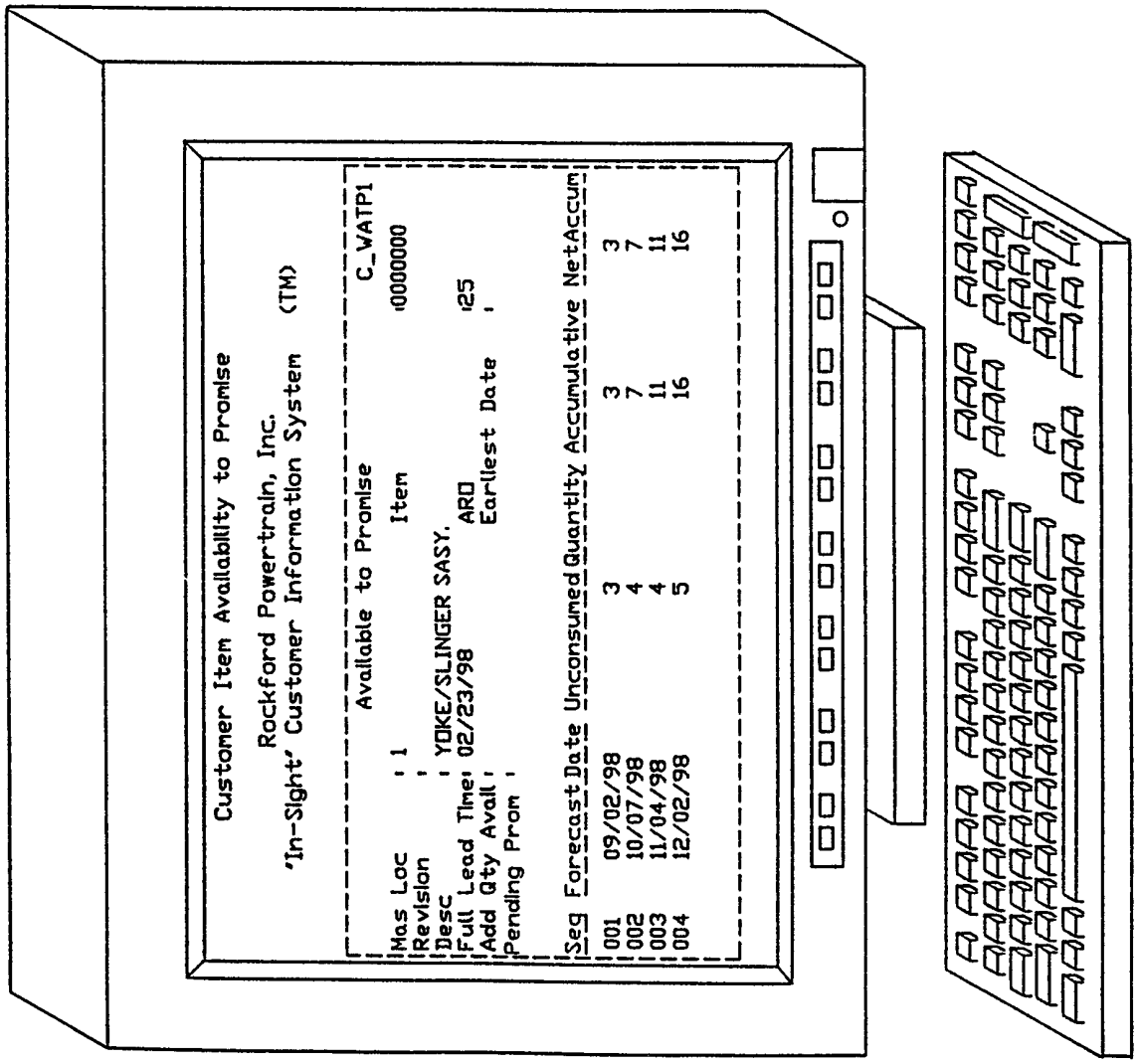

Customer Item Availability to Promise
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
Available to Promise C_WATP1
Mas Loc : 1 Item 0000000
Revision :
Desc : YOKE/SLINGER SASY.
Full Lead Time: 02/23/98 ARD 25
Add Qty Avail : Earliest Date :
Pending Prom :
Seq Forecast Date Unconsumed Quantity Accumulative NetAccum
001 09/02/98 3 3 3
002 10/07/98 4 7 7
003 11/04/98 4 11 11
004 12/02/98 5 16 16

FIG. 16

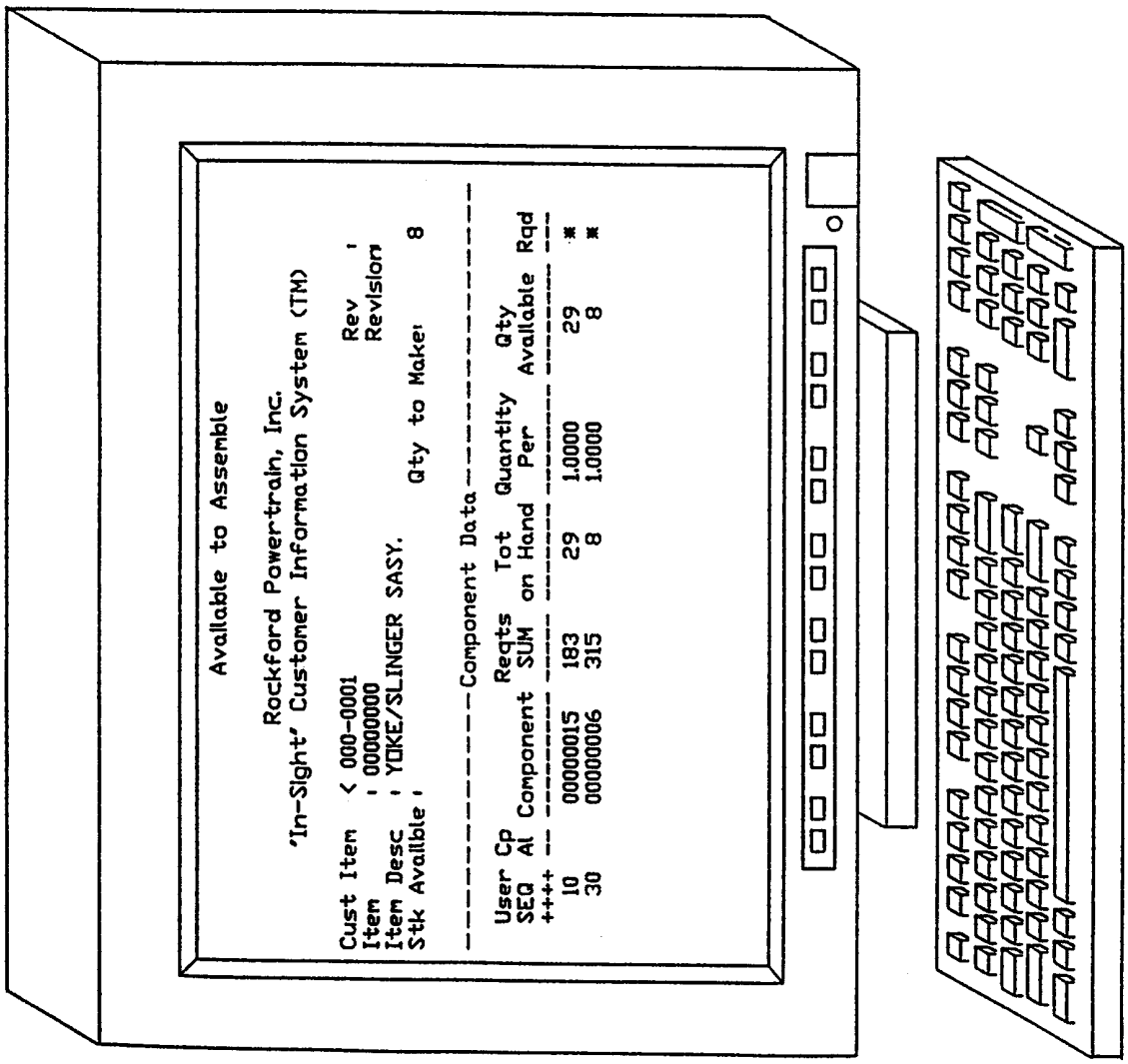

Available to Assemble
Rockford Powertrain, Inc.
'In-Sight' Customer Information System (TM)
Cust Item < 000-0001 Rev '
Item ' 00000000 Revision
Item Desc ' YOKE/SLINGER SASY. Qty to Make: 8
Stk Available '
Component Data
User Cp Reqts Tot Quantity Qty
SEQ Al Component SUM on Hand Per Available Rqd
10 00000015 183 29 1.0000 29 *
30 00000006 315 8 1.0000 8 *

FIG. 17