United States Patent [19]

Levy

[11] **3,810,627**

[45] **May 14, 1974**

[54] **DATA-PROCESSING SYSTEM FOR DETERMINING GAINS AND LOSSES FROM BETS**

[76] Inventor: **David Levy**, 230 W. 54th St., New York, N.Y. 10019

[22] Filed: **Apr. 2, 1970**

[21] Appl. No.: **25,227**

Related U.S. Application Data

[62] Continuation-in-part of Ser. No. 699,509, Jan. 22, 1968, abandoned.

[52] **U.S. Cl.**..... **273/138 A**, 235/92 GA, 235/92 TA, 273/142 D, 340/172.5, 340/323

[51] **Int. Cl.**..... **A63b 71/06**

[58] **Field of Search**..... 235/92 GA, 92 TA, 92 TS, 235/92 TP; 340/323, 334, 337, 172.5; 273/138 A, 143 R, 143 A, 143 B, 143 C, 143 D, 143 E, 118 A, 119 A, 120 A, 121 A, 122 A, 123 A, 124 A, 125 A

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[57] **ABSTRACT**

In an establishment in which wagers are placed on the outcome of a fortuitous event, such as the roll of a pair of dice, the spin of a roulette wheel, the result of a horse race, or the like, a player operates a remote selector panel on which a register displays a previously established credit balance. Bets on the event are made from the panel by wagering any amount up to the limit of the credit balance. The amount wagered is automatically deducted from the credit balance, and in the event of a win the amount wagered is multiplied by a predetermined odds factor for the event and added to the credit balance.

21 Claims, 17 Drawing Figures

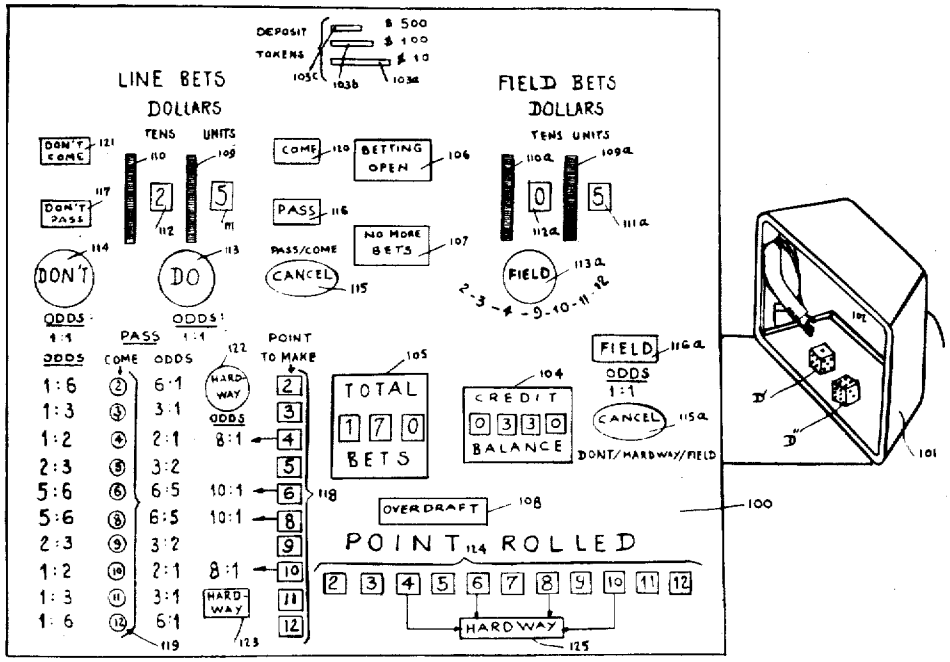
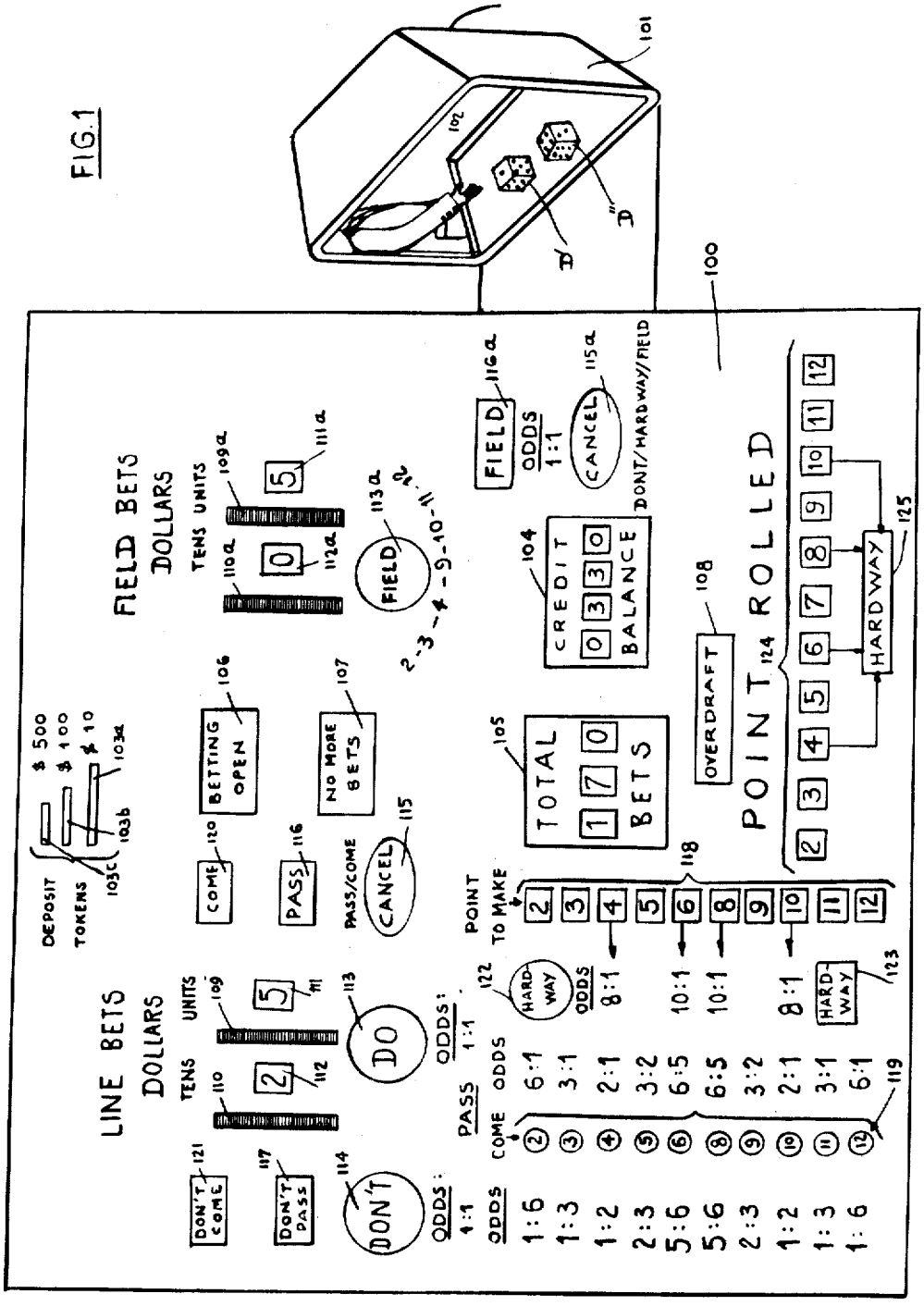


FIG. 1



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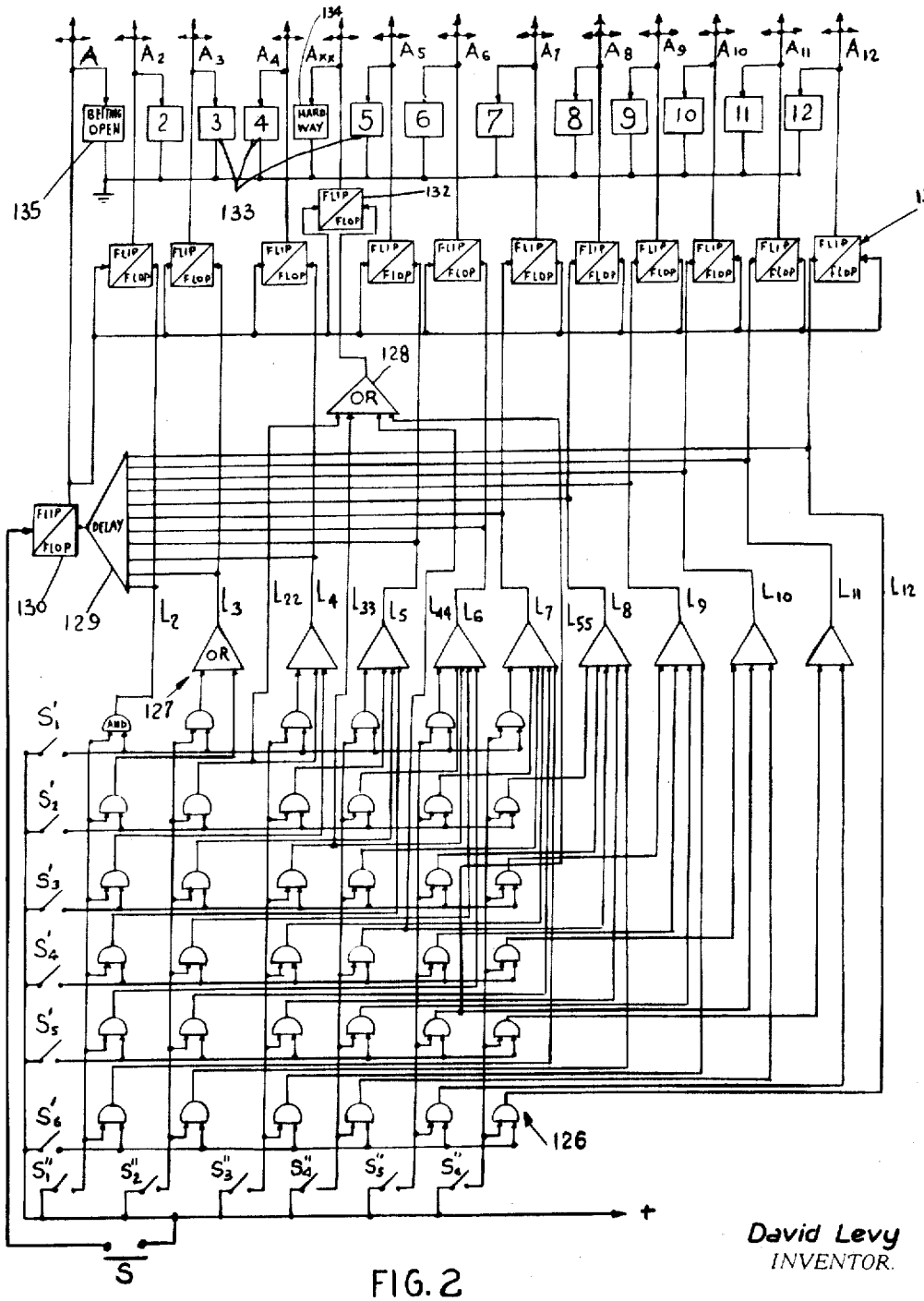


FIG. 2

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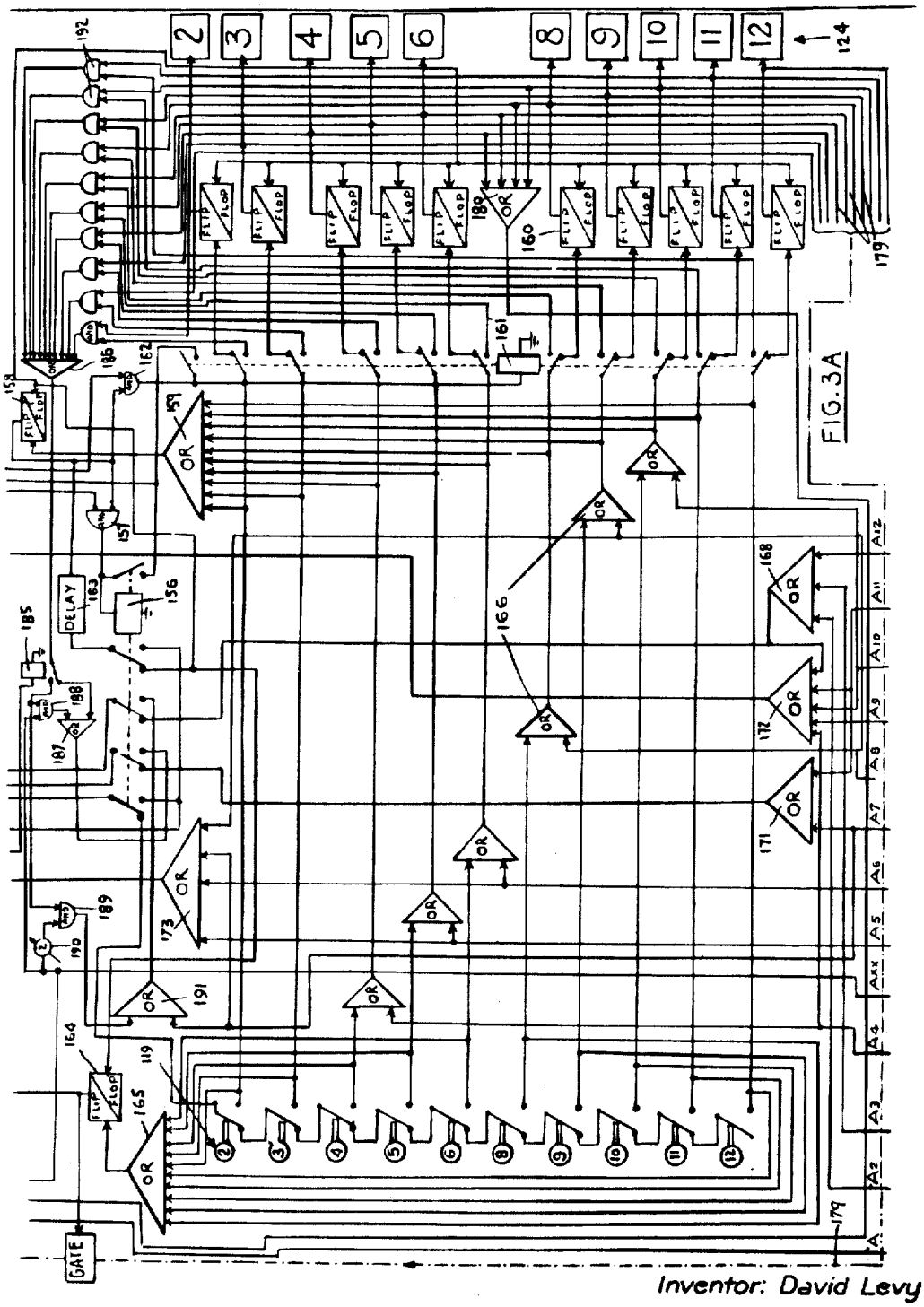


FIG. 3A

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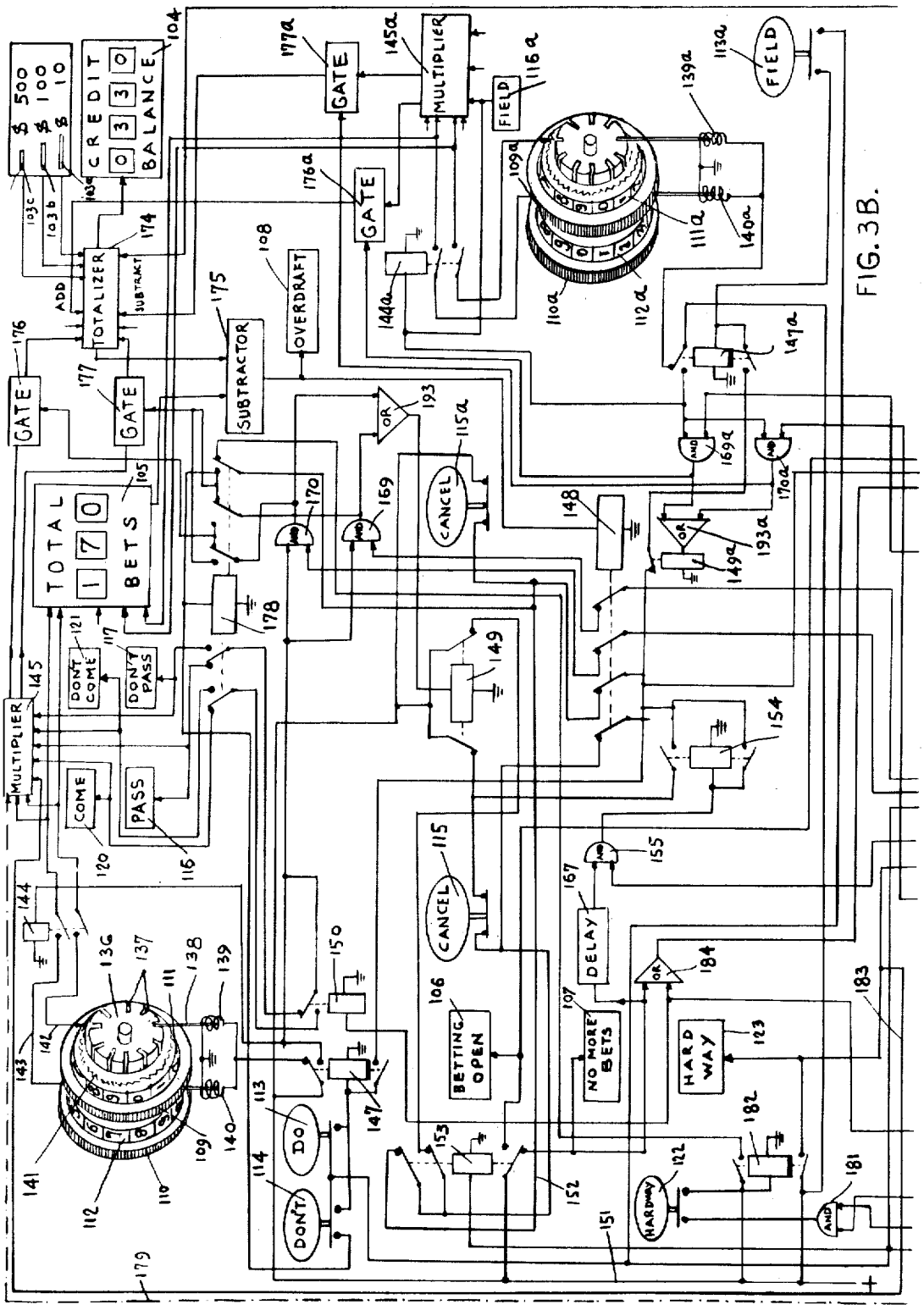

$ 500
$ 100
$ 10
CREDIT BALANCE
0 3 3 0
TOTAL BETS
1 7 0
TOTALIZER
ADD
SUBTRACT
SUBTRACTOR
OVERDRAFT
GATE
MULTIPLIER
FIELD
OR
AND
CANCEL
DELAY
NO MORE BETS
BETTING OPEN
HARD WAY
DON'T COME
DON'T PASS
COME
PASS
DO
DON'T
HARDWAY

FIG. 3B.

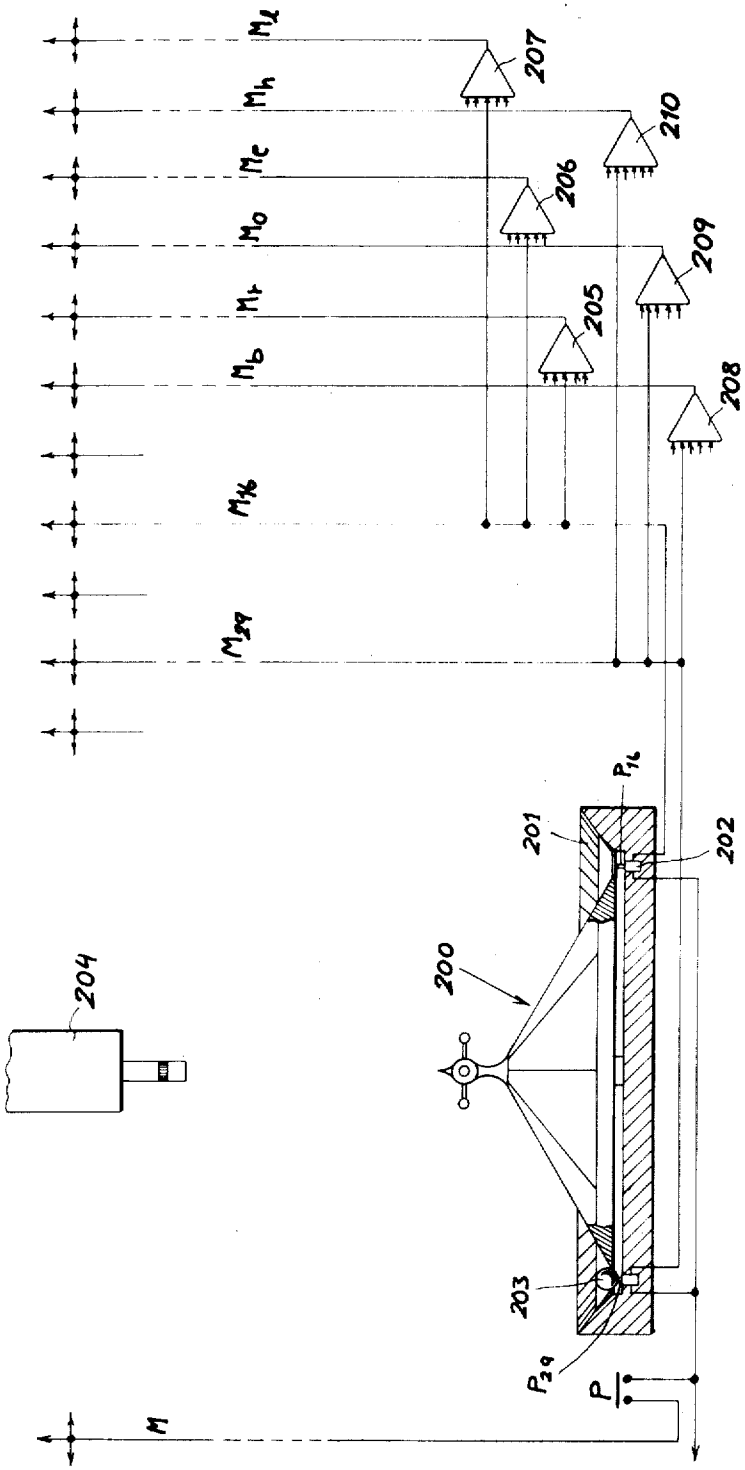


Fig. 4

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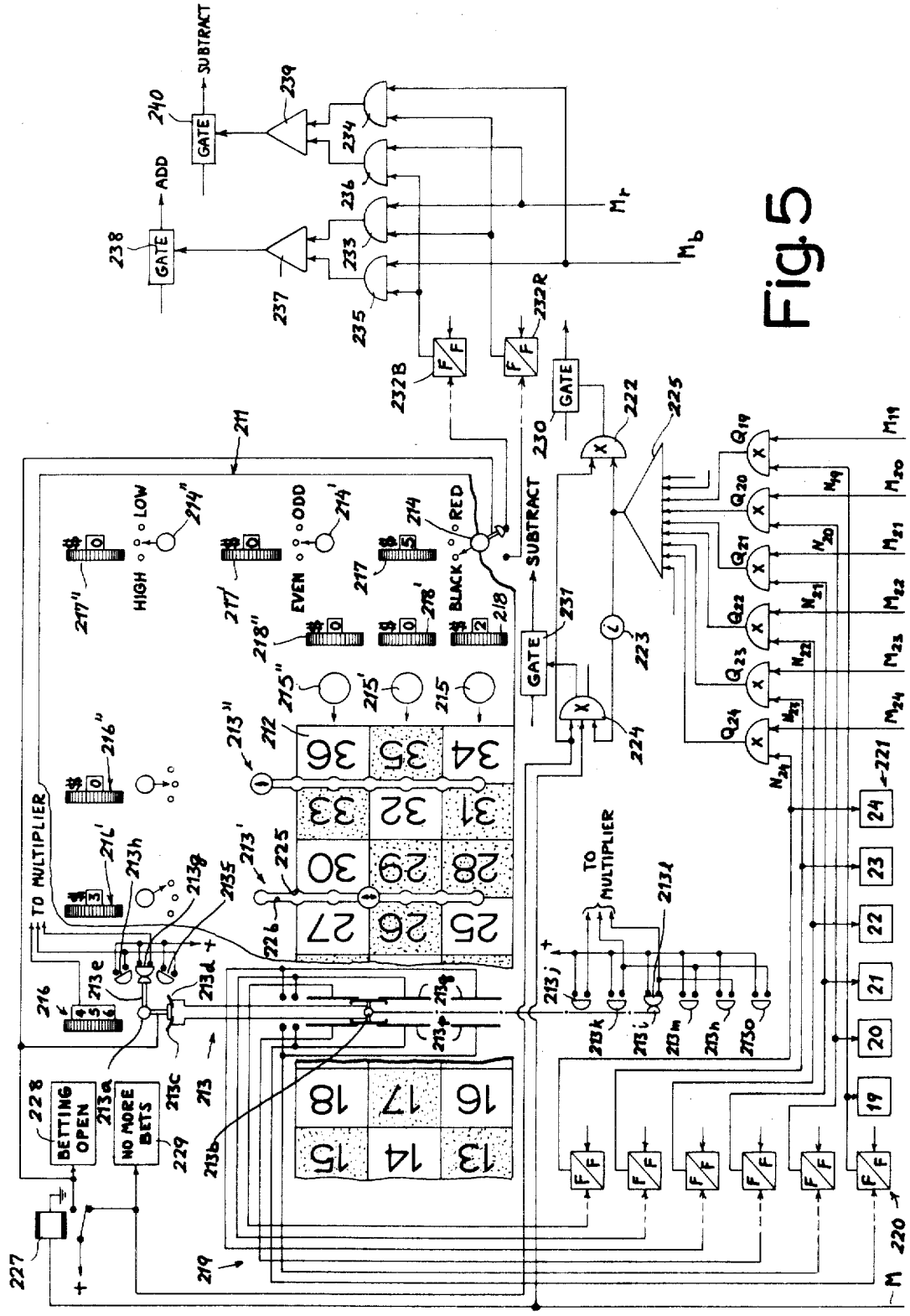

SUBTRACT
ADD
GATE
TO MULTIPLIER
BETTING OPEN
NO MORE BETS
HIGH
LOW
EVEN
ODD
RED
BLACK

Fig.5

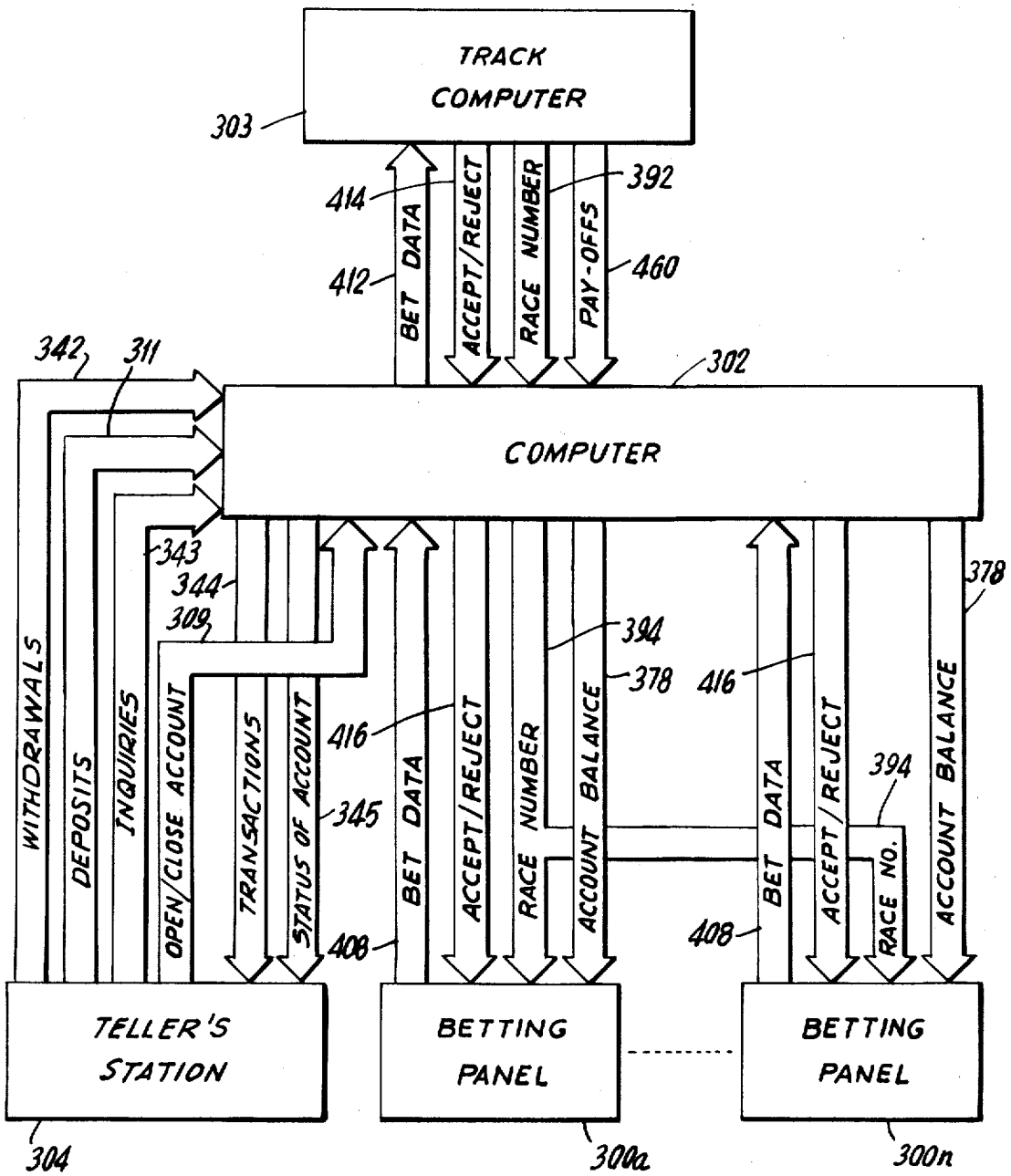


FIG. 6

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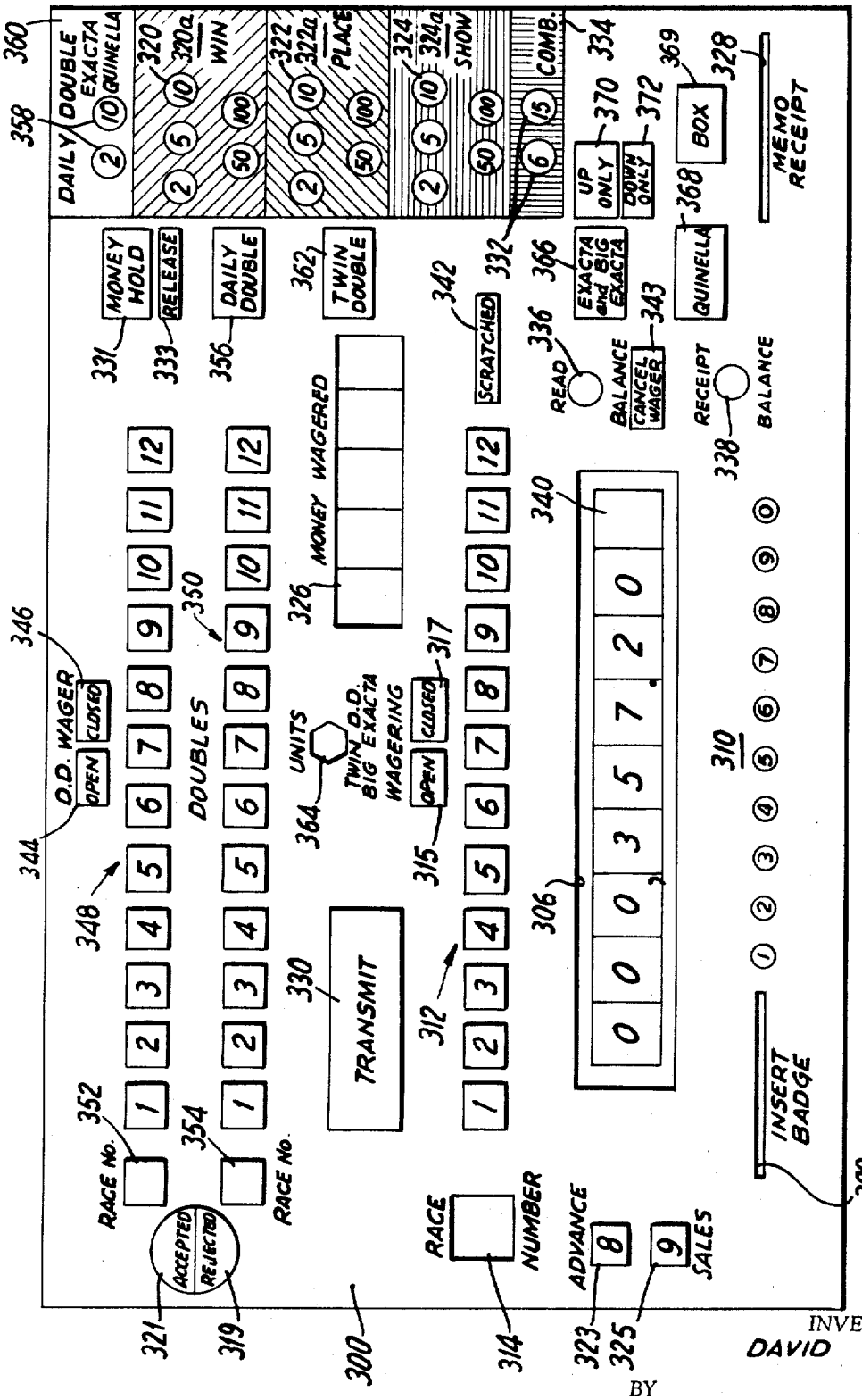


FIG. 7

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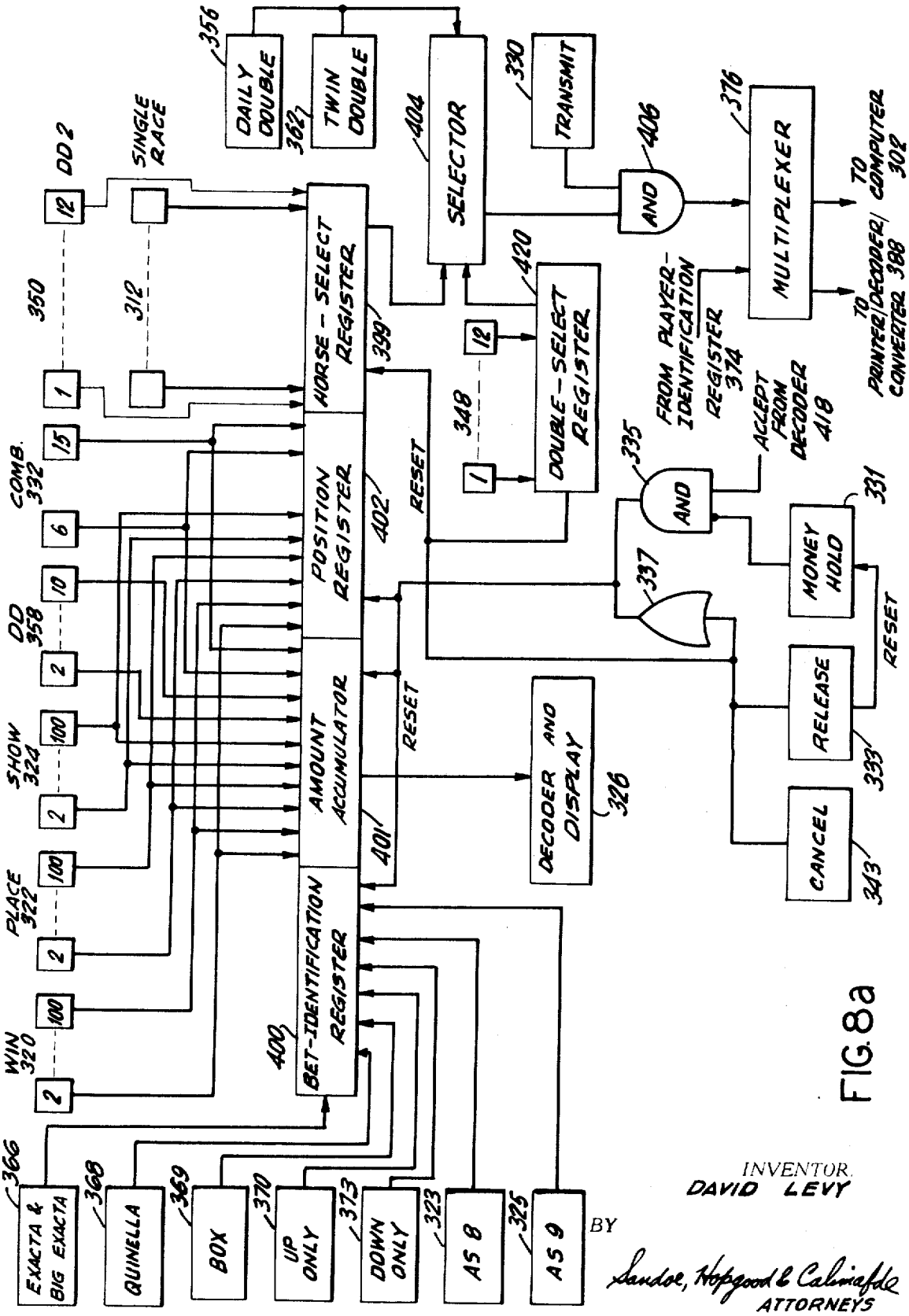


FIG. 8a

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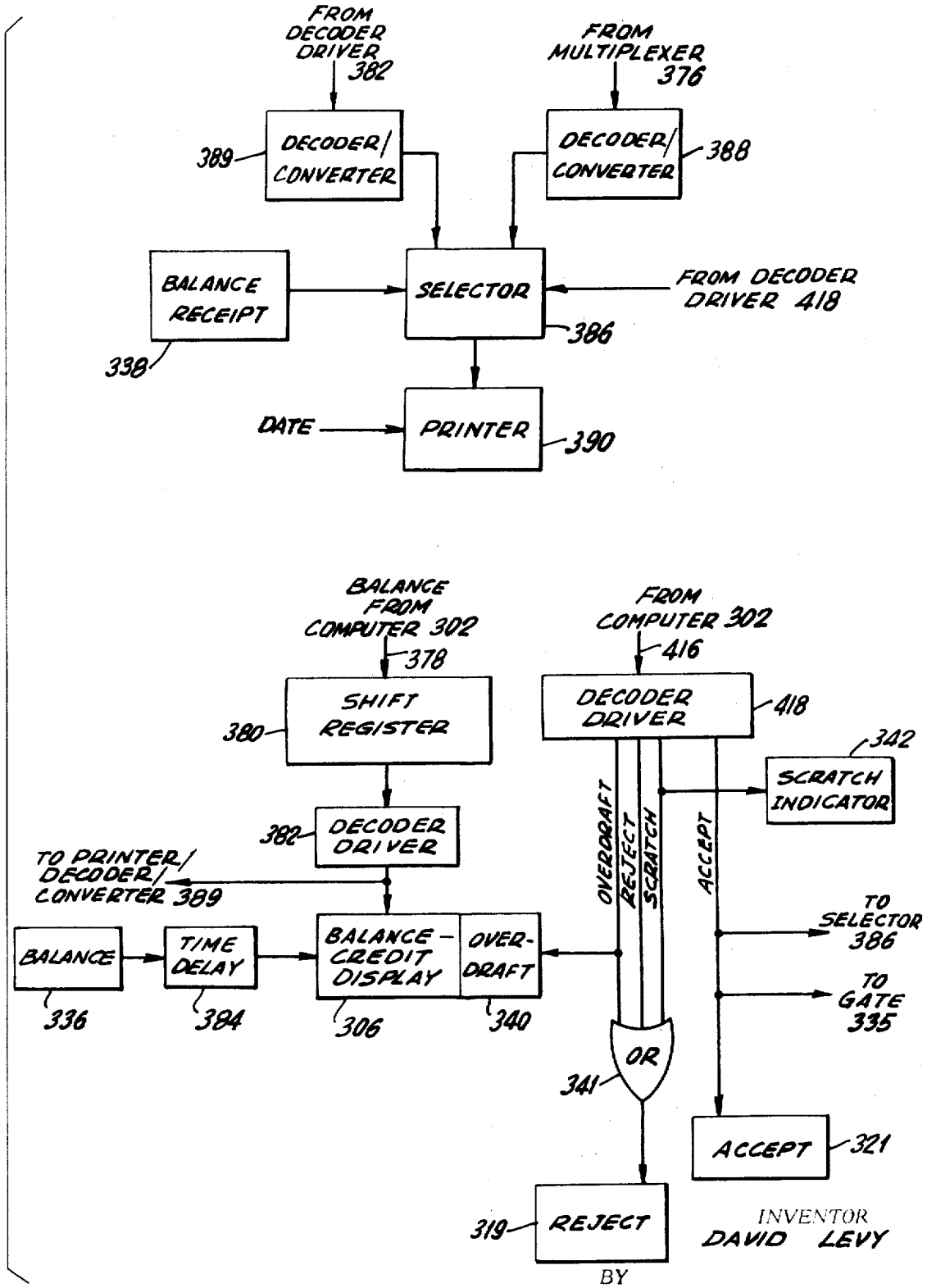

FROM DECODER DRIVER
382
FROM MULTIPLEXER
376
389
DECODER/ CONVERTER
DECODER/ CONVERTER
388
BALANCE RECEIPT
338
SELECTOR
386
FROM DECODER DRIVER 418
DATE
PRINTER
390
BALANCE FROM COMPUTER 302
378
FROM COMPUTER 302
416
SHIFT REGISTER
380
DECODER DRIVER
418
342
SCRATCH INDICATOR
382
DECODER DRIVER
TO PRINTER/ DECODER/ CONVERTER 389
OVERDRAFT
REJECT
SCRATCH
ACCEPT
TO SELECTOR 386
BALANCE
TIME DELAY
BALANCE - CREDIT DISPLAY
OVER-DRAFT
TO GATE 335
336
384
306
340
OR
341
ACCEPT
321
REJECT
319
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FIG. 8b

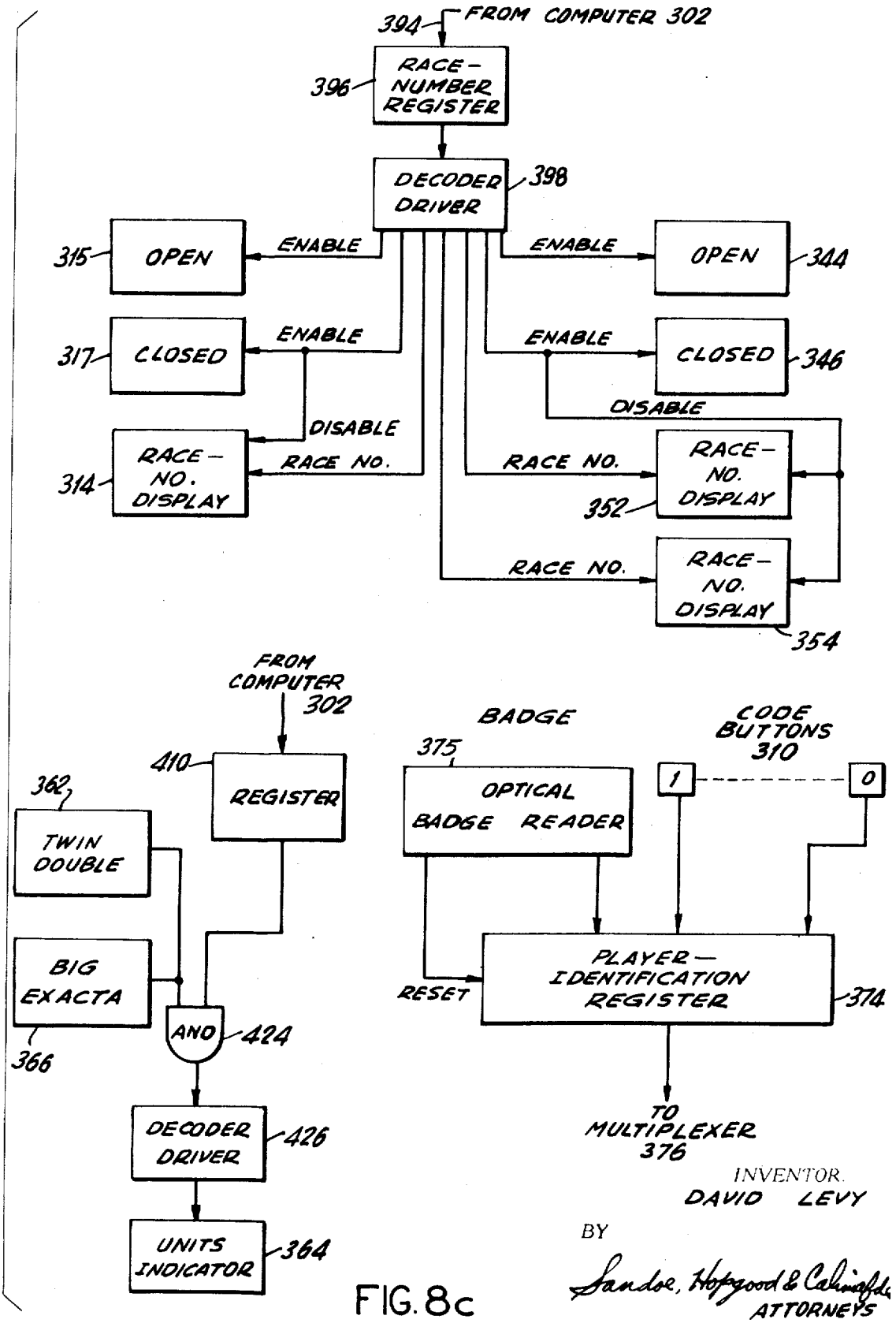


FIG. 8c

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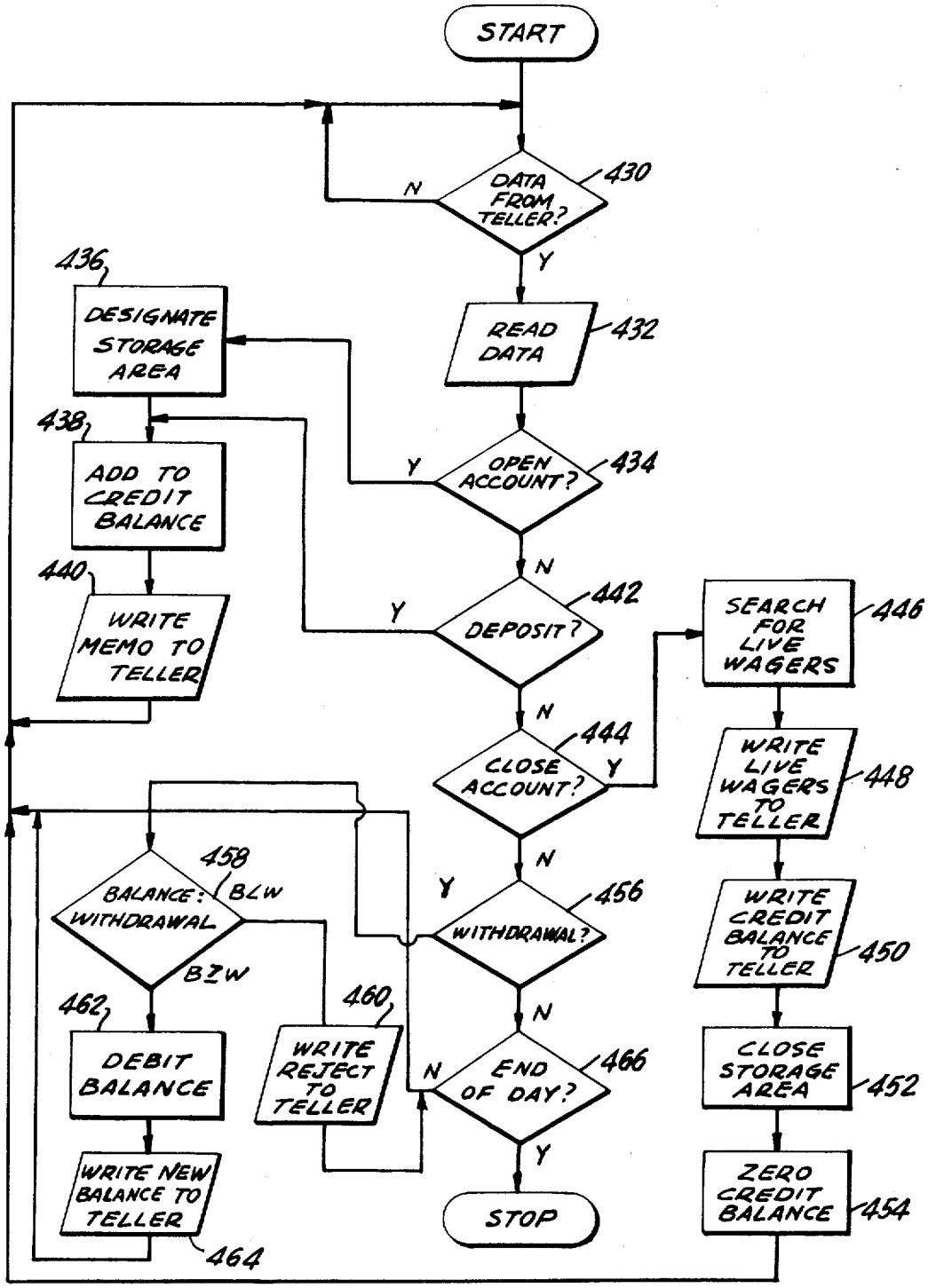


FIG.9a

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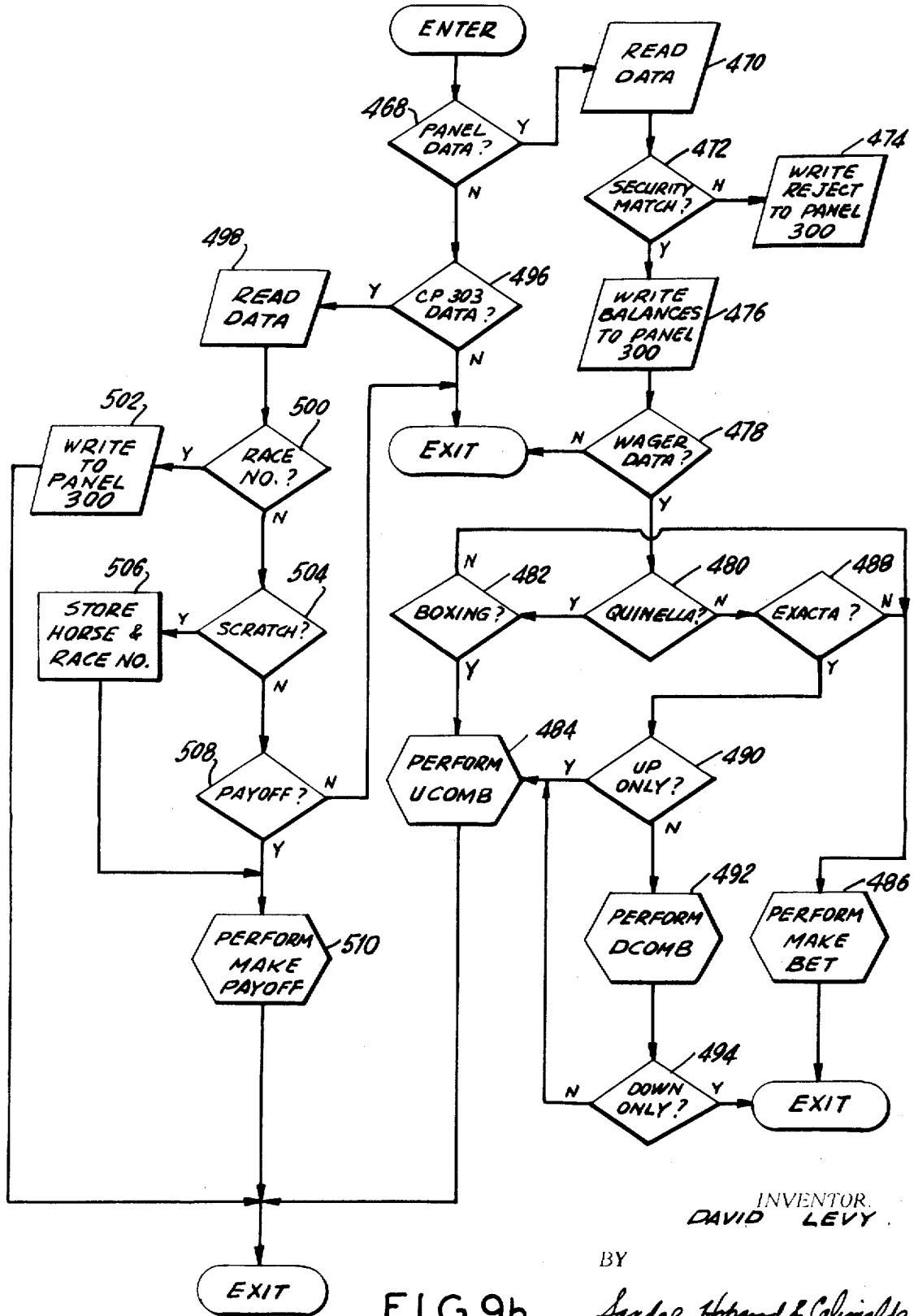


FIG.9b

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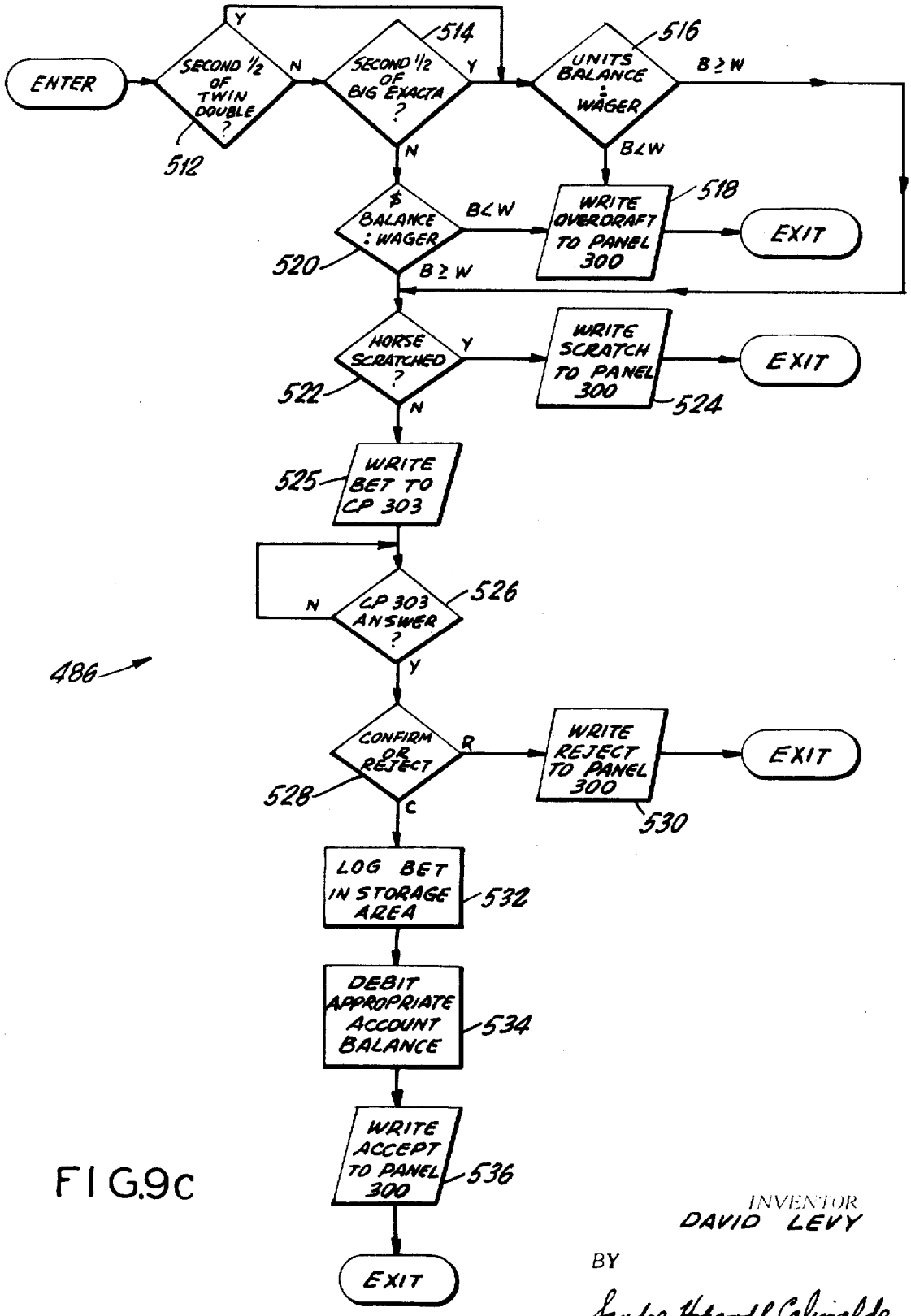


FIG.9c

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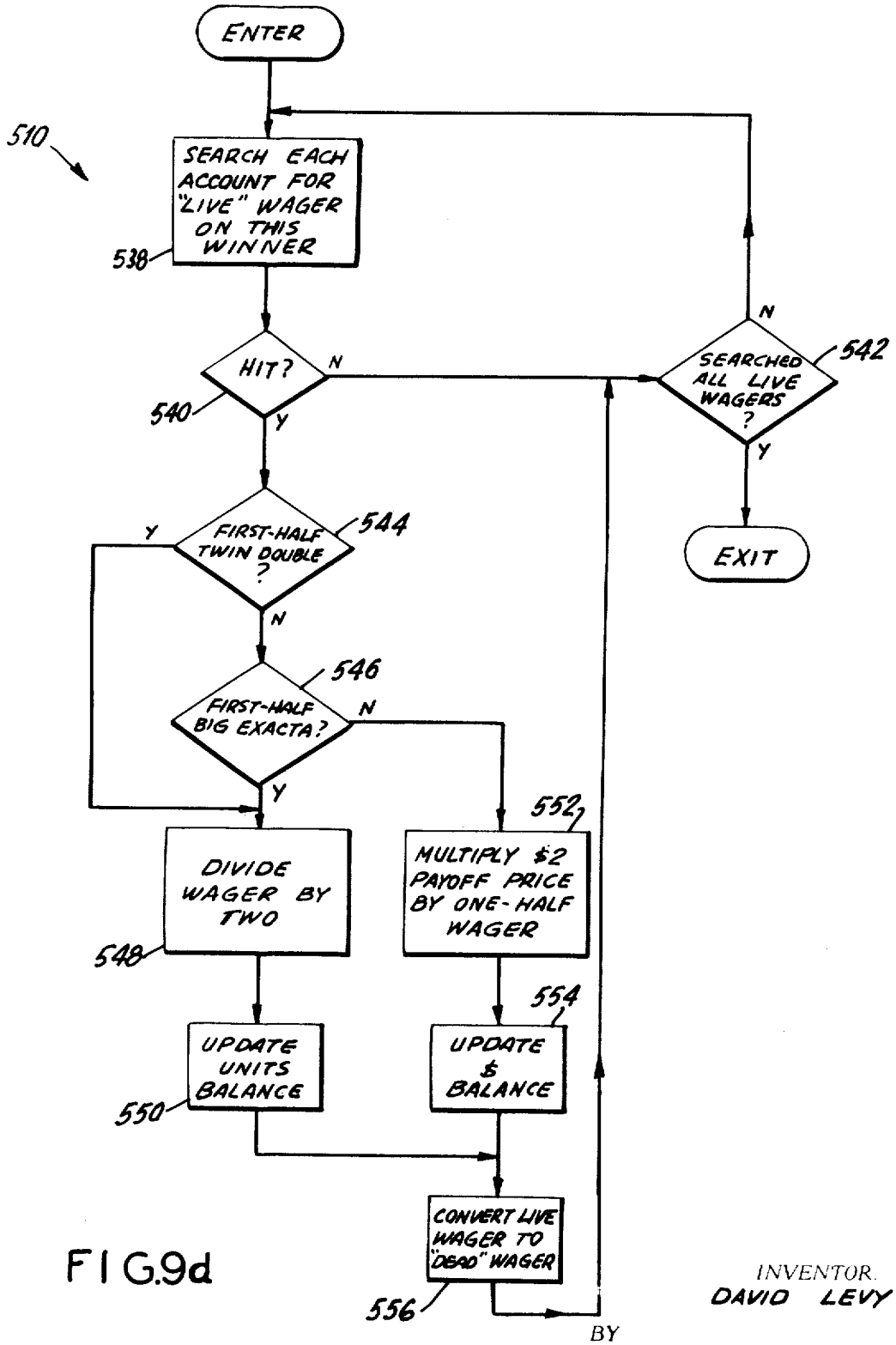


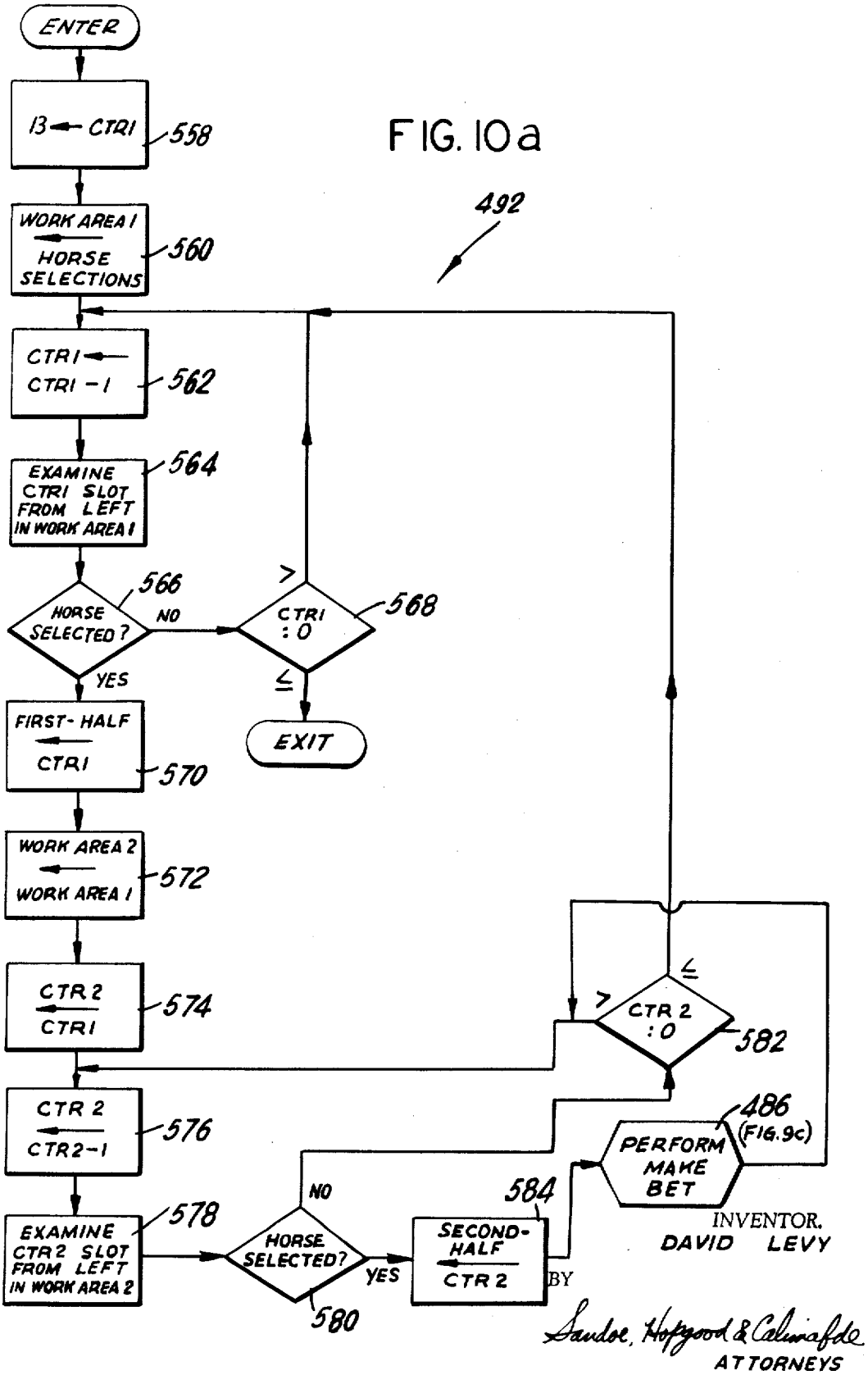
FIG.9d

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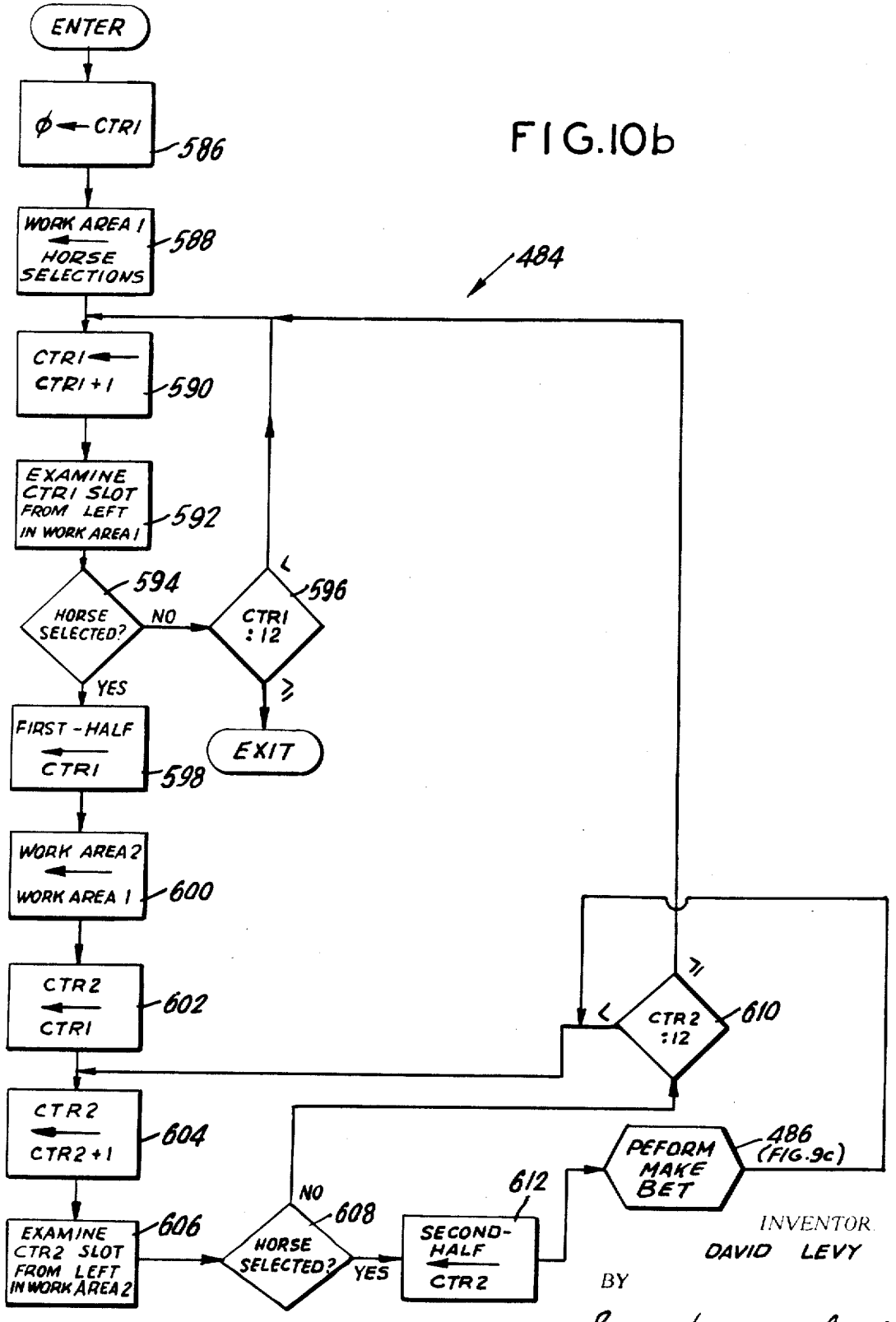
FIG. 10a



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FIG.10b



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DATA-PROCESSING SYSTEM FOR DETERMINING GAINS AND LOSSES FROM BETS

This is a continuation-in-part of my prior application Ser. No. 699,509, filed Jan. 22, 1968 and now abandoned.

The present invention relates to a data-processing system for placing wagers from a remote location on the outcome of a fortuitous event, such as the rolling of dice, the spinning of a roulette wheel, or the outcome of a horse race, in which means are provided to automatically calculate the results of the wager based on the outcome of the event.

In conventional gambling casinos, the players usually crowd around the dealer, croupier or banker at a location such as a dice, roulette or card table which shall be referred to hereinafter as a banker's station. The number of participants in any such game of chance is thus limited by the physical dimensions of the table and the room in which it stands. Also, in a game in which the players may place bets subject to widely differing odds, the presence of a large number of participants complicates the proceedings and may give rise to errors in paying off the winners.

Wagers on the outcome of horse races are placed at parimutuel windows at race tracks. Prior to each race the player stands on line at the appropriate seller's window at which tickets for specified denominations of money and selected positions are sold for each race. Thus to place a $10 bet on a horse to "win", the player must stand on the $10 win line, and to make a different bet as to amount and/or position the player must then go to the end of a different line. If the player is successful in his wager he must eventually return to a different cashier's window to collect his winnings. Each cashier only pays off for a specified amount and finishing position so that a player successful on more than one bet on a given race must stand at a corresponding number of cashier's windows at the end of that race.

Tickets for wagers on a race are usually sold only after the previous race on the track program has been completed and prior to the running of the race on which the wagers are to be made. Except for some tracks in which wagers may be made in advance on the last two races of the day's program, betting tickets may not be purchased for any race on the program other than the immediately succeeding race with the exception of certain special races, such as Exacta or Quinella, in which the wagering is usually opened two races prior to the special race. As a result the player is required to stand on what is often a long line to place his bets on a race, and must repeat this process for each race on which he wishes to place his wager. If the player wishes to place wagers of different denominations on different horses in a single race, or make a win wager on one horse or a place and/or show wager on that horse or another horse running in that race, he must stand on a number of lines all before the race begins and the taking of wagers is terminated.

The need for repeatedly standing on long lines is an annoying and often frustrating experience for many players and needlessly diminishes some of the pleasures to be obtained at the track, and in fact may occasionally discourage some less dedicated players from placing a wager on a race. The sophisticated player usually prefers to wait until the last possible moment to place his wager, as this additional time gives him the opportunity of noticing any changes in the odds (which occur continually until the betting is closed) and allows the player to view the horses as they enter the track. Thus as the time for the closing of bets nears, the waiting lines at the betting windows often grow longer and many players are often unable to reach the window in time to place their wagers. Moreover, the sellers at the ticket windows often rush to complete the taking of wagers before the start of the next race. This need for haste may cause human error resulting in the possible loss of revenue to the track, or in the issuing of an incorrect ticket to the great annoyance and inconvenience to the player and an adverse effect on the management of the track. Moreover, a player, particularly one who has had a successful day at the track, often carries large sums of money to and from the track each day that he frequents the track. This presents the possibility of loss or theft of the player's funds and thus further reduces the pleasureful aspects of his attendance of the event.

It is, therefore, the general object of the present invention to provide an improved wagering system, as well as a method of operating same, in which the aforestated disadvantages of the known wagering operations are avoided by an automatic wagering-payoff and credit-balance registration.

It is another object of this invention to provide a wagering system and method allowing for the participation of any number of players at locations remote from the site of an event on whose outcome wagers are to be placed.

It is still another object of the invention to provide a wagering system of the type described in which the need for the player to carry large sums of money to and from the event is significantly reduced, thereby decreasing the chances of loss or theft of those funds.

It is a further object of the present invention to provide a wagering system allowing for increased facility and enjoyment for the player in making a wager, and a reduction in the possibility of error in calculating payoff on the wager.

These objects are realized, pursuant to my invention, by the provision of a selector panel or board individually assigned to each player or groups of players and enabling the player or players to place bets on the outcome of any fortuitous and recurrent event then in progress, such as the aforedescribed gambling operations. An open phase of operation is initially established during which bets may be placed, followed by a closed phase during which a bet just made or left standing is locked up while the event takes its course. The amount of the wager is initially subtracted from the player's previously established credit balance. After the event has taken place, the outcome is signaled to all the panels for automatic determination of the amounts won by the winning players which are then added to their respective credit balances.

In order to qualify for the placement of a bet, a player must first establish a credit balance on a display register disposed on or next to his selector panel, this register being inaccessible to the player (except, possibly, for the purpose of increasing his balance) during the subsequent phases of operation in which the amount displayed is augmented as a result of a winning wager. To register the initial credit balance, the prospective player may make a payment to a banker or to a teller who thereafter presets the register, e.g., by the use of a tool or key or with the aid of a control panel at his

station or by communicating the amount of the initial payment to a computer memory. In accordance with a more particular feature of my invention, however, I prefer to allow each player to register his own initial credit balance by purchasing from the banker a token representing a predetermined cash value, this token being then irretrievably inserted into a slot associated with the register. It should be understood in this connection that the term "token" is to be broadly construed as including not only coin-like disks to be received by a collection box but also special keys, identification credit cards and similar implements which, once inserted and used to set the register, cannot be withdrawn for re-use except by an authorized person; in principle, real coins could also be used. The player, having bought one or more of these tokens, may invest them all at once or may save some of them for later insertion to restore a depleted balance. In any event, the arithmetic unit of each panel will not accept a bet exceeding the available credit balance and, advantageously, will turn on a light or other alarm signal whenever a player attempts to overdraw. If the player's credit balance is sufficient the amount of the wager is reduced immediately upon the registering of the wager.

During the open phase, which may be indicated by a signal lamp on the panel switched on by the banker, the player may operate his selectors to choose both the amount of his stake and the outcome on which he places his wager; if desired, he may annul his selection by pressing a cancellation button. In the closed phase, also indicated by a banker-controlled signal such as a sign reading "no more bets", the selector position is locked up and cancellation of the bet is inhibited so that the wager previously made cannot be altered until the win or loss has been determined. In certain instances, such as a line bet in a dice game, the outcome at a particular stage may be indecisive and may require the bet to be held over for one or more cycles of operation until a decision occurs; in this case, the selection remains "frozen" even during subsequent open phases until the arithmetic unit registers either a win or a loss.

To register a win, an "add" channel is enabled by the arithmetic unit or computer which should also include a multiplier to take into account the odds governing the selected bet. Thus, if the panel offers a choice between a variety of bets at different odds, a signal may be sent to the multiplier stage of the computer to indicate the odds factor whenever a particular selector is actuated. This odds factor, of course, has no influence upon the "subtract" channel and the overdraft indicator. The cummulative value of all the bets simultaneously placed may be shown on a separate register for visual comparison with the available credit balance.

In a resort hotel featuring a casino, the panels may be located in the several hotel rooms in combination with closed-circuit television to give each player a direct view of the roulette wheel, dice table or other gambling facility used in the establishment. Such a player, of course, will not directly participate in the game but will place his bets on the outcome of an operation performed by the croupier or by some other player at the banker's station.

According to another aspect of the invention a system is provided for placing wagers on the outcome of a horse race or the like from a betting panel conveniently located at the track. The system comprises a plurality of betting panels tied into the main track computer. The latter computer is of the type commonly provided at race tracks for the purpose of calculating the odds based on the amount of money wagered.

Each betting panel is used at the track by an individual player or players. The player opens an account by depositing an amount of money at a special teller's window provided at the track. The teller transmits this information to a control computer to identify the new player and the amount deposited That amount is stored and is reflected as the initial credit balance at the panel assigned to that player.

A player may place a bet on the outcome of a race by operating the appropriate members on the panel to transmit the wager data to the control computer, which in turn transmits them to the track computer. The placing of a bet of a selected amount reduces the player's credit balance. When the results of the race have become official, the track computer transmits the pay-off data (i.e., the return on a unit wager multiplied by the odds factor) to credit the account of a successful player by an amount corresponding to the winnings, and transmits the pay-off information to the appropriate panel.

Many race tracks allow the placing of bets on certain combinations of races in which there is the possibility of winning larger amounts of money on a wager. These combinations include the Daily Double, Big Exacta, and Twin Double. The Exacta and Quinella are special races which may be provided by the track to provide the player with the opportunity for achieving a large payoff. The panel and control computer of the invention contain suitable operating members and logic circuitry to permit the making of such wagers from the panel. According to another aspect of the horse-race betting system of this invention, the bettor may at his choice select all permutations and/or combinations of a given number of horses in an Exacta or Quinella wager by a so-called "boxing" technique by actuating suitable members of the panel, the actual permutations or combinations being calculated and determined by suitable circuitry or a computer program.

The invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a diagrammatic view of a player's selector panel as used in an automated dice game embodying features of my invention;

FIG. 2 is a circuit diagram of an associated banker's station;

FIGS. 3A and 3B, when vertically juxtaposed, show elements of the panel of FIG. 1 together with associated logic circuitry;

FIG. 4 is a partly diagrammatic cross-sectional view of a roulette wheel and associated circuitry forming part of another system in accordance with the invention;

FIG. 5 is a diagrammatic view of the layout of a selector panel and associated circuitry co-operating with the arrangement of FIG. 4;

FIG. 6 is a block diagram of an automatic horse-race wagering system according to a further embodiment of the invention;

FIG. 7 is an elevation view of a betting panel for use in the system of FIG. 6;

FIGS. 8*a*, 8*b* and 8*c* illustrate in schematic block-diagram form the logic circuitry of the betting panel of FIG. 7;

FIG. 9*a* – 9*c* are program flow-charts illustrating the steps in the operation of the computer of the system of FIG. 6; and

FIGS. 10*a* and 10*b* are similar program flow-charts illustrating the operating steps in the computer to perform Quinella, Exacta and boxing operations.

Reference will first be made to FIG. 1 which illustrates a somewhat simplified selector panel **100** together with a receiver **101** of a closed-circuit television system whose camera (not shown) is trained upon a dice table **102** at a remote banker's station. The two dice visible on the receiving screen have been designated D' and D''. The assembly shown in FIG. 1 is assumed to be disposed in a hotel room for use by an occupant during times when a dice game is in progress at an associated casino. Since the occupant of the room has no immediate access to the game itself, he will wager on points rolled by a direct participant while actually betting against the house or the bank; thus, the person rolling the dice is disinterested in the stake of the remote player and, like the banker, does not know what bets have been made by him so that the possibilities of a rigged game are minimized. Generally, the player at the board **100** may make his bets during a succession of different dice throwers; however, if no direct participants are available, the game could also be played with the banker rolling the dice himself.

At the top of panel **100** I have shown several slots **108***a*, **103***b*, **103***c* for the insertion of tokens to be purchased in advance, e.g., in denominations of $10, $100 and $500, respectively. A register **104**, suitably protected against tampering, displays the crdit balance established by the deposited token or tokens as modified by subsequent wins or losses. Another register **105** indicates the total amount wagered at any one time. Two alternately illuminated signs **106, 107**, respectively labeled "BETTING OPEN" and "NO MORE BETS", indicate the two phases of operation together constituting a betting cycle. A further sign, **108** reading "OVERDRAFT", lights up whenever a player attempts to place a bet for an amount exceeding the credit balance displayed at the register **104**. The elements so far described could be present on any selector panel according to the invention, regardless of the type of recurrent event on whose outcome bets are to be placed.

With the specific gam of chance known as "bank craps" for which the panel **100** is particularly designed, a player may wager on a succession of rolls or on a single roll. The first type of wager is known as a "line bet" and is made with the aid of several digit wheels (only two shown) for the selection of the stake, i.e., a wheel **109** for the units digit and a wheel **110** for the tens digit of the dollar amount to be wagered; these digits appear on display wheels **111** and **112** in respective windows adjoining the corresponding selector wheel **109, 110.**

Apart from choosing the amount of his bet, the player may press either a "DO" button **113** or a "DON'T" button **114** to choose either a "PASS" or a "DON'T PASS" sequence as more fully explained hereinafter. A "CANCEL" button **115** may be depressed to annul this selection as long as the sign **106** is lit. Actuation of button **113** or **114** lights a sign **116** reading "PASS" or a sign **117** reading "DON'T PASS", respectively, and also locks the selector **109**–**112** in the position last imparted thereto.

As an example of a one-shot selection, panel **100** offers the choice of a "field bet" which calls for the appearance of any one of several points at the next roll, specifically the point **2, 3, 4, 9, 10, 11** or **12.** The corresponding stake selector again includes a units wheel **109***a*, coupled with a display wheel **111***a*, and a tens wheel **110***a*, coupled with a display wheel **112***a*. To make this kind of bet, the user depresses a button **113***a* labeled "FIELD"; an associated cancellation button is shown at **115***a*. A sign **116***a* lights up when the selection button **113***a* is depressed.

After any roll, the field bet is canceled and may be renewed by reoperation of button **113***a*; whenever the sign **106** is lit, button **115***a* may be depressed to cancel a field bet registered during the same open phase. Upon such cancellation, the stake selector **109***a*, **110***a* may be reset after having been previously locked upon the actuation of button **113***a*. As long as button **113***a* is not depressed, selector wheels **109***a*, **110***a* may also be shifted during the closed phase (sign **107** lit) but this will have no effect upon the betting.

On the other hand, a player depressing either of the two buttons **113** and **114** commits himself to a full sequence of throws from the moment the sign **107** lights up for the first time. This sequence of operations, in the arrangement here shown, is independent of the sequence of rolls entered into by the actual dice thrower and may be started at any time by the player using the panel **100.** As with ordinary bank craps, however, the player at the panel wins if the next rolls is a "**7**" or "**11**" but loses if that throw is "craps", i.e. a "**2**", "**3**" or "**12**"; in all other instances, i.e. if a "**4**", "**5**", "**6**", "**8**", "**9**" or "**10**" is rolled, the point is registered by the lighting of a corresponding lamp **118** and the player wins if the same point is subsequently rolled again before the next "**7**" comes up. This mode of operation requires actuation of "DO" button **113**; if, instead "DON'T" button **114** is depressed, the situation is reversed, i.e., the player wins on "craps" during the first roll and on " **7**" during subsequent rolls while losing on "**7**" or "**11**" during the first roll or on a recurring point during subsequent rolls.

Another possibility of playing the game with the board **100** of FIG. 1 is the player's own choice of a point to be made by actuation of any one of ten pushbuttons **119** along with button **113,** the wager then being that the point will recur before a "**7**" is rolled. Again, operation of button **114** in lieu of button **113** reverses the outcome as well as the corresponding odds. These odds have been listed in FIG. 1 alongside the corresponding pushbutton **119** and range from 6:1 for point "**2**" or "**12**" to 6:5 for point "**6**" or "**8**". It is to be understood that these odds, as well as others shown in the drawing, are subject to some modification by the house rules, depending also on whether or not the bank adds a markup or "vigorish" to the purchase price of the tokens.

If a betting sequence is initiated by the actuation of one of the buttons **119** in addition to button **113** or **114,** the corresponding lamp **118** also lights up and the further operation will be the same as with a "PASS" or "DON'T PASS" bet except that the first roll of a "**7**" will cause either a loss or a win whether occurring immediately afterwards or at some subsequent cycle and the roll of an "**11**" will be ineffectual unless this hap-

pens to be the selected point. This mode of operation is characterized by the lighting of a sign **120**, reading "COME", or a sign **121**, reading "DON'T COME", in lieu of signs **116** and **117**. The player may also choose to increase his odds on a "COME" or "PASS" bet by pressing a button **122** marked "HARDWAY" whenever the point to be made is "**4**", "**6**", "**8**" or "**10**", signifying that the roll is to be a "double" in order to win; in that case the player loses when the point comes up in any different combination of eyes. A sign **123** is lit in response to this choice.

A set of further lamps **124** are controlled by the banker to indicate the point actually rolled during each closed phase, as monitored on television receiver **101**; another lamp **125**, also labeled "HARDWAY", shows that a double has been rolled on any of the four even numbers mentioned above.

In the system particularly described hereinafter, actuation of any pushbutton **119** will be ineffectual if a line bet has already been irrevocably placed, i.e., if any of the signs **116, 117, 120, 121** is lit and the time for cancellation has passed. The player, however, may switch during any open phase from "DO" to "DON'T" by depressing button **114**, or vice versa by depressing button **113**; similarly, the "HARDWAY" choice can be made during any cycle in the open phase thereof (if a proper even-numbered point is indicated by the lamp **118**) and revoked by operation of button **115***a*. These shifts are thus representative of further one-shot selections, it being understood that the system may be expanded to include other point combinations so selectable and that the panel **100** could also be modified to make the "COME" or "DON'T COME" selection through buttons **119** a one-shot proposition. Also, a negative or "wrong" field bet could be added, i.e., a wager that none of the 7 points listed adjacent button **113***a* will come out on the next roll. As specifically illustrated, a pass bet and a field bet both pay even money; thus, a shift from "PASS" to "DON'T PASS" does not alter the odds any more than would a reversal of a field bet.

FIG. **2** shows the circuitry of the banker's station partly visible on the television screen of FIG. **1**. Two set of switches S_1'–S_6' and S_1''–S_6'' are concurrently operable by the banker, e.g., with the aid of pushbuttons, to indicate the point thrown, the subscripts denoting the number of eyes of a respective die; naturally, it is immaterial which die D' . D'' happens to be associated at any time with either set of switches. A starting switch S serves to indicate the closing of the betting phase and is momentarily depressed by the banker before the dice are thrown. Switches S_1'–S_6' control respective line conductors whereas switches S_1''–S_6'' control respective column conductors of an orthogonal conductor array having a matrix of **36** AND gates **126** disposed at their respective junction. After the roll, simultaneous closure of two switches—one from each set—unlocks one of these AND gates **126** whose outputs energize respective numerical leads L_1 – L_{12}; each of these leads, with the exception of the first and the last, also includes an OR gate **127** to combine the outputs of several AND gates **126** in accordance with the multiple possibilities of rolling any of points "3" through "11". Certain of these AND gates, located at the junction of a line and a column from two switches with identical subscripts (i.e., S_2', S_2''; S_3', S_3''; S_4', S_4''; S_5', S_5''), respectively energize a group of further leads L_{22}, L_{33}, L_{44} and L_{55} all terminating at an OR gate **128**. Another OR gate **129**, also acting as a delay network, has **11** inputs respectively connected to lines L_2–L_{12} and works into a reset terminal of a flip-flop **130** which can be set by the phasing switch S and has an output line A energized in its reset condition. Other flip-flops, collectively designated **131**, are individually settable by signals from respective leads L_2 – L_{12} and are resettable by voltage on line A. An additional flip-flop **132** is settable by the output of OR gate **128** and is also resettable by flip-flop **130** at the end of an operating cycle. The outputs of flip-flops **131**, respectively energized in their set conditions, are **11** lines A_2 – A_{12}; a similar line A_{xx} emanates from flip-flop **132**. Signal lamps forming part of a set of luminous signs **133** are individually connected to lines A_2 – A_{12} to light up when any of these lines is energized, displaying the value of the point rolled; a similar lamp lights a sign **134** reading "HARDWAY" whenever a "double" is rolled to energize OR gate **128**. Finally, a lamp connected to line A illuminates a sign **135** reading "NO MORE BETS" to apprise players near the dice table that the closed phase has been started.

The **13** output lines A, A_{xx} and A_2 – A_{12} originating at the banker's station branch out, as diagrammatically illustrated in FIG. **2**, to the several remote players' stations, briefly described above, one of which has been shown in detail in FIGS. **3A** and **3B**. It will be noted that FIG. **3B** contains a number of elements already discussed in conjunction with FIG. **1** and designated in the same manner.

I shall first describe the construction of the two selectors **109** – **112** and **109***a* – **112***a*; since the selectors are identical, this description will be limited to the wheels **109** – **112**. The wheels **109, 110** have knurled rims projecting slightly from slots in the panel; each wheel pair **109, 111** and **110, 112**, rotatable independently of the other pair, is rigid with a notched disk **136**; only the one associated with the units pair being visible, disk **136** has ten marginal indentations **137** engageable by a detent **138** under the control of a solenoid which has been designated **139** in the case of the units wheels and **140** in the case of the tens wheels. A signal generator **141**, shown diagrammatically as an arcuate resistor, produces a voltage whose magnitude depends on the rotary position of the respective digit wheel, this voltage appearing on a lead **142** for the units position and on a lead **143** for the tens position. Leads **142, 143** include front contacts and armatures of a relay **144** and terminate at respective inputs of a multiplier **145**. In the deenergized condition of solenoids **139** and **140**, detents **138** lock the disks **136** and thereby the respective digit wheels against rotation. These solenoids are jointly energizable over a back contact and armature of a locking relay **147**, an associated front contact serving to operate the relay **144** when the relay **147** is energized. Such energization takes place under the control of either switch **113** ("DO") or switch **114** ("DON'T") which completes a circuit to the line A extending from the banker's station. Since this line carries current only during the open phase, relays **147** and **144** cannot be operated at any other time so that a rotation of selector wheels **109, 110** during the closed phase has no effect upon the multiplier **145**. If, on the other hand, relays **144** and **147** are energized, solenoids **139** and **140** are deactivated so that these selector wheels are locked by their detents **138**.

The locking relay **147** has a holding circuit which extends over an armature and back contact of an overdraft relay **148** to a normally closed switch controlled

by cancellation button **115** and thence via an armature and back contact of a relay **149** to potential on a bus bar **151**. Another armature and back contact of relay **149** connect bus bar **151** to an auxiliary bus bar **152** by way of a pair of armatures and back contacts of a signaling relay **153** whose winding is directly connected to lead A; the holding circuit of relay **147** extends to this auxiliary bus bar through the aforementioned armature and back contact of relay **148** so that this circuit cannot be broken by actuation of cancellation button **115** as long as none of the relays **148, 149** and **153** is energized. An armature of relay **153** also controls the illumination of signs **106** and **107** in the operated and unoperated condition, respectively, of that relay.

Another shunt circuit across the contacts of cancellation button **115** extends over an armature and front contact of a relay **154** which is energizable from an AND gate **155** having one input connected, in parallel with the lamp of sign **107**, to the lower back contact of relay **153** by way of a delay network **167**. The other input of AND gate **155** is connected to a front contact of a switching relay **156** (FIG. 3A), which is operable by the output of an AND gate **157** having one input connected through an OR gate **184** to the aforementioned lower back contact of relay **153**, the other input of AND gate **157** being joined to the "set" output of a flip-flop **158** whose setting input is energizable under the control of the contacts of any of the pushbuttons **110** via an OR gate **159**. These pushbuttons contacts are interconnected in a chain so that only one pushbutton at a time (the first in a series if several are depressed simultaneously) is effective to energize the OR gate **159** as well as an associated flip-flop **160**, the setting inputs of all the flip-flops **160** being connected to the respective pushbutton switches **119** through back contacts and armatures of a relay **161**. The energizing circuit of the latter relay includes another AND gate **162** with a first input connected to the lower front contact of relay **153**, in parallel with the lamp of sign **106**, and a second input tied to the output of flip-flop **158** in parallel with one of the inputs of AND gate **157**. A lead also extends from this flip-flop output through a delay network **163** and another armature and back contact of relay **156** to the resetting input of a flip-flop **164** having an output lead tied to another input of OR gate **184**; the last-mentioned output lead also serves to energize a relay **150**. Flip-flop **164** has its setting input connected to the output of an OR gate **165** with **11** inputs respectively connected to the front contacts of pushbutton switches **119** in parallel with corresponding inputs of OR gate **159**. The connections between this OR gate and the pushbutton switches **119(4), 119(5), 119(6), 119(8), 119(9)** and **119(10)** include respective OR gates **166** with alternate inputs tied to lines A_4, A_5, A_6, A_8, $A_9$and A_{10}. Flip-flops **160** have "set" outputs terminating at the lamps of respective signs **124** whose numbering is identical with that of the corresponding pushbuttons **119**. Flip-flops **160, 158** and **164** are resettable by the delayed output of flip-flop **158** traversing network **163** in the unoperated condition of relay **156**.

Lines A_2, A_3 and A_{12} (energized when "craps" is rolled) are connected to respective inputs of an OR gate **168** whose output lead extends through armatures and back contacts of relays **156** and **148** to an input of an AND gate **169** whose other input is energizable, in parallel with a corresponding input of a companion AND gate **170**, from bus bar **151** via the armature and front contact of relay **147** included in the operating circuit of relay **144**. The second input of AND gate **170** is tied, again over armatures and back contacts of relays **156** and **148**, to the output of an OR gate **171** whose inputs are joined to lines A_7 and A_{11}, i.e., the winning lines in the first roll of a "pass" bet. The outputs of AND gates **169, 170** alternatively energize the relay **149** through an OR gate **193**. Still another OR gate **172** has input connections to the three "craps" lines A_2, A_3, A_{12} (by way of OR gate **168**) and to lines A_4, A_9, A_{10} and A_{11}, a signal on any one of these lines indicating a win in the case of a "right" field bet; OR gate **172** works into an input of an AND gate **169*a*** whose companion gate **170*a*** has an input energizable from an OR gate **173** receiving the signals of the nonwinning lines A_5, A_6, A_7 and A_8. (For purposes of a "wrong" field bet, these connections would have to be interchanged.) The other inputs of AND gates **169*a*** and **170*a*** are energizable via a front contact and armature of a locking relay **147*a*** which, in a manner analogous to that of relay **147**, controls the energization of solenoids **139*a*, 140*a*** associated with selector **109*a*** – **112*a*** and is operable by means of pushbutton **113*a*** in a circuit including the line A. Relay **147*a*** has its holding circuit connected to bus bar **151** through armatures and back contacts of relay **148** and a relay **149*a***, in series with the contacts of cancellation button **115*a***, these contacts being shunted by a connection to auxiliary bus bar **152**; relay **149*a*** is operated from either AND gate **169*a*, 170*a*** through an OR gate **193*a***. The upper armature and front contact of relay **147*a*** also serve to energize, in parallel with AND gates **169*a*** and **170*a***, a relay **144*a*** which controls the operation of a multiplier **145*a*** in response to the setting of selector **109*a*** – **112*a***. Multiplier **145*a*** also has an input connected directly to the energizing lead of relay **144*a***, in parallel with the lamp of sign **116*a***, to receive information on the odds factor (here unity) assigned to this particular bet; this is necessary only if the multiplier is also used, as diagrammatically illustrated by additional input leads, to calculate other types of bets not further described. If all the bets handled by this multiplier have the same odds of 1:1, the multiplier degenerates to a simple analogue or digital register delivering the same signal to either of the two inputs of an associated totalizer **174** which also receives the output of multiplier **145** and of any other multiplier includes in the system. It will be noted that the multiplier **145** has different odds setting inputs connected in parallel with the lamps of signs **116, 117, 120** and **121**, respectively. The signals fed to multipliers **145** and **145*a*** over contacts of relays **144** and **144*a*** are also delivered to register **105** which is biased to show a count of zero whenever all its inputs are de-energized. The output of register **105** goes to one input of a subtractor **175** which also receives a numerical signal from the totalizer **174**, this numerical value corresponding to the information concurrently supplied by the totalizer to register **104** for the display of the instantaneous credit balance. Subtractor **175**, on determining an excess of the amount stored in register **105** over that accumulated in totalizer **174**, energizes the overdraft relay **148** in parallel with sign **108**.

The connections between each multiplier **145, 145*a*** and totalizer **174** consists of respective "add" channels including a win gate **176** or **176*a*** and a loss gate **177** or

177*a*. The control electrodes of gates **176** and **177** are connected to the outputs of AND gates **169** and **170** by way of respective contacts and armatures of a reversing relay **178**; the control electrodes of gates **176***a* and **177***a* are connected to the outputs of AND gates **169***a* and **170***a*. The illustrated circuits are so arranged, as more fully described hereinafter, that, if a bet with the aid of selector **109** – **112** is properly registered and locked up, such bet will not be canceled in the event of an overdraft by means of selector **109***a* – **112***a* which affects only the field bet attempted to be placed by means of selector **109***a* – **112***a*.

Since the various "come" bets made with the aid of pushbuttons **119** have different odds, conductors **179** are branched off the output leads of flip-flops **160** and terminate at other inputs of multiplier **145**; for the sake of simplicity, all these branch conductors have been shown combined in a cable illustrated in dot-dash lines. Certain of these output leads, i.e., those from the No. **4**, No. **6**, No.**8** and No. **10** flip-flops **160**, are also connected to respective inputs of an OR gate **180** (FIG. 3A) working into an input and an AND gate **181** (FIG. 3B) whose other input is energized from line A_{xx}. The output of AND gate **181** leads to a contact of "hardway" switch **122** which, on being actuated in the conducting condition of this AND gate, operates an associated relay **182** which thereupon energizes a lead **183** to multiplier **145** and locks to auxiliary bus bar **152**, as well as to main bus bar **151** in series with cancellation switch **115***a*, through an armature and back contact of reversing relay **178**. Relay **182**, which like relays **147** and **147***a* is operable only during the open phase in which line A carries current, can thus be locked only when the reversing relay **178** is released, i.e., when either the sign **116** ("PASS") or the sign **120** ("COME") is lit. Lead **183** also extends to the winding of a relay **185** whose single armature, connected to the output of an OR gate **186**, has a back contact tied to an input of an OR gate **187** and a front contact tied to an input of an AND gate **188** whose output is joined to the other input of OR gate **187**. This input of AND gate **188** is connected in parallel with an input of a companion AND gate **189**; line A_{xx} is connected directly to the second input of AND gate **188** and through an inverter **190** to the second input of AND gate **189**. The output of AND gate **189** is fed to one input of an OR gate **191** whose other input is connected to line A_7 and whose output is applied to a front contact of relay **156** for delivery, in the energized condition of that relay, to AND gate **169** via one of the armatures and back contacts of relay **148**.

OR gate **186** has ten inputs emanating from respective AND gates **192** each having one input tied to the output lead of a respective flip-flop **160** and another input connected to a front contact of a respective armature of relay **161** for energization by one of the lines $A_2 - A_6$ and $A_8 - A_{12}$, OR gate **186** being thus operated upon the recurrence of a line signal which previously had set one of the flip-flops **160**.

I shall now describe several typical betting operations adapted to be performed with the system of FIGS. **1**, **2** and **3A**, **3B**.

I. "PASS BETS"

With sign **106** lit, the player adjusts the knurled digit wheels **109**, **110** on panel **100** to select an amount to be placed on the line. He then depresses pushbutton **113** which energizes relays **147** and **144**, locking the selector **109** – **112** and applying its output voltages to multiplier **145** as well as to register **105** to display the amount of the bet. If the player changes his mind as to either the amount or the type of bet, he may depress the cancellation button **115** before the light **106** goes out; this releases the relays **144** and **147**, thereby restoring the original condition and unblocking the selector wheels.

If the bet just described is allowed to stand until the banker closes the switch S (FIG. **2**), the player's choice is locked up as sign **107** is lit to indicate that the dice are about to be rolled, an event which the player can observe on the screen of his television set **101**. Three possibilities may now occur:

a. The roll is a "**7**" or an "**11**", representing a win for the player. Let us assume, for example, that a "**3**" and a "**4**" are rolled, the banker therefore closing switches S_3' and S_4'' to set the No. **7** flip-flop **131** which energizes the line A_7. The line voltage (here taken as positive) then passes through OR gate **117** and through back contacts and armatures of the unoperated relays **156**, **148** and AND gate **170** which is concurrently energized by the upper armature of relay **147**. With relay **178** likewise unoperated, the output of AND gate **170** unblocks the win gate **176** so that the numerical value computed by multiplier **145** is fed into one of the "add" inputs of totalizer **174** to increase the credit balance exhibited by register **105**. Relay **149**, operating simultaneously with the unblocking of gate **176**, opens the holding circuit of relay **147** which, however, is shown to be of the slow-releasing type so as to give the multiplier **145** enough time to step the totalizer **174**.

b. The roll is "craps" ("**2**", "**3**" or "**12**"), representing a loss. Suppose that a double-**6** has come up. The banker depresses switches S_6' and S_6'' to set the No. **12** flip-flop **131** with resulting energization of line A_{12}; the signal is conveyed through OR gate **168** via back contacts and armatures of relays **156**, **148** to AND gate **169** whose output unblocks the loss gate **177**, thereby feeding the information from multiplier **145** to a "subtract" terminal of totalizer **174** whereby the balance displayed on register **106** is reduced to the extent of the stake selected by means of wheels **109** – **112**. Again, relay **149** is operated to deactivate the slow-releasing relay **147**.

c. The roll is a "point" ("**4**", "**5**", "**6**", "**8**", "**9**" or "**10**"), continuing the wager. Let us assume that a double-**4** has been rolled. Actuation of switches S_4', S_4'' by the banker energizes lead L_8 as well as lead L_{44}, thereby setting the No. **8** flip-flop **131** along with flip-flop **132** and placing voltage on lines A_8 and A_{xx}. At the banker's station (FIG. **2**), the sign **134** is illuminated but this is without significance for the player at board **100** since the "hardway" relay **182** there has not been operated. The signal from line A_8 passes ineffectually through OR gate **173** (inasmuch as relay **174***a* is unoperated) and also clears the OR gate **159** to set the flip-flop **158**. Since this occurs at a time when relay **153** is released so as to energize OR gate **184** concurrently with sign **107**, AND gate **157** conducts in response to the output of flip-flop **158** and operates the relay **156** which thereupon locks by way of its right-hand armature and front contact to auxiliary

bus bar 152 via the outermost left-hand armature and back contact of relay 148. The pulse energizing the relay 156 is also applied to delay network 163 whose output, however, is interrupted at the end of the delay interval by the operation of that relay. The circuits remain in this condition until relay 153 again attracts its armatures at the beginning of the next open phase, thereby extinguishing sign 107 and relighting sign 106; at that instant, however, voltage from the back contact of relay 153 is still applied by the delay network 167 to the AND gate 183 so that the latter is opened immediately after the switchover, i.e., as soon as this AND gate also receives a signal from line A by way of the outermost left-hand armature and front contact of the now energized relay 156. Since the operation of relay 154 establishes a connection from auxiliary bus bar 152 to main bus bar 151 via contacts of relays 148 and 149 only, actuation of the cancellation button 115 continues to be ineffectual during this open phase. Thus, relays 144, 147 and 156 continue operating, sign 116 remains lit over contacts of unoperated relays 150 and 178, and No. 8 flip-flop 160 stays in its set condition in which it had been placed upon energization of line A_8. Sign 124(8) has lit up in response to an output voltage from this flip-flop which is also applied to one of the inputs of the corresponding AND gate 192. Furthermore, the reoperation of relay 153 energizes the second input of AND gate 162 whose first input still carries voltage from the output of flip-flop 158; this results in the operation of relay 161 which locks over its uppermost armature and front contact to the same holding circuit as relay 156.

Let us suppose that the player now takes no further action until a decision is reached, i.e., until either a "7" or an "8" is rolled. In the first instance, voltage on line A_7 passes through OR gate 191 to a front contact and armature of operated relay 156 and thence through an armature and back contact of relay 148 to AND gate 169 which thereupon unblocks the loss gate 177 and operates the relay 149 with the results previously described. In the second instance voltage from line A_8 passes through one of the OR gates 166 and thence via an armature and front contact of relay 161 to the other input of the No. 8 AND gate 192 which thereupon opens up and transmits a signal through OR gate 186, armature and back contact of relay 185, OR gate 187, an armature and front contact of relay 156, and an armature and back contact of relay 148 to AND gate 170, thereby initiating the aforedescribed registration of a win. Upon the release of relay 156 (along with relay 161) by the operation of decision relay 149, the delayed output of flip-flop 158 is applied through network 163 to the reset terminals of this flip-flop and to the operated No. 8 flip-flop 160, restoring them to normal. Relay 154 is also released. As long as neither a "7" nor an "8" comes up, the player has some additional choices available to him during subsequent open phases, i.e.:

II. "HARDWAY" BETS

If the point registered on sign 124 is one of the even numbers other than "2" and "12", the player may increase his odds (and comensurably reduce his chance of winning) by pressing the button 122. With one input of AND gate 181 from the output of OR gate 180, this step operates the relay 182 wich lights the "HARDWAY" sign 123 and locks over the back contact and armature of relay 178 to bus bar 151 by way of the contacts of switch 115*a*; when the relay 153 is deenergized in the closed phase, this locking circuit also extends to auxiliary bus bar 152. This wager is therefore a cancelable bet in the sense that it may be revoked during any open phase by depression of button 115*a*, leaving undisturbed the existing "pass" condition.

Relay 182 also operates the relay 185 which reverses its contacts to direct the output of OR gate 186 to one of the inputs of each AND gate 188, 189. If, as in the example previously given, the point to be made is "8", and if the roll is a double-4, closure of switches S_4' and S_4'' at the banker's station energizes the line A_{xx} so that AND gate 188 conducts in response to a pulse from the No. 8 AND gate 192 and registers a win through corresponding contacts of relays 156 and 148 as well as AND gate 170. If the roll was not a double but, say, the combination 3 + 5, line A_{xx} does not carry current when the NO. 8 AND gate 192 responds so that AND gate 189 is opened, in lieu of AND gate 188, through inverter 190, thereby registering a loss via contacts of relays 156, 148 and AND gate 169.

Relay 182, like relays 147 and 147*a*, is shown to be slow-releasing in order to let the multiplier 145 and the totalizer 174 operate properly after the decision relay 149 has attracted its armatures.

III. REVERSAL OF "PASS" BETS

During any open phase, the player may shift from "pass" to "don't pass" by pressing the "DON'T" button 114. This operation energizes the relay 178 which locks to bus bar 151 via cancellation button 115*a* while reversing, on the one hand, the connections to gate 176, 177 and lighting, on the other hand, the sign 117 in lieu of sign 116. The input connections to multiplier 145 are also switched though this is without significance where, as in the situation here assumed, the odds are the same (1:1) in both cases.

The operaion of relay 178 further opens the holding circuit of relay 182 since, with that kind of negative line bet, a "hardway" wager cannot be made.

Whereas in the closed phase the holding circuit of relay 178 is extended over contacts of relay 153 to auxiliary bus bar 152 and cannot be broken except upon the operation of decision relay 149, the player may release the relay 178 during any open phase by depressing the cancellation button 115*a*. This restores the circuits to the previous "pass" condition so that the player may, at his option, alternate between betting for and against the recurrence of the point before the appearance of a "7".

If the player has initially actuated the "DON'T" button 114 instead of the "DO" button 113, relay 178 would have been energized from the start so that, on the first roll, a "7" would have opened the loss gate 177 whereas a "craps" would have opened the win gate 176. Subsequently, again, the player would have had the choice of maintaining his "wrong" bet or changing it to a "right" bet by pressing the cancellation button 115*a*.

IV. "COME" BETS

This type of wager users the same type of circuitry as

the aforedescribed "pass" bets and differs from it only in that the player selects the point to be made instead of leaving this choice to the accident of the next roll. In fact, with the arrangement shown, he may extend this selection to any point other than a "7", thus including the numbers "2", "3", "4", "11" and "12", always betting that the selected point may come up before a "7" is rolled. As with a "pass" bet, the wager is noncancelable after the beginning of the first closed phase. It may, however, be modified from one cycle to the other by the cancelable "hardway" bet (with depression of button **122** if the selected point is "4", "6", "8" or "10") or by reversal through actuation of the "DON'T" button **114**. As before, a "wrong" bet may be converted into a "right" bet by depression of button **115***a* which also controls the cancellation of a "hardway" bet.

To place either a "come" bet or a "don't come" bet, the player actuates either the "DO" button **113** or the "DON'T" button **114** as well as one of the pushbuttons **119** which, via OR gate **165**, sets the flip-flop **164** provided that line A is energized and relay **156** has not been operated. It will be noted that only one pushbutton **119** will be operative in this manner, namely the first one (e.g., No. 3) if several (e.g., Nos. **3,5** and **6**) are depressed simultaneously. This push-button also sets the corresponding flip-flop **160** in the unoperated condition of relay **161**, either directly (in the case of number **2,3, 4, 11, 12**) or through one of the OR gates **166**. Flip-flop **164** applies voltage to one input of AND gates **157** and **162** which are rendered conductive by the concurrent setting of flip-flop **158** via OR gate **159**. Relay **156** then operates and prevents further effective actuation of pushbuttons **119**; with one of the signs **124** lit to indicate the chosen point, the operation is now the same as with a "pass" bet after the first roll.

The set flip-flop **164** also operates the relay **150** which causes illumination of "COME" sign **120** or "DON'T COME" sign **121** in lieu of "PASS" sign **116** or "DON'T PASS" sign **117**, respectively, depending on whether button **113** or **114** had been depressed.

Naturally, a more elaborate system according to the invention may use separate logic circuits for the "pass" and the "come" bets in lieu of the common circuit arrangement here shown. In such case the two types of bets could be placed similtaneously and the "come" bet could also be made a one-shot proposition, similar to the "hardway" bet discussed above or the "field" bet described hereinafter.

Again, as in the aforedescribed case, the player may exercise at the very outset his option for betting against rather than for the come-out of a selected point before a "7" is rolled. However, the "hardway" button **133** will function only in the event of a positive or "right" bet.

It should be noted that, in the case of a "come" or "don't come" bet, the setting of flip-flop **158** by the operation of any pushbutton **119** immediately operates the relay **161** since this step takes place during the open phase, i.e., with relay **153** energized whereby voltage from the bus bar **151** is applied to the other input of AND gate **162**. If the player wishes to cancel his selection before this phase is terminated, he may do so by depressing button **115** which thereupon breaks the holding circuit of relay **156**, and, in the aforedescribed manner, resets flip-flop **158** together with the flip-flop **118** previously set.

V. "FIELD" BETS

With this type of bet the player wagers that a point from a specified group will appear on the next roll. In the arrangement here shown, the "field" group consists of the numbers **2, 3, 4, 9, 10, 11,** and **12,** with the odds rated as even.

After having set the selector wheels **109***a* – **112***a* to register his stake, the player depresses the button **113***a* which, in the energized state of line A, operates the relay **147***a*, the latter locking over armatures and back contacts of the associated decision relay **149***a* and the overdraft relay **148** to bus bar **151** via cancellation switch **115***a*, a shunt path again extending to auxiliary bus bar **152** in the unoperated condition of relay **153** to prevent cancellation during the closed phase.

If one of the aforementioned field numbers comes up during the cycle in which the bet was made, OR gate **172** conducts and energizes the AND gate **169***a* to which voltage is also applied by the operated relay **147***a*. This results in the opening of win gate **176***a* and the operation of decision relay **149***a* which releases relay **147***a*.

If the point rolled is not included in the field group, i.e., if it is one of the numbers **5** – **8**, OR gate **173** conducts and opens the AND gate **170***a* which also has voltage applied to its other input by relay **147***a*. In that case, loss gate **177***a* responds while relay **149***a* is likewise operated to open the holding circuit of relay **147***a*.

If the "field" bet coincides with a pre-existing "pass" or "come" bet and if the total displayed on register **105** is so close to the credit balance exhibited by register **104** that the operation of selector **109***a* – **112***a* overdraws the totalizer as soon as relay **147***a* actuates the relay **144***a*, relay **148** responds to prevent the locking of relay **147***a* and to inhibit the registering of a win or a loss by means of gate **176** or **177** without, however, releasing the previously operated relays **147** and **154** of the pass/come section. The bets in the latter section, therefore, remain locked up and can be consummated as soon as the overdraft condition has been cured by cancellation of the field bet or suitable reduction of the amount wagered thereon.

Naturally, the system shown in FIGS. **3A** and **3B** could be extended to include a reversing relay, similar to relay **150**, and a "DON'T" button, similar to button **114**, associated with selector **109***a* – **112***a* to provide for a "wrong" field bet. Other, analogous circuits may be included to facilitate one-shot bets for different point combinations or single points.

In FIGS. **4** and **5**, I have illustrated the adaptation of my invention to a game of roulette. FIG. **4** shows a conventional roulette wheel **200** whose bowl **201**, however, is equipped with a set of microsensitive switches **202** underneath the wheel for the closure of contacts whenever the ball **203** lands in one of its pockets, the latter having bottom holes somewhat smaller than the ball which register with these switches and are disposed near the inner end of each pocket so that, when the wheel comes to rest, the ball actuates the switch underneath the pocket it occupies. These switches may be slightly slow-operating (or connected to slow-operating relays) so as not to close their circuits until the ball stays put. The two pairs of contacts particularly illustrated in FIG. **4** have been designated P_{16} and P_{29}, respectively associated with pocket No. **16** (red) and

pocket No. 29 (black). A television camera 204 is trained upon the wheel 200 to let distant players observe its operation.

Switch contacts P_{16} are connected to an individual outgoing numerical line M_{16} and to "red" line M_r, "even" line M_e and "low" line M_l by way of respective OR gates 205, 206, 207 having other inputs connected to switch contacts from similarly identified locations along the bowl 201. On the other hand, contacts P_{29} are connected to an individual outgoing line M_{29} and to "black" line M_b, "odd" line M_o and "high" line M_h through respective OR gates 208, 209, 210. A master switch P is operable by the croupier, before the ball 203 comes to rest in any pocket, to indicate the termination of betting by energizing an outgoing line M which corresponds to line A of the preceding embodiment. The master line M, the numerical lines such as M_{16} and M_{29} as well as the even-chance lines M_b, M_r, M_o, M_e, M_h and M_l all include respective flip-flops, not shown, in the manner illustrated for the various outgoing lines A etc. in FIG. 2.

At each player's station (FIG. 5), a panel 211 carries a simulated roulette layout 212 together with a variety of selector means, including slectors 213, 213', 213'' for individual numbers or small groups (up to six), rotatable knobs 214, 214', 214'' for the "even" chances red/black, odd/even and low/high, and pushbuttons 215, 215', 215'' for the three columns. The associated stake selectors have been designated 216, 216', 216'' for the individual numbers, 217, 217', 217'' for the even chances and 218, 218', 218'' for the columns; for simplicity's sake, each of these selectors is represented by a single digit wheel with associated display wheel even though, for larger bets, two or more decades may be used as in the system previously described.

Whereas an elaborate roulette system according to my invention may include an individual numbers and stake selector for each of the 36 to 38 numbered squares of the layout (the number of such squares depending on the presence or absence of an 0 and/or 00), the simplified arrangement shown in FIG. 5 has but one selector for any six-number group which, as particularly described for selector 213, offers a choice of six "straights" (i.e., any one of the six adjoining numbers 19 - 24), any "split" (combination of two) either longitudinally or transversely, either of two "streets" (transverse three-number combination), either of two "quarters" (four-number combination) and a "line" (six-number combination). For this purpose, the selector 213 comprises a rotatable knob 213*a* and a slider 213*b*, knob 213*a* having three positions for energizing a first contact 213*c* (left), a second contact 213*d* (right) or both these contacts together (center). An arm 213*e* rigid with knob 213*a* closes one of three switches 213*f*, 213*g*, 213*h* in its various positions to transmit respective odds factors to the associated multiplier, not shown, the odds factor being the same for the two outer positions (switch 213*f* or 213*h* closed) and lower for the middle position (switch 213*g* closed). Slider 213*b* has an arm 213*i* for the alternate closure of six multiplier-controlling switches 213*j*, 213*k*, 213*l*, 213*m* and 213*o* in corresponding positions in which, as best seen for selectors 213' and 213'', the slider may be indexed by being dropped into a notch 225 of a track 226 after being raised from another notch in which it had been seated. A set of contacts 213*p* on the left and 213*g* on the right serve for the selective energization of different combinations of leads 219 in the six operative slider positions, the slider also having a seventh or inoperative position in which none of these leads is energized. Leads 219 terminate at the setting inputs of respective flip-flops 220 which are part of a circuit arrangement analogous to that shown in FIG. 3A with reference to flip-flops 160, these flip-flops being automatically reset at the end of the closed phase of each betting cycle. A set of signals 221, comparable to lamps 124 of FIG. 3A, are connected to respective output conductors N_{19} - N_{24} of flip-flops 220 so as to be individually lit whenever these flip-flops are set, these output conductors also extending by way of respective AND gates Q_{19} - Q_{24}, whose other inputs are tied to numerical lines M_{19} - N_{24} from the banker's station, to an OR gate 225 working directly into an output of an AND gate 222 and through an inverter 223 into an input of a tripple-coincidence AND gate 224. A relay 227, connected across line M, has the back contact of its single armature multipled to other inputs of AND gates 222, 224, the third input of AND gate 224 being connected directly to line M. Two signs 228 and 229, reading "BETTING OPEN" and "NOR MORE BETS", are respectively lit in the energized and the de-energized conditions of relay 227 which is the counterpart of line relay 153 in FIG. 3B. When energized, the armature and front contact of relay 227 also apply working potential to a wiper of knob 213*a* and through it to either or both bank contacts 213*c*, 213*d* associated therewith. The outputs of AND gates 222 and 224 are connected to control electrodes of a win gate 230 and a loss gate 231.

In its lowermost position, the wipers of slider 213*a* engage two of the contacts 213*p*, 213*q*, respectively associated with numbers 19 and 25. Since these wipers are respectively connected to contacts 213*c* and 213*d* of knob 213*a*, only contact 213*p* will be energized in the left-hand position of this knob and will set the corresponding flip-flop 220 with resulting energization of line N_{19} and lamp 221(19). In this position, switch 213*o* will be closed to transmit to the multiplier a signal which, together with that transmitted concurrently by switch 213*f*, establishes the odds applicable to a single number selection or "straight", generally 35:1. If knob 213*a* had been in its right-hand position, contact 213*d* would have energized the wiper engaging contact 213*g* so that the setting of the No. 22 flip-flop 220 would have applied voltage to lead N_{22} with resulting illumination of sign 221(22); the same odds would have been established in that case by the joint closure of switches 213*h* and 213*o*. When knob 213*c* and 213*d* simultaneously energizes the contacts 213*p* and 213*q* associated with numbers 19 and 22 to register a "split", with a setting of the two corresponding flip-flops 220, lighting of signs 221(19) and 221(22), and application of voltage to one input each of AND gates Q19 and Q22; the odds, as determined by the joint operation of switches 213*j* and 213*o*, are then much lower, generally 17:1.

In the second-lowest position of slider 213*b*, the combination of lines N_{19} and N_{20} (associated with the left-hand numbers 19 and 20) and/or N_{22} and N_{23} (associated with the right-hand numbers 22 and 23) is registered, according to the position of knob 213*a*; this results either in a "split" (odds 17:1) or in a "quarter" (odds 8:1), with the lighting of signs 222(19), 221(20) and/or 221(22), 221(23). The third slider position,

similarly, gives a choice between numbers **20** and/or **23**; the fourth position registers either of the two "splits" **20, 21** and **23, 24** or the "quarter" **20, 21, 23, 24.** The fifth position deals with numbers **21** and **24,** again giving the choice among two "straights" and a "split". Finally, the top working position offers a selection of the left-hand "street" **19 – 21,** the right-hand "street" **22 – 24** or the "line" **19 – 24,** with odds of **11:1** or **5:1.**

In any one or more of line $N_{19} - N_{24}$ are energized and a corresponding line $M_{19} - M_{24}$ receives a signal from the banker's station, the associated AND gate $Q_{19} - Q_{23}$ conducts and energizes the AND gate **222** to open the wing gate **230** for operation of the totalizer in an additive sense, taking into account the odds registered by the selector-actuated switches. Naturally, the selector elements **213***a*, **213***b* may be provided with mechanical or electrical locking means to prevent their untimely actuation, e.g., with the aid of solenoid-operated detents as illustrated at **138 – 140** in FIG. **3B**; such solenoids or other electromechanical means may also be used to reset the sliders **213, 213', 213''** to their uppermost or inactive positions at the end of each closed phase, either automatically or in response to a special signal from the banker's station.

If none of the numbers chosen by selector **213** is spun, all the AND gates $Q_{19} - Q_{24}$ remain blocked and a true signal is applied by inverter **223** to one of the three inputs of AND gate **224.** At the beginning of the next open phase, the second input of this AND gate is also energized from line M while relay **227,** shown to be of the slow-operating type, still applies voltage to the third input to open the loss gate **231,** thereby causing the totalizer to perform a subtracting operation.

It will be understood that the connections between leads **219** and flip-flops **220** may include circuitry for the cancellation of selections before betting is closed, as described above with reference to flip-flop **158** and relays **156, 161.** Other circuitry from FIGS. **3A** and **3B** (e.g., an overdraft relay) may likewise be used insofar as it applies to one-shot propositions.

The operation of the even-chance selectors will now be described with reference to knob **214** controlling the choice between "red" and "black"; the wiper of this knob, connected to the front contact of relay **227,** is engageable with either of the two bank contacts **213R, 214B,** being disengaged from both in an intermediate position. One of the two flip-flops **232R, 232B** is settable by this wiper, again through the intermediary of circuitry previously described but not shown in detail in FIG. **5,** to condition either of two pairs of AND gates **233, 234** or **235, 236** for conduction in the event that their other inputs are subsequently energized by voltage on one of the two lines M_b, M_r. AND gates **233** and **235** work through an OR gate **237** into the control electrode of a win gate **238**; AND gates **234** and **236** similarly work through one OR gate **239** into a control electrode of a loss gate **240.** Thus, gate **238** is opened when line M_r receives a signal in the set condition of flip-flop **232R** or when line M_b is energized upon the setting of flip-flop **232B**; conversely, loss gate **240** is activated when energization of line M_r coincides with a setting of flip-flop **232B** or when line M_b carries current upon the setting of flip-flop **232R.**

The resetting of flip-flops **232R, 232B** after each cycle is carried out by circuitry of the type previously described. If, under the house rules, the appearance of a "O" (or "OO") is to leave the even chances standing, then such flip-flop will not be reset in that event; naturally, neither line M_r nor line M_b would then receive a signal upon the spin of a "**0**" (or "**00**").

Knob **214** may also be associated with an odds selector similar to wiper arm **213***e*, the odds factor here having the value of unity.

The operation of selectors **215, 215'** and **215''**, being analogous to that of selector **214** (as well as that of field selector **113***a* in FIG. **3B**) except for a different combination of winning numbers, need not be described in detail. This also applies to other multiple-choice selections usually provided on a roulette layout, such as first, second and third dozen.

Naturally, the credit-balance register **104** at each player's station should be accessible to an authorized representative of the banker or the house for resetting to zero, with payment of the indicated amount to the player upon his request or at the end of a gambling session.

VI. HORSE-RACE WAGERING

A further embodiment of the present invention is illustrated in FIGS. **6–10***b* in which a player is permitted to place wagers on the outcome of a horse race or a series of horse races from a remote panel generally designated **300.** Preferably, as shown in FIG. **6,** a number of such panels are located in a suitable area in the race track at which the player may sit comfortably while viewing the track from an optimum vantage position such as in a lounge or restaurant at the track. In a typical track installation a plurality of betting panels **300***a* – **300***n* are tied into a control computer **302.** The player opens an account by making a payment at a teller's station **304,** specially provided for this purpose.

The teller transmits the information, e.g., over teletype lines **309** and **311,** to computer **302** to cause the latter to store information respectively relating to the identification and code number of the player, and the amount of money given in payment to the teller. A receipt may be issued at this time to the player containing the relevant information. The computer **302** then establishes in its memory an initial credit balance for the player. Computer **302** is tied into a track computer **303** commonly provided at parimutuel tracks for the purpose of computing the odds on the horses running in each race.

Wagers can be placed on the races without the need for the player going to the betting windows to purchase his wagering tickets, thus saving him the burden of spending time waiting on lines. As shown in FIG. **7** the operating panel **300** for the horse-race wagering operation comprises a window **306** in which an initial credit balance may be displayed reflecting the data stored in computer **302** for the player. That credit balance is updated periodically depending on the outcome, to wit, the success or lack of success, of a wager made by that player on a horse race or a series of horse races. As herein shown that initial credit is displayed at window **306** by the player placing an identification card or badge (which he has obtained at teller's station **304,** and which carries his identification number) into a slot **308** which is scanned or read by suitable equipment located in the panel to identify the player to the control computer **302.**

For additional security the player may also be provided at teller's station **304** with a code number which

may be made up of three or more digits. That code number is inserted into the panel by the proper activation of several numbered code buttons **310.** The code number along with the identification number on the player's card provide a unique identification of the player to computer **302.** Both the badge and the identification code must be fed into the panel to enable the player to make a wager from the panel.

The horses running in a particular race are identified by numbers **1 – 12** and a linear array of twelve select buttons **312** is arranged in the central region of the panel. In the event that more than twelve horses are running in a given race, the additional horses may be grouped as "field" and identified by number **12.** The odds for each horse running as "field" are the same, and if the player selects the field to win, place or show by operating button No. **12,** he will be successful if any horse in the field wins, places or shows. A window **314** is located to the left of buttons **312** and provides an indication of the number of the race for which betting is at that time permitted. The number appearing in window **314** is displayed before the commencement of betting on that race under the direction of track computer **303** and is changed in each panel **300** when track computer **303** transmits an appropriate signal to the central computer **302** at the proper time. The wagering period prior to the running of the race is controlled by the track computer **303** which causes an "open" light **315** to be lit at each panel **300** during the period in which a wager may be placed on the outcome of the race identified by the number appearing in window **314.** At a predetermined time prior to the beginning of the race the wagering period is closed, light **315** is de-energized, and a "closed" light **317** is caused to be lit. Thereupon no wagers made from panel **300** will be accepted by computers **302** and **303.** This fact is indicated at panel **300** by the lighting of a "rejected" light **319** which may be red in color. Under normal conditions the wager made at panel **300** is accepted by the track computer and an indication of this is given to the player by the energization of an "accepted" light **321** which may be green in color.

Once the player has made his selection of a horse by the operation of one of horse-select buttons **312,** he selects the amount of the wager and the selected desired position for the selected horse, i.e., win, place or show. To this end three sets of money-select buttons **320, 322** and **324** are respectively provided in win, place and show sections **320a, 322a,** and **324a.** Each set of buttons **320–324** includes individual buttons for making wagers in the amount of $2, $5, $10, $50 and $100. Thus to make a wager for a horse to win, one or more of buttons **320** are operated, and for making a place wager, one or more of buttons **322** are operated. The amount of the wager made is determined by which of the buttons in the selected set is operated.

In some race tracks a player is allowed to place wagers on the final two, e.g., the eighth and ninth, races on the day's racing program at anytime after the completion of the second race, as opposed to the other seven races for which wagers may be placed only after the results of the preceeding race have become final.

An advance wager may be made on the panel **300** by operating a button **323** to bet on the eighth race and/or a button **325** to place a wager on the ninth race. The selection of the horse and amount of wager is then made as in an ordinary single-race wager.

After the player has actuated the desired horse select button **312,** and the wager-amount and position select-buttons, the wager is placed by operating a transmit member **330.** Once transmit member **330** is operated the wager cannot be recalled or canceled by the player. The data for the wager (i.e., the number of selected horse, the amount wagered, and the type of wager made) are transmitted in suitable binary form along with the player's identification to control computer **302,** and from there to track computer **303.** The amount wagered is immediately subtracted from the player 3 stored credit balance in the balance storage section of computer 302, and a slip of paper on which the information for that wager is printed is issued to the player from a slot 328. Computer 303 uses the wager data to update its betting-pool data from which the odds for that race are calculated in a known manner. When the wagering period is over, the odds become final.

Upon the completion of the horse race, control computer **302** receives the payoff data for the win, place and show horses as well as combination, and the special races, such as the Daily Double, Exacta etc., from the track computer. The wagers made earlier for that race from the betting panels are all stored in computer **302** and these stored data are scanned and compared to the race results to locate all successful wagers. If the player is successful in picking the winning horse, or in selecting the second horse for place, or in making any other winning wager, the credit-balance register for that player in computer **302** is updated by an amount equal to the payoff for the successful wager multiplied by the number of units wagered, since the payoff in most tracks is calculated for a basic $2 wager. For example, if a player has successfully wagered $10 (five units) on the outcome of a race, the payoff figure is added five times (i.e., multiplied by five) and then added to his previous balance.

To protect the player's privacy, his current credit balance is preferably not continuously displayed in window **306.** If the player should desire to learn his credit balance, so that he may know how much of his initial investment is available for further wagering, the player operates a credit-balance button **336** which causes his credit balance to be viewed at window **306.** The player may also have his credit balance printed on a memo strip by a balance operation of the receipt button **338** which causes a printed slip, prepared by a printer unit housed in panel **300** and controlled by the data stored in computer **302,** to be passed out of the panel through slot **328.**

The computer **302** comprises means to compare the amount wagered by a player against that player's current credit balance, to sense the making to a wager of an amount greater than the player's credit balance and upon that occurrence to prevent the completion of that wager. This condition is reflected at the player's panel by an energization of an overdraft indicator **340** visible through window **306,** and computer **302** will thereupon, in a manner described below, prevent the making of that wager and cause the reject light **319** to be energized.

To increase the amount of his wager, the player may either make a number of single bets during the wager-open period by repeated operations of the horse-select, wager-amount and transmit members or operate the wager-amount-select buttons **320, 322** and **324** a de-

sired number of times until the amount of the desired wager is accumulated and appears in a window **326**. The wager is then effected, that is, the pertinent wager data are communicated to control computer **302** by the operation of transmit member **330**. A player who may wish to place a single wager on a single horse to win, place and show may make such a combination wager by actuating the desired horse-select member and either of two buttons **332** (e.g., for a $6 or $15 wager) on a combination panel **334**, and then operating the transmit member **330**. The combination wager is transmitted to the computer **303** in the form of a single wager. Computer **303** operates on that wager information to translate it into three separate wagers, one each for win, place and show. The amount of each component wager in the combination wager is one-third of the amount wagered by the operation of combination button **332**.

If a horse is "scratched" from the race, this information is transmitted from track computer **303** to computer **302**. To prevent the making of a wager on a scratched horse, a scratch light **342** may be caused to light when the select button **312** corresponding to the scratched horse is operated by the player. After a player has operated some or all of the buttons for the purpose of communicating a wager to computer **302**, but has not yet operated the transmit member **330**, he may cancel his yet uncompleted wager by operating a cancel-wager button **343** to reset all the previously actuated buttons and thereby clear the panel for the making of a new wager. Computer **303** also prevents the making of a wager on a scratched horse if one is made, and causes reject light **319** to be energized at that time. Alternately, the indication of a scratch may be reflected through computer **302** to each of the panels **300** to inhibit the operation of the corresponding select button **312** at the panel.

Upon the completion of the player's wagering activities for a given day, the player generally desires to receive his remaining balance at teller's station **304**. He may, of course, first view that balance at display **306** or have it printed out by the operation of button **338**.

When requested by the player, the teller determines the player's remaining balance by making an inquiry over a teletype line **343** of the stored balance for that player in computer **302**. The latter transmits that information to the teller over status line **345**. When the teller has paid the corresponding amount of cash, the player's balance is reduced by that amount or canceled by the teller transmitting balance-withdrawal data over a line **342**. If there is any question of the player's true balance, the teller, upon the presentation by the player of his receipt, which contains his badge number, code for the day, and the amount deposited by that player, may request an audit of that player's wagering activities for the day, as prepared in computer **302**, over a line **344**. The teller then receives a printed record of all wagers, refunds and payoffs made by or for that player that were recorded and processed in computer **302**.

Upon the completion of the day's activities, the player may elect to leave his credit balance with the track by not collecting his money at the teller's station. To this end, at the end of a day, after all collections have been made, the credit storage portions of computer **302** are scanned to discover all remaining credit balances. This information is conveyed to the teller's station from computer **302** and records of those remaining balances are maintained at the teller's station. A player may then at any subsequent time, by displaying to the teller his identifying receipt, either collect his credit balance or establish a new credit balance in computer **302** for the purpose of wagering.

In this manner, the player need not carry large sums of money to and from the track, thereby reducing the possibility that that money may be lost or stolen. In addition the track may make use of the funds left in its custody for any proper purpose until they are collected by the proper player.

In many race tracks the player has the opportunity to place wagers on specified combinations of races in which the return to the player, if he is successful, may be considerable. The most popular of these is the so-called Daily Double in which the player, to be successful, must select the winners of both races or halves (usually the first and second races on the program) of the Daily Double. A Daily Double wager can be made only before the running of the first race of the Daily Double.

That open period is indicated to the player of the actuation of a "Daily Double open" light **344** under the control of computer **303**. When the Daily Double wagering period ends at a predetermined time prior to the first half of the a "Daily Double, light **344** is turned off and Daily Double closed" light **346** is activated. To make a wager on a Daily Double the player operates one of the select buttons in each of two rows **348** and **350** located at the upper portion of panel **300**. Windows **352** and **354** are respectively located to the left of horse select rows **348** and **350** and indicate the number of the race on which the wager is to be placed. The select buttons in rows **348** and **350** each carry a unique number for each horse in the race. To make a wager on the Daily Double the player first actuates Daily Double button **356**, presses one button in row **348** to select the winner in the first race of the Daily Double, and the operates a button in row **350** to select the winning horse in the second race of the Daily Double. The player then marks the amount of his wager by actuating one of two buttons **358** (the $2 or $10 button) located in a Daily Double panel **360**. To complete the wager the player operates the transmit member **330** to communicate the wagering information to computer **302** and thence to track computer **303**. The amount of the wager is presented to the player in window **326**. To increase the amount of the wager, the player may operate a money-hold button **331** and then operate either wager-amount-select button **358** a desired number of times until the desired wager amount appears in window **326**. The money-hold button **331** may be released by the operation of a release button **333**, by the operation of cancellation member **343**, or by the removel of the player's identification badge from slot **308**.

The player may make wagers on different combinations in the Daily Double to increase his possibility of success, as by combining one or two key horses running in the first half of the Daily Double with several horses running in the second half of the Daily Double. In the system herein disclosed this may be accomplished by operation of money hold button **331** and by a repeated selection of horses in each race by the actuation of one of buttons **348, 350,** followed by the operation of the transmit member **330** for each such combination.

The operation of computer **302** with respect to a Daily Double wager in the manner in which it is re-

corded and updated upon a successful payoff is substantially the same as described above for a single-race wager. The amount of money wagered on the Daily Double is subtracted from the player's credit balance and a successful payoff to the player is reflected in the augmentation of the credit balance by an amount corresponding to the money wagered multiplied by the odds factor for the winning Daily Double provided to computer **302** from track computer **303.** The payoff for a successful Daily Double wager is, of course, usually higher than for a signal-race wager.

In some states other special wagering arrangements are provided in which the player has the opportunity to even further increase his winnings by correctly predicting the results of to a combination of races, rather than just the outcome of a single race. A Twin Double may be considered as being a pair of Daily Doubles, that is the player to win the Twin Double must select the winners of four specified races designated by the track for that purpose. The Exacta requires the player to select the win and place horses in a single race in the correct order of their finish. The Quinella is similar to the Exacta but permits the player to select the first two horses in a given race in either order of finish. The big Exacta requires the player to pick the first two horses in the correct order of finish in two specially designated races. The difficulty and thus the potential payoff of these special wagering combinations is greatest on the Big Exacta and Twin Double combinations. To increase the scope of possibilities in placing wagers on the Exacta and Quinella the player may "box" his bets by placing wagers on all permutations or combinations of two or more horses running in the race on which those wagers are permitted.

To place a Twin Double wager, a button **362** is operated and select buttons **348** and **350** in the Daily Double section of the panel are actuated to select the winners in the first half, to wit, the first two races in the Twin Double. The winning of the first half of the Twin Double provides the player with units that he can then wager on the second half of the Twin Double. In order to continue to make a desired number of wagers on the second half of the Twin Double, he must place a sufficient amount of wagers in the first half of the Twin Double. Assume that the player has decided to wager on three combinations in the first half and four combinations in the second half (e.g., the No. **5** and No. **7** horses in the third Twin Double race combined with the No. **6** and No. **8** horses in the fourth race). Since only one of the wagered combinations in the first-half combination can be successful, the player must thus wager each of the three first-half combinations four times so that he will have at least one unit or ticket to wager on each of his proposed second-half combinations. If the player is successful in the first half of the Twin Double his credit balance is not augmented since the Twin Double is not completed. Instead the number of units available for wagering on the second half of the Twin Double are computed in computer **302** and visually presented in a Twin Double units window **364.** The player may then make his wagers on the second half of the Twin Double by again operating buttons **348** and **350,** the appropriate wager button **358,** and transmit member **330** the desired number of times. Each wagering operation is reflected by a decrease in the indication of the remaining available wagering units in window **364.** If desired, the panel printer may print out the number of wagering units remaining on a slip of paper which is passed to the player from slot **328.** The player may continue to wager until the reading in window **364** is zero at which time the wagering is completed. That zero count is sensed in computer **302** which then prevents the acceptance of any further wagers on the Twin Double.

Of course, if the player is unsuccessful in the first half of the Twin Double, that is if none of his first-half selected combinations is the correct one, no units appear in window **364** (its count remains at zero), and the computer **302** then inhibits all wagers on the second half of the Twin Double.

To make an Exacta wager, a button **366** is operated, two or more of buttons **312** are actuated, and an up only button **370,** a "down only" button **372** or a box button **369** is operated. That is if the player is wagering that horse No. 7 will win, and horse No. 3 will come in second, he will depress buttons No. 3 and No. 7, and then box in the "down only" direction by the operation of button **370.** Ordinarily in a straight race only one of buttons **312** may be depressed at a single time, that is an operation of a horse select button releases any previously operated select button pressed prior to a cancel or transmit operation. However, button **366,** when operated, overrides the button control mechanism to allow the simultaneous operation of two or more of buttons **312.** The Exacta wager is completed by first operating one of buttons **358** and then operating transmit member **330.**

A Quinella wager is made by operating a button **368** and depressing two of buttons **312** corresponding to the first two horses picked to finish the race in either order. Button **368** like button **366,** permits the simultaneous depression of two or more of buttons **312.** One of buttons **358** and transmit member **330** are then operated to complete the Quinella wager.

In the Quinella (or Exacta) wager it may be desired to make wagers on the combinations (or permutations) of two three or more selected horses. Since in a Quinella the order of finish is irrelevant, it is the combination that is desired; in an Exacta, in which the order is significant, it is the permutation that is desired. To place a plurality of Quinella (or Exacta) wagers, the player selects two, three or more horses and these numbers are then "boxed" by the programming of computer **302** in combination with appropriate circuitry in panel **300** by the operation of boxing button **369** to create wagers on all the combinations (permutations) of the selected horses. The instruction to box follows from an actuation of the Quinella (or Exacta) button **368** (**366**) the operation of button **369,** and the selection of two three or more select buttons **312.**

Thus, for example, if the player wishes to box horses **1, 2** and **4** in an Exacta wager, the boxing system will place wagers on the **1–2, 1–4, 2–4, 2–1, 4–1,** and **4–2** permutations. If it is desired to box in only one direction, that is to place an Exacta wager on either the first three or the second three of these permutations, the player, in addition to operating the Exacta button **366** and the box button **369,** must also operate the "up only" button **370** or the "down only" button **372.** Thus, if buttons **366, 369** and **370** were operated, the player would have Exacta wagers on only the **1–2, 1–4** and **2–4** finishing sequences.

For a Quinella wager the operation of buttons **368** and **369,** and of the **1, 2** and **4** select buttons **312,**

causes the boxing of these horses to place wagers on the 1–2, 1–4 and 2–4 horses in either order of finish.

The Big Exacta is similar to a Twin Double in that the player is required to correctly predict the first two horses in their exact order of finish in two races. Since the Big Exacta races are usually different from the race assigned to an Exacta wager, the operation of button **366** at the first race of the Big Exacta indicates to the computer **302** that a Big Exacta wager is being made, and that a successful outcome of the first race should not be credited to the player's credit balance, but rather should be registered in winning units in window **364** indicating to the player the number of units available for wagering on the second race in the Big Exacta. As in the Twin Double, wagers made on the second race of the Big Exacta, by the operation of two or more buttons **312**, may continue until the number of units in window **364** is decreased to zero at which time the computer **302** will accept no further wagers. As in a regular Exacta, the player in a Big Exacta wager may wager all or only selected up or down permutations of two or more horses, in each race, by the boxing technique outlined above.

BETTING PANEL 300

The Betting Panel **300** is illustrated in FIGS. 8*a* - 8*c* block-diagram form. The player identifies himself to control computer **302** by inserting his badge into an optical badge reader **375**, which scans the configurations of holes in that badge to store an identification word in the initial bit positions of a player-identification register **374**. The badge reader **375** senses the presence or absence of the badge. Whenever the badge is removed, reader **375** resets player - identification register **374**, thereby clearing its contents.

The player's identification number is completed by sequenally operating code buttons **310** to enter the remaining digits in register **374**. pon the entry of the final code digit in register **374**, the stored player-identification word is transmitted through a multiplexer **376** to computer **302**. The stored player identification word is continuously available to computer **302** through multiplexer **376**.

When computer **302** has received and verified the player's identification code number, it transmits over a line **378** (FIG. 6) the player's credit balance which was fed into its memory at the time the player established his credit at teller's station **304**.

That balance word is stored in a balance register **380** and is transferred to a decoder driver **382** which processes that information into a form to operate balance-credit display **306**. To view his balance when desired, the player operates balance button **336** which enables a timer **384** to actuate the credit display **306** for a brief period determined by the enabling period of timer **384**. Decoder driver **382** also transmits the credit balance information to a printer/decoder/converter **389**. In order to obtain a printout of his balance, when desired, the player operates the balance receipt button **338** which applies an enabling signal to one input of a selector **386**, another input of which receives the balance-credit data via printer/decoder/converter **389**. Selector **386** in turn causes a printer **390** located in panel **300** to print out the player's current credit balance. The date is inserted daily into printer **390** and is printed with each line.

The track computer **303** transmits race-number data to control computer **302** over a line **392** (FIG. 6), and suitable corresponding data are transmitted from computer **302** to panel **300** over a line **394** where they are stored in race-number register **396**. The race number is transmitted each time a form of betting is opened or closed. These data, which also include betting open and betting closed information are transferred to a decoder driver **398** which produces therefrom signals to operate either the betting-open or the betting-closed indicators **315, 344** or **317, 346**, whichever is appropriate, and the race-number displays **314** or **352** and **354**. When betting is closed, a signal to that effect may be used to disable the race-number display **314**, or displays **352** and **354**.

As described above, the making of a wager is carried out at panel **300** during the open period by actuating suitable buttons on the panel which reflect all the pertinent information for that wager, such as horse selection, position, and the amount of the wager. For a simple race, one of the buttons **312** is operated to introduce the desired horse number into a horse-select register **399**.

The operation of one of the win, place, show or combination buttons **320, 322, 324** or **332** is effective to feed a corresponding input to an accumulator **401** and a position register **402**. That is, a two-dollar win button operation inserts a two-dollar amount into accumulator **401** and a win word into register **402**. The combination of the information inserted in this manner into registers **399, 401** and **402** thus constitutes the significant information necessary to identify the nature of the bet. For a simple race bet such as this, a bet-identification register **400** is left unused, i.e., its contents are zero. The combined word from registers **399** through **402** is applied to the input of a selector **404** and from that selector to one input of an AND gate **406**. When transmit member **330** is operated, gate **406** is enabled and the combined bet data are transmitted through multiplexer **376** to computer **302** over a line **408** (FIG. 6). The player-identification word is also transmitted through multiplexer **376** to computer **302**.

The accumulator **401** is also connected to a decoder and display **326** to provide a visual indication of the amount wagered. Repeated operation of one of the win, place, show or combination buttons **320, 322, 324** or **332** allows the player to accumulate a wager amount which is the sum of the amounts indicated by his repeated operation of the amount buttons. In this way, the player may designate a wager of almost any value before operating the transmit member **330**.

The control computer **302** compares the amount of the bet with the player's current credit balance and if it finds that the player's balance is sufficient to cover the wager it transmits the bet data over line **412** to track computer **303**. If, for example, the wager is timely placed (i.e., if betting is open), and if the selected horse is not scratched from the race, track computer **303** accepts the bet and transmits a signal over a line **414** to computer **302**. If the bet is unacceptable for any reason, such as a scratched horse or the late placement of the bet, or if the selected betting pool is closed as when no show betting is permitted in the race, track computer **303** will send a reject signal to computer **302** over line **414**.

The appropriate accept or reject signal is transmitted from computer **302** to panel **300** over a line **416** and is

fed into a decoder driver **418**. If the signal is a bet - accept signal, accept indicator **321** is operated and printer **390** is enabled through selector **386** to print out a memo containing the pertinent wager information received via a decoder/converter **388** from multiplexer **376**.

The accept signal is also applied to one input of an AND gate **335**. If hold-money member **331** is not actuated, a reset signal from gate **335** clears registers **400–402**, preparing the registers for a completely new bet. If, as explained above, hold-money member **331** is actuated, gate **335** will not transmit the reset signal to registers **400–402**. The player may now select another horse at buttons **312** and place the same type of bet by operating transmit member **330**.

To reset the money-hold circuit to normal operation, the player operates release member **333**. This resets money-hold actuator **331** and also transmits a clearing signal to registers **399–402**. The clearing signal to register **399** is transmitted directly from release member **333**. The clearing signal for registers **400–402** is transmitted through a gate **337** which is present to isolate the clearing signal of gate **335** from horse-select register **399**. Operation of cancel member **343** at any time clears registers **399–402**, as does the release member, except that money-hold member **331** is not affected.

If the wager is rejected for the reason that the player's balance is insufficient to cover the amount of the wager, decoder driver **418** produces an overdraft signal which enables the overdraft indicator **340** directly and the reject indicator **319** through an OR gate **341**. A scratch signal is transmitted from computer **302** through decoder driver **418** to enable the scratch incidator **342** directly and the reject indicator **319** through gate **341**. Any other reject signal is transmitted from decoder driver **418** through gate **341** to actuate the reject indicator **319**.

A wager on the Daily Double is made, as described avove, by operating daily-double button **356**, operating certain horse-select buttons **348** and **350**, and then operating one of buttons **358**. As shown in FIG. **8***a*, the operation of button **350** inserts data for the second race into horse-select register **399** and the operation of the horse-select button **348** for the first race in the Daily Double stores these data in a second horse select register **420**, whose output is applied to another input of selector **404**. The making of a Daily Double wager by the operation of daily-double member **356** supplies a control signal to selector **404**, causing the latter not to transmit the position data to gate **406**, but instead to transmit data from the first and second horse-select registers **399** and **420** to gate **406** and, upon the operation of transmit member **330**, to computer **302**.

Betting on the first half of the Twin Double proceeds in the same fashion as with the Daily Double just described except that twin-double member **362** is used in place of daily-double member **356**.

After both races in the first half of the Twin Double have been run and their results made official, track computer **303** notifies control computer **302** of the results. Computer **302**, in turn, scans its memory for all winning combination bets on the first half of the Twin Double. For each such winning combination it credits units to the player as described above. The credit units are made available to betting panel **300** via register **410** and an AND gate **424**. When twin double member **362** is actuated it transmits an enabling signal to gate **424** allowing register **410** to transmit the number of units to decoder driver **426** and thence to units indicator **364**.

The player may then proceed to place wagers on the second half of the Twin Double in a manner similar to that for the first half of the twin-double. That is, twin double member **362** and horse-select buttons **348** and **350** are actuated, followed by the operation of transmit member **330**. Computer **302**, instead of comparing the wager amount to the credit balance, compares the wager unit made on the second half of the Twin Double to the units balance. If there are sufficient units to cover the wager, computer **302** processes the wager to track computer **303** in the same manner as before. The new units balance, less the units just wagered, is made available to register **410**. In this way, several successive Twin Double second-half wagers may be placed until the units balance is exhausted. Any further attempts by the player to place second-half Twin Double wagers will be rejected by computer **302** actuating the reject indicator **319** as previously described.

To place a wager in advance on races **8** or **9**, at tracks permitting such advance sales, the player actuates either advance-sale-8 member **323** or advance-sale-9 member **325**. Actuation of either of members **323**, **325** places an identification code word in bet-identification register **400**. The player proceeds to make a horse selection and to actuate the win, place, show, or combination buttons as before in the case of a simple race wager. Upon the actuation of transmit member **330** the entire contents of registers **399–402** including the advance-sale code from register **400** are transmitted to computer **302**.

Similarly the player may place a wager on the Quinella by actuating Quinella member **368**, or the Exacta by actuating Exacta member **366**. Either operation places an appropriate code in bet-identification register **400**. In the case of a Quinella or Exacta wager, the player makes more than one selection on buttons **312**, thereby placing more than one horse number in horse-select register **399**. For a simple Quinella bet, the player then actuates transmit member **330**.

However, for an Exacta wager the player also actuates either "up only" member **370** or "down only" member **372** in order to transmit the essential information as to the predicted sequence of the finish. The actuation of members **366** and **370** or **372** loads appropriate codes into register **400** for transmission to computer **302**.

As described above, the player may elect to box two or more horse selections in the case of an Exacta wager, or three or more horse selections in the case of a Quinella wager. To do so he also actuates box member **369** adding an appropriate code to bet identification register **400**. He may also, in the case of the Exacta, select "up only" boxing or "down only" boxing by actuating either member **370** or member **372** as appropriate. Whichever options are selected by the player, appropriate codes are loaded into register **400** and upon the subsequent actuation of transmit member **330** the entire contents of register **399-402** are transferred to computer **302** as previously described.

A player may place wagers, at tracks and in states permitting same, on the Big Exacta. To do so member **366** is used in the same fashion that twin-double member **362** was used. That is, for the first half of a Big Exacta the player actuates member **366** and then proceeds to make Exacta selections as previously de-

scribed. When the second half of the Big Exacta is opened, computer **302** loads the register **410** for the units indicator **364** as previously described for a Twin-Double wager operation. Actuation of Big Exacta member **366** activates units indicator **364,** informing the player of the number of wagering units he is entitled to wager, if any. The player then proceeds to place his second-half Big Exacta wagers in the same fashion as for the Twin Double previously described except, of course, Big Exacta member **366** is operated instead of Twin Double member **362.**

The operation of computer **302** may be understood by reference to the simplified program flow charts shown in FIGS. **9***a* – **9***d*. It will be appreciated that computer **302** may be a general-purpose digital computer programmed to perform the required operations from data derived from the panels **300** and from the track computer **303,** or a special purpose computer designed to perform the required functions. It is believed to be well within the skill of those skilled in the programming art to implement the complete program for whatever type of computer is selected, so that only the basic steps in that program are described herein.

The program routine illustrated by the flow chart of FIG. **9***a* is the background-program routine, that is the program under which computer **302** operates when it is not receiving wagering data from any of the betting panels **300** or from track computer **303.** Thus, computer **302** first senses at **430** if data are being received from the teller's station. If the answer is yes, these data are read at **432.** If the answer is negative, the computer keeps on repeating the step until it obtains an affirmative response at which time a decision is made at decision step **434** to determine whether the teller's data include an instruction to open a new account for a player.

If the answer at step **434** is affirmative, a storage area in the memory of computer **302** is designated for the player at **436,** the amount deposited is added to the player's credit balance at **438,** and a memo confirming the new account is sent to the teller's station as indicated at **440** after which the cycle is repeated.

If the answer to decision step **434** is negative, the decision is then made at **442** as to whether the new data reflect a new deposit made by a player into his previously established account. Upon an affirmative response the new amount is added to that credit balance at **438,** and a suitable memo is sent to the teller as described. Upon a negative response at step **442,** the decision is made at step **444** as to whether the newly received data are for closing a previously established wagering account.

Upon an affirmative reply at step **444,** the computer is then instructed to search its wager storage area to determine at **446** whether that player has any outstanding or "live" wagers at that time. For any such live wagers, the information for that wager and the player's credit balance are written to the teller at **448** and **450,** the storage area in the control-computer memory for that player is closed at **452,** and a zero credit balance for that player is established at **454,** after which the program is returned to its initial idling condition at step **430.**

Upon a negative response to decision step **444,** a determination is then made at step **456** if the new data constitute a withdrawal by the player from his credit balance. If the response is affirmative, the player's credit balance is compared to the amount of the withdrawal at **458.** If the latter exceeds the former a withdrawal-reject memo is written to the teller as indicated at **460** to prevent the completion of the withdrawal at the teller'station, and the cycle is repeated. If the player's balance is sufficient to cover the amount of the withdrawal, his balance is reduced by that amount as indicated at **462,** and the player's new reduced balance is sent to the teller as indicated at **464.**

Upon a negative response at decision step **456,** a decision is then made at **466** as to whether the new panel data are indicative of the closing of wagering for the day. Upon an affirmative response to that step the program is terminated. A negative reply at step **466** indicates an error in the received data and the program is caused to be repeated, commencing once again at step **430.**

When computer **302** receives wager data from one of the panels or data from track computer **303,** the background program of FIG. **9***a* is temporarily halted to allow for the processing of the wager in accord with the foreground program for which the flow chart is illustrated in FIG. **9***b*. The first step of that program is to decide at step **468** if the data are obtained from a betting panel. Upon an affirmative response, the data are read into computer **302** at **470,** and a security match is made at **472** to confirm that the player-identification code received from the panel matches with the code word stored in computer **302** for that player. If the security match is not successfully made, the wager data are rejected, and a reject signal is sent to the panel as indicated at **474.**

Upon a positive outcome of the security match, the credit balance for the identified player is sent to the panel as indicated at **476,** and a determination is made at **478** if the data received from the panel are wager data. If it is not, an error is indicated, the program is terminated, and the background program of FIG. **9***a* is reinsituted.

Upon an affirmative response at decision step **478,** a decision is then made at decision step **480** to determine if the wager is a Quinella wager. If the wager is a Quniella wager a decision is then made at decision step **482** to see whether the wager data contain a boxing command. If such a command is sensed the computer is instructed to perform an up-combination subroutine at **484,** which will be more completely described below with reference to FIG. **10***a*. Upon a negative response to decision step **482** the computer is then instructed to perform the make-bet subroutine **486,** which will also be described below in greater detail with respect to FIG. **9***c*, after which the foreground program of FIG. **9***b* is terminated and the background program of FIG. **9***a* is resumed.

Upon a negative response to decision step **480,** a decision is made at step **488** to determine if the wager made is an Exacta wager. If it is not, indicating a non-special race, computer **302** is instructed to perform the make-bet subroutine **486.** If the wager is an Exacta, a decision is made at step **490** to determine if an up-only Exacta wager is desired. If the reply at step **490** is negative, the computer is instructed to perform a down-combination subroutine **492** which is more completely described below with reference to FIG. **10***b*. After the completion of subroutine **492,** a decision is made at step **494** to determine if a down-only Exacta is desired. If the answer to step **494** is affirmative, the foreground

program terminates. If the response at step **494** is negative, indicating that an Exacta in both the up and down directions is desired, computer **302** is instructed to perform up-combination subroutine **484**, after which the foreground program is terminated.

If the response to decision step **468** is negative, a determination is made at step **496** to determine if the input data come from track computer **303**. If they do not, an error is indicated, the program is terminated, and the background program of FIG. **9***a* is reinstituted. Upon a positive response at decision step **496**, the data from computer **303** are read at **498** and a decision is made at step **500** to determine if those data contain race-number information. If the reply at step **500** is affirmative the race-number information is sent to panel **300** as indicated at **502** and the program is terminated.

Upon a negative response at decision step **500**, the decision is then made at step **504** to determine if the data from track computer **303** contain scratch information. For a positive reply the identity of the scratched horse is stored in computer **302** as indicated at **506**, so that a subsequent wager made from panel **300** on a scratched horse will be rejected in a manner described below. Upon the completion of step **506** the program proceeds to perform a make-payoff sub-routine **510** illustrated in greater detail in FIG. **9***d*, in which the credit balance of all players who had wagered on the scratched horse will be augmented by an amount corresponding to the amount wagered.

Upon a negative response at step **504**, computer **302** then makes a decision at step **508** to determine if the data from track computer **303** constitute payoff information for a unit or two-dollar wager once the results of a race are official. If the response to decision step **508** is also negative, an error is indicated and the program is terminated. Upon an affirmative response at decision step **508**, the computer is instructed to perform a make-payoff subroutine **510** in which the credit balances of all successful players are augmented by an amount corresponding to the amount wagered by the successful player and the winning payoff for his wager.

FIG. **9***c* illustrates the make-bet subroutine **486** which is initiated after a negative decision is made at either of decision steps **482** and **488** as described previously. The first step in this subroutine is to decide at step **512** whether the wager made is for the second half of a Twin Double wager. If the response is negative a similar decision is then made at step **514** to determine if the wager is for the second half of a Big Exacta wager.

For an affirmative response to either of decision steps **512** or **514** the wagering units credited to the player for a successful wager on the first half of these wagering combinations, as described above, is compared at step **516** with the amount of the wager. If the amount of the wager exceeds the number of available wagering units, an overdraft signal is sent to the player's panel as shown at **518**. For a negative response at decision step **514**, the amount of the wager is compared at step **520** with the player's credit balance. If the former exceeds the latter, step **518** is performed to provide an overdraft indication at the player's panel and the make-bet subroutine is terminated.

For a positive comparison at either of steps **516** or **520**, depending on the nature of the wager, the make-bet sub-routine then determines at step **522** whether the selected horse has been scratched from the race. If that determination is positive, a scratch signal is sent as indicated at **524** to the player's panel and the make-bet subroutine is terminated. If the player's balance is sufficient, the bet information is transmitted from control computer **302** to track computer **303** as indicated at step **525**.

Computer **302** awaits a response from computer **303**, as indicated at decision step **526**, and continues to recycle until that answer is received. That answer is analyzed at decision step **528** to determine if the track computer has confirmed or rejected the wager. For a rejected wager, for any of the reasons described above, a reject signal is transmitted to the player's panel as indicated at step **530** and the make-bet subroutine is terminated.

If the player's wager is confirmed, the wager data are logged or inserted into wager at the memory storage area in computer **302** previously assigned to the player as indicated at **532**, after which the player's account is debited or reduced by the amount of the wager as indicated at **534**. The make-bet subroutine is then completed by sending an accept signal to the player's panel as shown at **536**.

FIG. **9***d* illustrates the make-payoff subroutine **510** that is initiated, as shown in FIG. **9***b*, upon the official certification of a successful wager on the part of the player. The subroutine is initiated at step **538** in which the accounts of each player are searched for a current or "live" wager made on any winning horse, which includes successful place or show wagers made on horses that finish in their predicted position or better.

A determination is made at each player's stored account at decision step **540** whether a successful wager has been made. If there is no such "hit", a decision is then made at step **542** to determine whether all live wagers have been searched. If the answer to step **542** is affirmative, the indication is that no successful wagers were placed for that race, no payoffs need thus be made, and make-payoff subroutine **510** is terminated. If the decision at step **542** is that not all live wagers have been searched, step **538** is repeated until step **540** locates a successful wager.

When that occurs, the wager is examined at steps **544** and **546** to respectively determine if the successful wager is for the first half of a Twin-Double or Big Exacta combination. If the wager is for either of these combinations, the amount of the wager is divided by two at step **548**, and the player's units balance is updated by an appropriate amount at step **550**.

If the successful wager is for neither of these combinations the pay off price as computed at track computer **303** for a basic two-dollar wager is multiplied by one-half the amount of the wager at step **552**, and the product derived at step **552** is added to the successful player's credit balance at step **554**, that balance having been previously adjusted by subtracting the amount of the wager at the time the wager was made at step **534**.

Upon the completion of steps **550** or **554**, the now processed live wager is closed by being converted to a "dead" wager at step **556**, after which the search for remaining live wagers is reinitiated at decision step **542**.

BOXING

The program for a Quinella or an Exacta operation is illustrated schematically in FIGS. **10***a* and **10***b*. As noted above, boxing is performed whenever a player electing to wager on the Quinella (or Exacta) combinations, selects three (or two) or more horses and operates one of buttons **369, 370** or **372** on panel **300.**

When it is determined at decision step **482** in FIG. **9***b* from the nature of the water, that a boxing operation is required, an appropriate input signal is generated to trigger a decision step at **484** which determines whether the wager is a Quinella or an Exacta. If the wager is a Quinella, computer **302** is instructed to perform an up-boxing operation according to the subroutine illustrated in FIG. **10***b*. Since the boxing operation for a Quinella is the same as that for an Exacta in which boxing is performed only in the up direction, the results of that operation are a series of wagers placed on the proper Quinella combinations which are then processed in the manner of regular wagers as described above.

The flow chart of the down-only subroutine **492** is illustrated in FIG. **10***a*. Upon instructions to perform a down boxing operation a counter in computer **302,** here designated CTR1, is set to a count of **13** as indicated at **558.** The horse selections to be boxed are inserted in a work area **1** located in the computer memory at **560.** The count in counter CTR1 is then diminished by one at **562.** The count in index counter CTR1 is used to examine the corresponding slot in Work Area **1** at **564** in which the horse-select data are stored, and a decision is then made at step **566** to determine whether the initial count in counter CTR1, that is horse **12,** corresponds to one of the selected horses. If the response is negative, the stored count in counter CTR1 is compared to zero at **568.** If that count is greater than zero, the count in counter TR1 is once again decreased by one at **562.** The above-described steps are repeated until the reduced count in counter CTR1 corresponds to the number of the selected horse having the highest number.

At that time an instruction is given at **570** to transfer the count in counter CTR1 to a memory cell here designated as first-half. The data in Work Area **1** are then stored in a second memory portion, here designated as Work Area **2,** as indicated at **572,** and the data from counter CTR1 are transferred to a counter CTR2, at **574.** The count in the latter counter is then decreased by one at **576.** The decreased count in counter CTR2 is used to examine the correspondingly numbered slot in Work Area **2** at **578.** A determination is made at **580** to see whether or not that slot contains a selected horse; if that decision is negative, the count in counter CTR2 is again compared to zero at **582,** and if it is found to be greater than zero, counter CTR2 is again decreased by one at **576.** This process is repeated until the decision at **580** is affirmative, at which time the count in that counter is transferred at **584** to a second memory cell here designated as second-half. At this time the counts in the first-half and second-half cells reflecting the highest and next-highest numbers of the selected horses, is presented as a single wager to the make-wager subroutine **486** illustrated in FIG. **9***c*. This wager is the first down-only Exacta Combination wager.

At this time the comparison at **582** is repeated and the count in counter CTR2 is again incrementally decreased by one, one or more times, until the count in that counter corresponds to the number of the next-lowest-numbered selected horse, at which time a second combination wager is performed consisting of the latter selected horse and the highest-numbered horse stored in the first-half memory cell. This procedure is then repeated until the count in counter CTR2 reaches zero at which time the decreasing number combinations of the highest-numbered horse and all other selected horses is made, all at subroutine **486.**

When counter CTR2 reaches zero, decision step **582** then causes step **562** to be repeated which again causes the count in counter CTR1 to be decreased by one until the next-lowest-numbered selected horse is located in work area **1.** At that time steps **570–584** are repeated until all two-horse, down-only combinations of that next-lowest numbered selected horse and all lower-numbered selected horses are derived and wagers made thereon at **486.** This process is repeated until the count in counter CTR1 reaches zero. The down-only subroutine of FIG. **10***a* is then terminated when the outcome of decision step **568** is that the count in counter CTR1 is equal to zero, which indicates that all the down-only, two-horse combinations of the selected horses have been formed and wagers placed thereon.

The operation of an up-only subroutine **484** is illustrated in FIG. **10***b*, and is substantially similar to the down-only subroutine **492** of FIG. **10***a*. When an instruction to perform the latter subroutine is present, counter CTR1 is set to zero at **586,** and, as before, the horse select data are stored in Work Area **1** at **588.** The count in counter CTR1 is increased by one at **590** and that increased count is used to index and examine the corresponding slot in Work Area **1** at **592** whereupon a decision as to whether or not that indexed slot contains a selected horse is made at **592.** Upon a negative response to that decision, the count in counter CTR1 is compared to twelve at **596.**

If the count in counter CTR1 is less than twelve, step **590** is repeated to again increase the count in that counter by one. This process is repeated until the count in counter CTR1 causes a slot in Work Area **1** having the lowest-numbered-horse select bit therein to be examined, resulting in an affirmative decision at step **594.**

The count in counter CTR1 containing the lowest-numbered selected horse is transferred at **598** to a first-half memory cell. Thereafter, the horse-select data in Work Area **1** are transferred at **600** to Work Area **2** and the count in counter CTR1 is transferred to counter CTR2 at **602.** The count in the latter counter is then increased by one at **604,** and that increased count is used to examine a correspondingly numbered slot in Work Area **2** at **606.** A decision is then made at step **608** to determine whether a selected horse bit is stored in that slot.

If the decision is negative, the count in counter CTR2 is compared to twelve at step **610.** If the count is less than twelve, step **604** is repeated to further increment the count in counter CTR2 until the answer to decision step **608** is affirmative. That count, which represents the next-highest selected horse, is transferred to Work Area **2** at **612,** and the combined wager representing a combination of the lowest-numbered and next-lowest-numbered selected horses is then made at subroutine

486. Step **610** is then repeated one or more times to continue to update counter CTR2 until all combinations of the lowest-numbered horse (the count in counter CTR1) and the other higher-numbered selected horses are derived and wagers placed thereon. At that time the count in counter CTR2 reaches **12** whereupon the decision at step **610** causes step **590** to be repeated, thereby causing the count in counter CTR1 to be increased by one. The latter operation is then repeated until the count in counter CTR1 corresponds to the number of the next-highest selected horse, after which steps **598–612** are repeated to bring about all combinations of the nest-highest-numbered selected horse and all higher-numbered selected horses. After the completion of each succeeding series of up-only, two-horse combinations, counter CTR1 is further updated by one until all up-only combinations are derived and wagers placed thereon at which time its count will be **12**. When the count in counter CTR1 reaches **12**, the subroutine of the up-only Exacta wager is completed.

It will thus be apparent that my invention can be applied to a variety of games of chance, with manual or automatic generation of result signals to be transmitted to remote players' stations, and that many details of circuitry of structure may be modified; thus, for example, the token-operated credit-balance register (shown at **106** in FIG. **3B** and not illustrated in FIG. **5**) may be set by a signal from the banker upon the payment of a corresponding cash amount or may be operated by a special key the player may buy in lieu of a token. Similarly, credit balance may be established in the horse-race betting system of FIG. **6** by inserting tokens into the panel as in the dice system. The specific wagering combinations described herein for use with the horse race system are not limiting in nature, and it will be understood that the system could be readily adapted for the processing of other wagers or combinations of wagers. While the racing wagering system has been specifically described for facilitating the making of wagers on horse racing, it could be used to equal advantage at dog tracks or jai-alai games in states permitting wagering on those events.

The system of the invention is thus highly advantageous in that it permits a player to participate in the prediction of the outcome of a fortuitous event in a far more convenient manner which greatly adds to the pleasure of that participation.

Moreover, by facilitating the making of wagers at locations such as race tracks, more people will take advantage of the opportunity to enjoy a day at the track, with the resulting increase in revenue by the track and thus by the state which receives a share of track revenues.

These and other variations, readily apparent to persons skilled in the art, are intended to be embraced within the spirit and scope of my invention as defined in the appended claims.

I claim:

1. A data-processing system for determining gains and losses from bets placed on the outcome of a recurring fortuitous event, comprising:

a banker's station for the acceptance of wagers;

a panel provided with numerical selector means operable by a player;

register means at said panel manually operable to display an initial credit balance, but otherwise inaccessible to the player;

arithmetic means forming a first and a second channel for the additive and the subtractive introduction, respectively, of a wagered amount into said register means in response to the operation of said selector means, the latter being inoperative for amounts exceeding said credit balance;

computer means in said first channel for multiplying said wagered amount by a predetermined odds factor under the control of said selector means;

banker-controlled first switch means at said station for establishing open and closed phases of operation;

first circuit means controlled exclusively by said first switch means for locking said selector means in position during each closed phase pending determination of the outcome of said event;

second switch means at said station for signaling the outcome of each event wagered on before the beginning of the next open phase; and

second circuit means responsive to said second switch means for actuating said arithmetic means.

2. A system as defined in claim **1** wherein said register means is provided with at least one slot for the insertion of a token to display an initial credit balance.

3. A system as defined in claim **1** wherein said panel is provided with overdraft-indicator means jointly controlled by said register and said selector means.

4. A system as defined in claim **1** wherein said panel is provided with cancellation means for annulling a selection, said first switch means controlling said cancellation means for disabling same during said closed phase.

5. A system as defined in claim **4** wherein said arithmetic means includes logic circuitry presettable by said selector means for enabling one of said channels in response to one type of signal from said second switch means, enabling the other of said channels in response to another type of signal from said second switch means and enabling neither channel in response to a third type of signal from said second switch means, said logic circuitry further controlling said cancellation means to maintain the disablement thereof until either of said channels is enabled.

6. A system as defined in claim **1** wherein said selector means includes a first selector for choosing one of several possible outcomes of said event and a second selector for determining the amount wagers on such outcome.

7. A system as defined in claim **1**, further comprising television means including a camera positioned to observe the event wagered on and a receiver adjacent said panel linked with said camera by a closed circuit.

8. A data-processing system for determining gains and losses from bets placed on a fortuitous event, comprising:

numerical selector means at a location remote from the site of said event operable by a player to indicate an amount wagered on the outcome thereof, said selector means being provided with cancellation means for annulling a selection;

register means at said location inaccessible to the player following operation thereof to display an initial credit balance, said register means being re-

sponsive to said selector means for deducting the wagered amount from said balance;

arithmetic means coupled to said register means and provided with input means inaccessible to the player for actuating said arithmetic means under the control of said selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means said wagered amount multiplied by a predetermined odds factor to increase the existing credit balance; and

signaling means inaccessible to the player for disabling said cancellation means for a limited period immediately prior to determination of the outcome of said event.

9. A system as defined in claim **8**, further comprising inhibiting means linking said register means with said selector means for preventing entry in the latter of a wagered amount exceeding the existing credit balance.

10. A system as defined in claim **8**, further comprising a control station at the site of said event provided with said input means.

11. A system as defined in claim **10**, further comprising indicator means at said remote location operable from said control station to signal the outcome of said event.

12. A data-processing system for determining gains and losses from bets on a fortuitous event, comprising:

first selector means at a location remote from the site of said event operable by a player to indicate an amount wagered on the outcome thereof;

second selector means at said location operable by the player to choose one of several types of wagers;

register means at said location inaccessible to the player following operation thereof to display an initial credit balance, said register means being responsive to said first selector means for deducting the wagered amount from sai balance;

calculating means coupled to said second selector means for determining an odds factor from the chosen type of wager;

arithmetic means coupled to said register means and to said calculating means, said arithmetic means being provided with input means inaccessible to the player for actuating said arithmetic means under the control of said first selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means said wagered amount multiplied by said odds factor to increase the existing credit balance;

a control station at the site of said event provided with said input means;

cancellation means coupled to said first and second selector means for annulling a selection; and

signaling means operable exclusively from said control station for disabling said cancellation means for a limited period immediately preceding determination of the outcome of said event.

13. A system as defined in claim **12**, further comprising inhibiting means linking said register means with said first selector means for preventing entry in the latter of a wagered amount exceeding the existing credit balance.

14. A data-processing system for determining gains and losses from bets placed on a fortuitous event, comprising:

a plurality of playing stations remote from the site of said event;

numerical selector means individual to a player at each of said playing stations, said selector means being operable by the respective player to indicate an amount wagered on the outcome thereof;

register means at each of said playing stations individual to the respective player and inaccessible to such player following the operation thereof to display an initial credit balance, said register means being responsive to said selector means for deducting the wagered amount from said balance;

a central control station common to all said playing stations;

arithmetic means individual to each playing station coupled to said register means thereof;

input means at said control station common to all said arithmetic means for actuating same under the control of the respective selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means the wagered amount indicated by the associated selector means multiplied by a predetermined odds factor;

individual cancellation means at each playing station normally operable by the respective player for annulling a selection; and

signaling means common to all said selector means and operable exclusively from said control station for disabling said cancellation means at each playing station for a limited period immediately preceding determination of the outcome of said event.

15. A data-processing system for determining gains and losses from bets placed on a fortuitous event, comprising:

numerical selector means at a location remote from the site of said event operable by a player to indicate an amount wagered on the outcome thereof;

register means at said location inaccessible to the player following operation thereof to display an initial credit balance, said register means being responsive to said selector means for deducting the wagered amount from said balance;

arithmetic means coupled to said register means and provided with input means inaccessible to the player for actuating said arithmetic means under the control of said selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means said wagered amount multiplied by a predetermined odds factor to increase the existing credit balance; and

signaling means inaccessible to the player for making said selector means ineffectual for a limited period immediately preceding determination of the outcome of said event.

16. A system as defined in claim **15**, further comprising inhibiting means linking said register means with said selector means for preventing entry in the latter of a wagered amount exceeding the existing credit balance.

17. A system as defined in claim 15, further comprising a control station at the site of said event provided with said input means.

18. A system as defined in claim 17, further comprising indicator means at said remote location operable from said control station to signal the outcome of said event.

19. A data-processing system for determining gains and losses from bets placed on a fortuitous event, comprising:

first selector means at a location remote from the site of said event operable by a player to indicate an amount wagered on the outcome thereof;

second selector means at said location operable by the player to choose one of several types of wager;

register means at said location inaccessible to the player following operation thereof to display an initial credit balance, said register means being responsive to said first selector means for deducting the wagered amount from said balance;

calculating means coupled to said second selector means for determining an odds factor from the chosen type of wager;

arithmetic means coupled to said register means and to said calculating means, said arithmetic means being provided with input means inaccessible to the player for actuating said arithmetic means under control of said first selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means said wagered amount multiplied by said odds factor to increase the existing credit balance;

a control station at the site of said event provided with said input means; and

signaling means operable exclusively from said control station for making said first and second selector means ineffectual for a limited period immediately preceding determination of the outcome of said event.

20. A system as defined in claim 19, further comprising inhibiting means linking said register means with said first seletor means for preventing entry in he latter of a wagered amount exceeding the existing credit balance.

21. A data processing system for determining gains and losses from bets placed on a fortuitous event, comprising:

a plurality of playing stations remote from the site of said event;

numerical selector means individual to a player at each of said playing stations, said selector means being operable by the respective player to indicate an amount wagered on the outcome thereof;

register means at each of said playing stations individual to the respective player and inaccessible to such player following the operation thereof to display an initial credit balance, said register means being responsive to said selector means for deducting the wagered amount from said balance;

a central control station common to all said playing stations;

arithmetic means individual to each playing station coupled to said register means thereof;

input means at said control station common to all said arithmetic means for actuating same under the control of the respective selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means the wagered amount indicated by the associated selector means multiplied by a predetermined odds factor;

individual cancellation means at each playing station normally operably by the respective player for annulling a selection; and

signaling means common to all said selector means and operable exclusively from said control station for making said selector means ineffectual for a limited period immediately preceding determination of the outcome of said event.

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