United States Patent [19]

Kortenhaus

[11] **3,807,541**

[45] **Apr. 30, 1974**

[54] **CREDIT STORAGE MEMORY DEVICE FOR JUKEBOXES, GAMING DEVICES AND THE LIKE**

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[22] Filed: **Mar. 28, 1973**

[21] Appl. No.: **345,779**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 313,516, Dec. 8, 1972, abandoned.

[30] **Foreign Application Priority Data**

Dec. 8, 1971 Germany 2160888

[52] **U.S. Cl.** ..... **194/1 N**, 194/15

[51] **Int. Cl.** **G07f 9/08**

[58] **Field of Search** ..... 194/1 N, 9, 10, 12, 15

[56] **References Cited**

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Primary Examiner—Stanley H. Tollberg
Assistant Examiner—Joseph J. Rolla
Attorney, Agent, or Firm—Wolfgang G. Fasse

[57] **ABSTRACT**

A credit storage memory device includes encoding means for producing a coin value signal corresponding to the value of coins inserted in a coin operated apparatus. The coin value signals are stored in an intermediate storage device, and then are added to a coin value storage register. The outputs of the coin value storage register are decoded, and interrogated as to their highest value, for application to a conversion device for converting the coin values to predetermined play unit values. The play unit values from the conversion device are applied to a play shift register by way of an intermediate play shift register, with the outputs of the play shift register being decoded for indication of the availability of credit in the device for given operations. Values from the coin value storage are subtracted in response either to insertion of coins or operation of the apparatus in a given fashion, and subtraction of units from the play shift register are accomplished in response to operation of the apparatus. The circuits for transferring the contents of the intermediate registers to the storage registers are full adders, the necessary subtraction being effected by subtraction inputs to the full adders.

18 Claims, 10 Drawing Figures

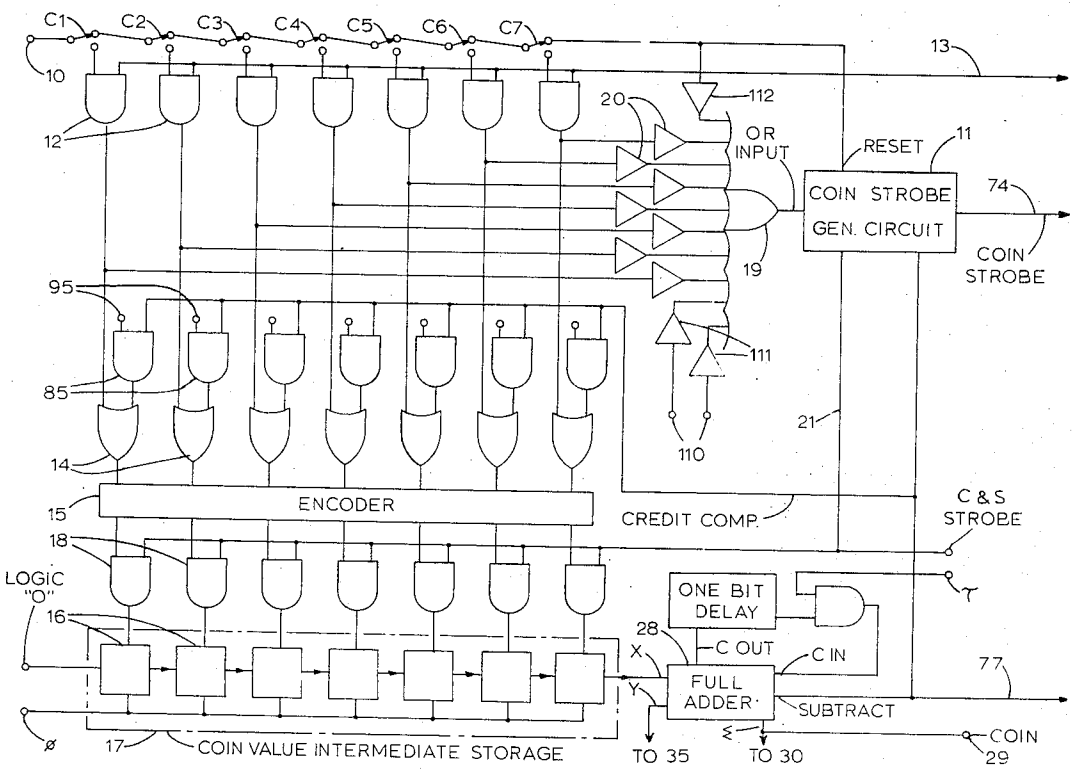


Fig. 1A

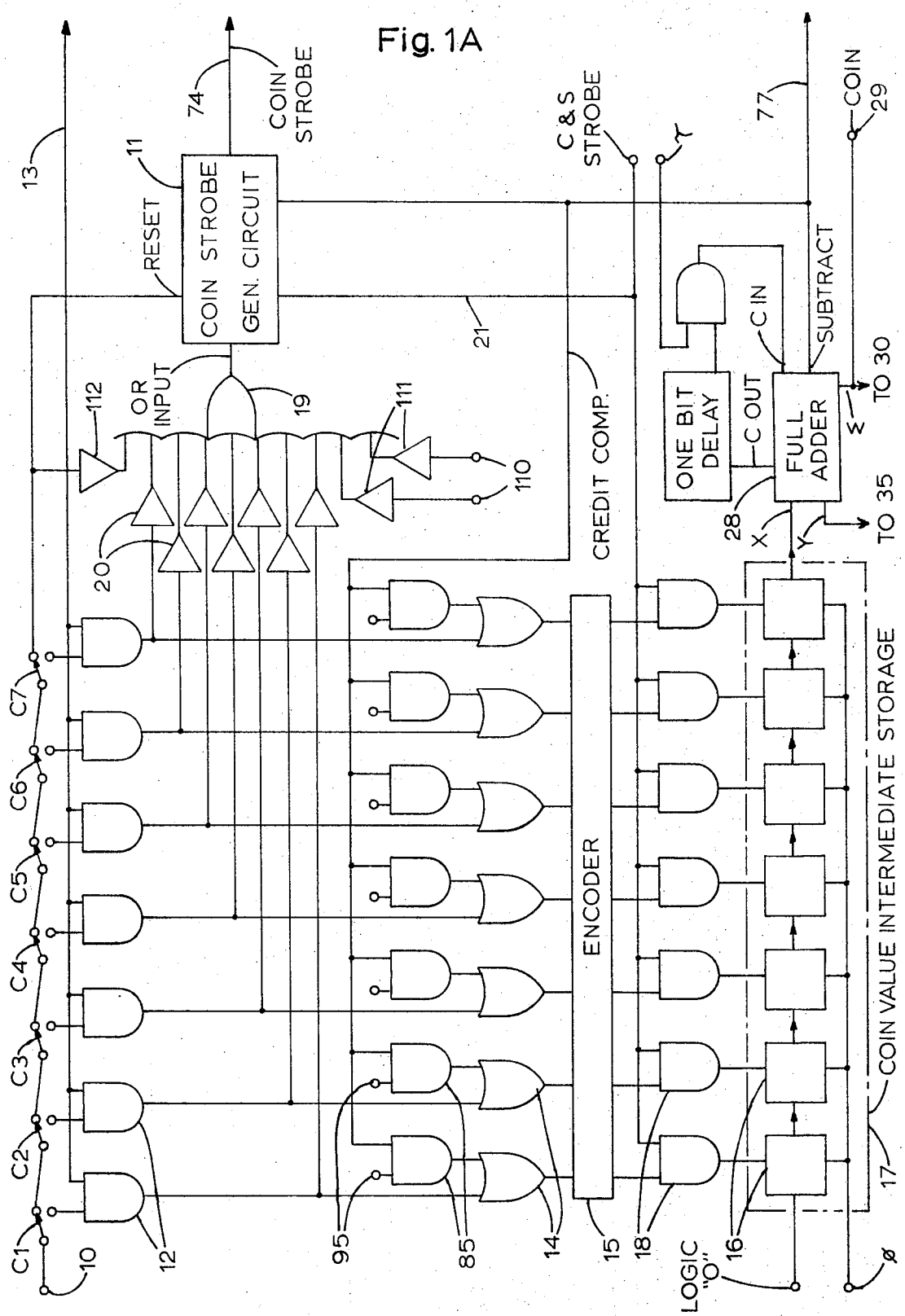

COIN STROBE GEN. CIRCUIT
RESET
COIN STROBE
C&S STROBE
COIN
SUBTRACT
C IN
C OUT
ONE BIT DELAY
FULL ADDER
TO 30
TO 35
OR INPUT
CREDIT COMP.
ENCODER
COIN VALUE INTERMEDIATE STORAGE
LOGIC "0"
C1
C2
C3
C4
C5
C6
C7
10
11
12
13
14
15
16
17
18
19
20
21
28
29
74
77
85
95
110
111
112

Fig. 1B

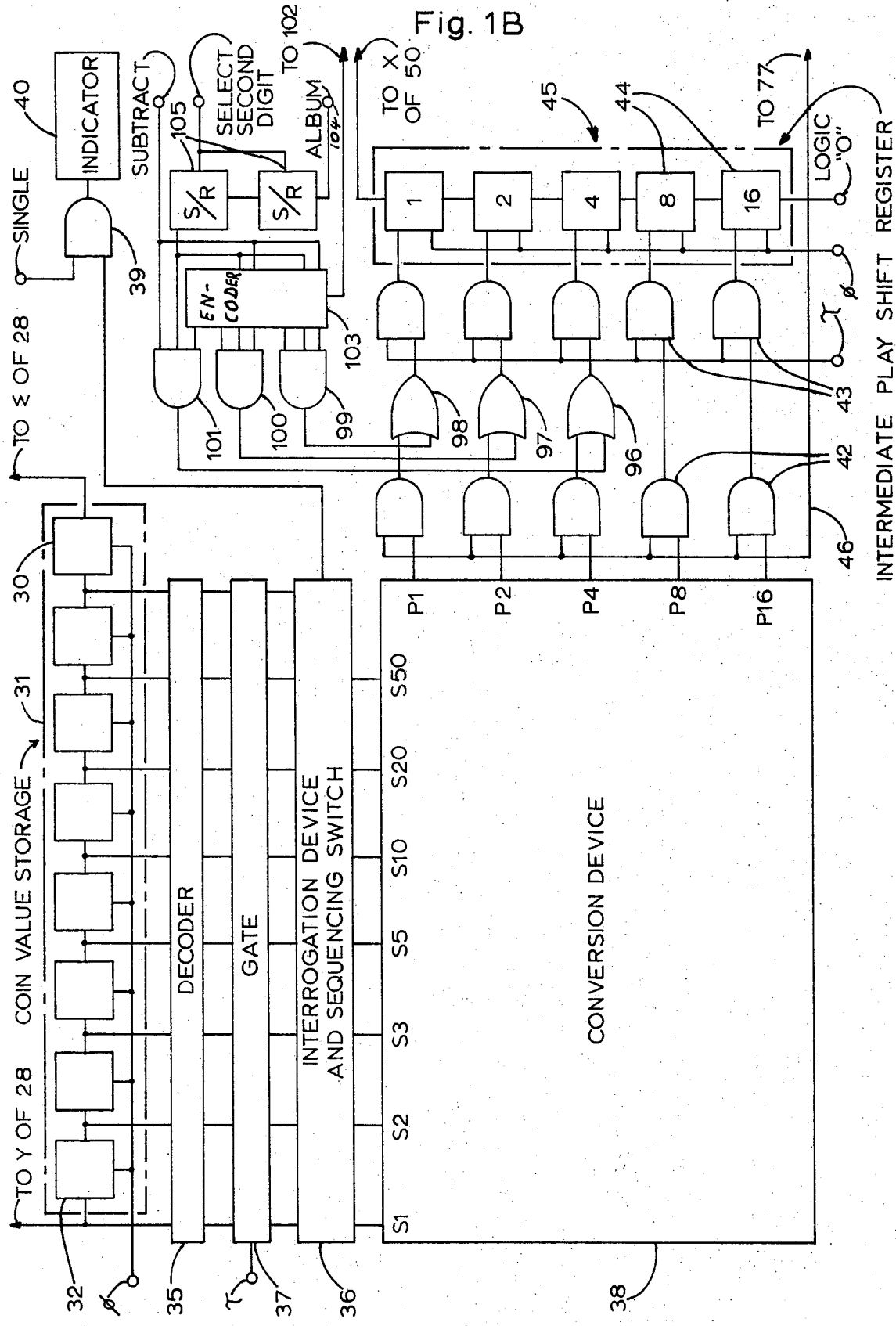
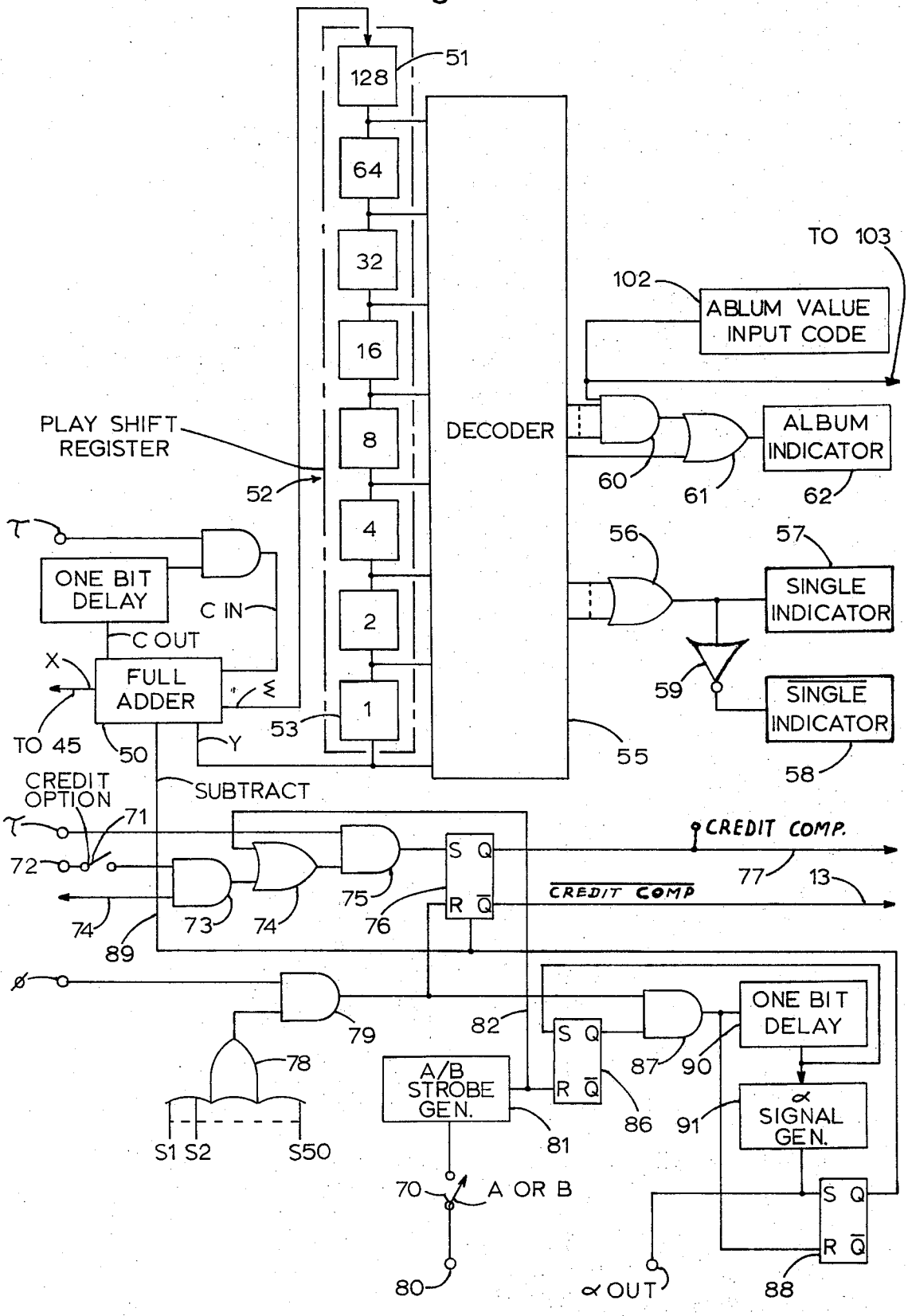

TO Y OF 28
COIN VALUE STORAGE
TO ≤ OF 28
SINGLE
INDICATOR
40
39
SUBTRACT
105
SELECT SECOND DIGIT
ALBUM
104
TO 102
TO X OF 50
45
44
TO 77
LOGIC "0"
INTERMEDIATE PLAY SHIFT REGISTER
S/R
S/R
EN-CODER
103
101
100
99
98
97
96
43
42
46
1
2
4
8
16
P1
P2
P4
P8
P16
30
31
32
35
37
36
38
DECODER
GATE
INTERROGATION DEVICE AND SEQUENCING SWITCH
CONVERSION DEVICE
S1
S2
S3
S5
S10
S20
S50

Fig. 1C


128
64
32
16
8
4
2
1
51
DECODER
TO 103
102
ABLUM VALUE INPUT CODE
ALBUM INDICATOR
60
61
62
PLAY SHIFT REGISTER
52
ONE BIT DELAY
C IN
C OUT
FULL ADDER
X
Y
Z
TO 45
50
53
55
56
57
SINGLE INDICATOR
59
SINGLE INDICATOR
58
CREDIT OPTION
SUBTRACT
71
72
73
74
75
76
77
13
CREDIT COMP.
CREDIT COMP
89
79
78
S1 S2
S50
A/B STROBE GEN.
81
82
86
87
90
91
ONE BIT DELAY
SIGNAL GEN.
70
A OR B
80
OUT
88

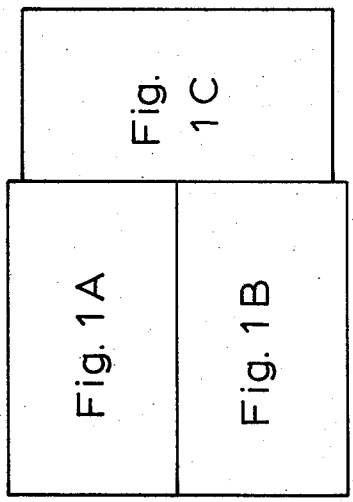


Fig. 1D

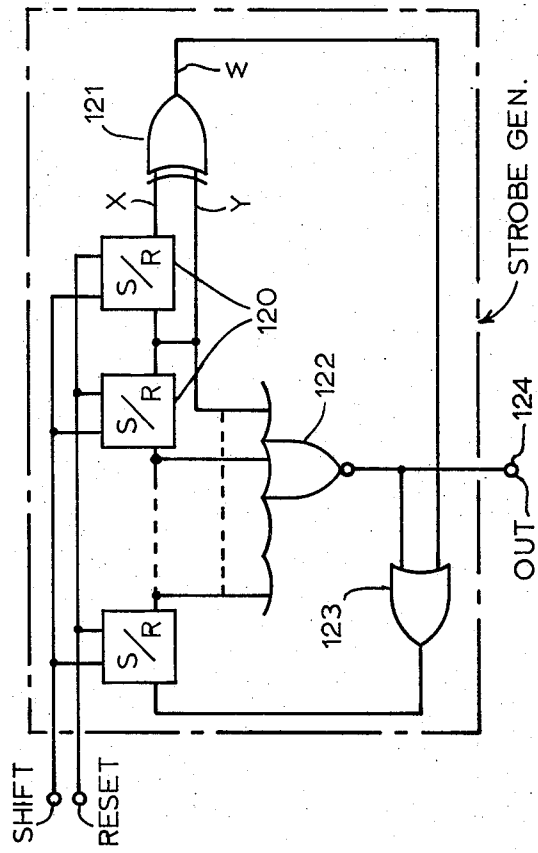


Fig. 3

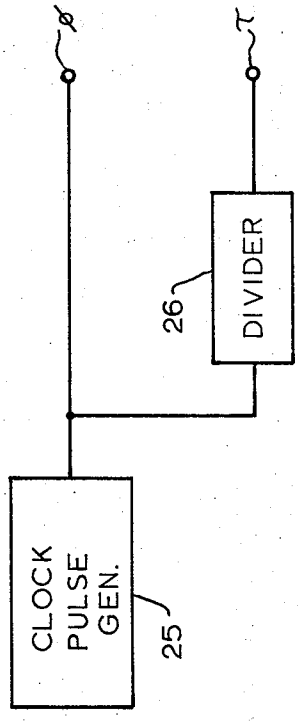


Fig. 2A

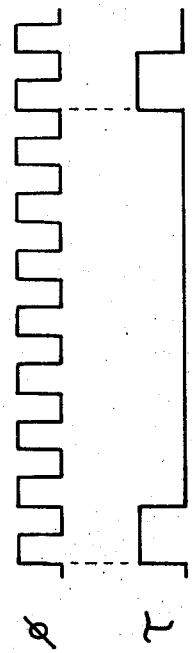


Fig. 2B

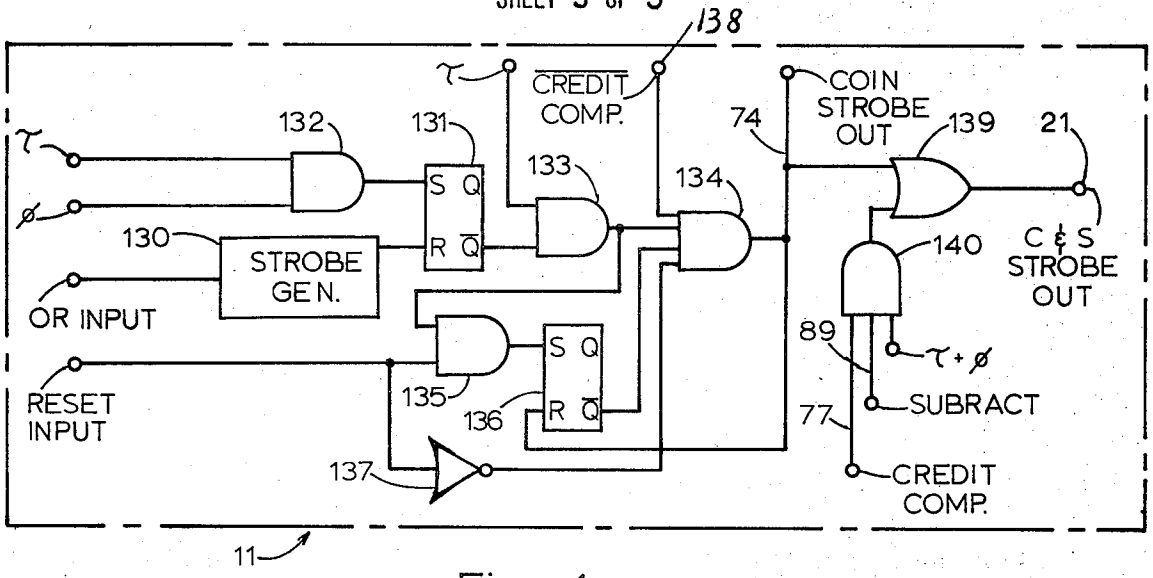


Fig. 4

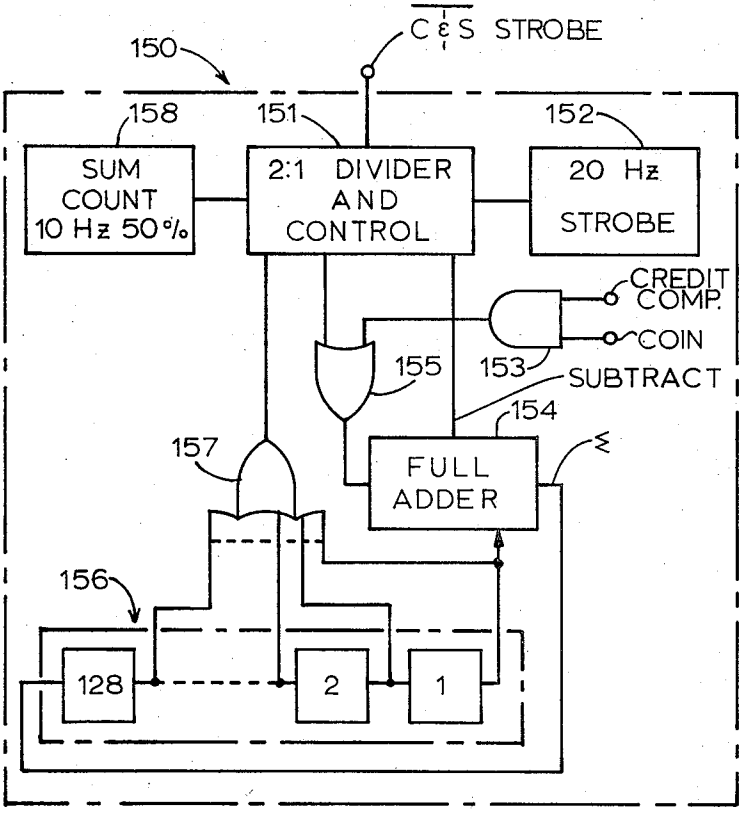


Fig. 5

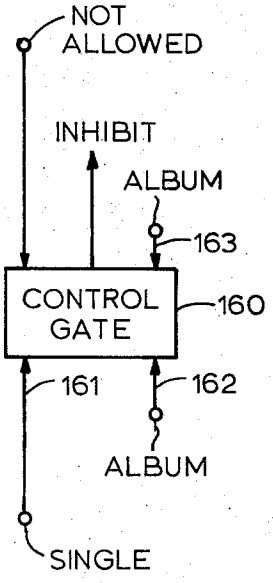


Fig. 6

CREDIT STORAGE MEMORY DEVICE FOR JUKEBOXES, GAMING DEVICES AND THE LIKE

CROSS REFERENCE TO COPENDING APPLICATION

This application is a continuation-in-part application of my copending earlier application coins No. 313,516 filed Dec. 8, 1972 now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to credit storage means, and is particularly directed to the provision of a credit storage device for controlling the operation of coin operated devices such as jukeboxes, as well as gaming devices and the like.

In the past, the registering of amount of money inserted in machines such as jukeboxes in order to ascertain the credits of an operator, has been accomplished generally by mechanical or electromechanical means. In such devices it is frequently desirable to provide means for ascertaining or granting a credit or bonus to the operator. For example, in jukeboxes, it is frequently desirable that the operator be given a credit for the insertion of a larger number of coins than the minimum number. In devices employed in the past, the ascertaining or granting of such credits or bonuses generally employ the same mechanical or electromechanical elements which were used in the summing operation in the device. Irrespective of the type of system employed, the granting or crediting of a bonus in such systems depends upon the input of a single coin having a predetermined value, for example, upon the insertion of a quarter or half-dollar coin into the device. For example, in such devices if a unit price were 10 cents, a bonus price may be three for 25 cents if a 25 cent piece were inserted in the device, and no other form of credit could be obtained, for example, by the insertion of smaller coin equivalent of a quarter.

U. S. Pat. No. 3,548,387, discloses an apparatus in which a credit or bonus may be ascertained which is not a function of the value of individual coins. In this system, the credit or bonus may be a function of the total value of credit which has been accumulated in the device in any random fashion. In this system the accumulated credit is increased in accordance with the input of further amounts of money into the machine, such as a vending machine. Consequently, a customer who decides to insert a larger amount of money into the device at one time is given a discount, even though the money is in the form of a number of separate coins. According to this patent, this result is accomplished by increasing the total credit in the device over and above the amount corresponding to the amount of money inserted in the machine. In this system, an electrical circuit is provided which counts the individual value units, and stores the sum of the counted input value units. Whenever the sum thus stored reaches a predetermined value, the circuit produces a bonus signal, and the bonus circuit is thereupon automatically returned to its initial condition. The counting and storage functions of the bonus circuit occur in parallel, and act simultaneously with the summing device itself in the coin operated apparatus. The bonus signal is then supplied to an additional bonus circuit, which produces a second bonus signal if a predetermined second value of credit has been reached in the storage circuit. Thereupon, the bonus circuit is returned to its initial position, corresponding to the initiation of a vending sequence, or by the initiation of summing of available credit that occurs upon the insertion of additional money in the apparatus.

The arrangement of this patent only permits the generation of a bonus signal in response to the accumulation of a defined non-adjustable total credit or coin value in the memory. This result is disadvantageous, since changing of the predetermined values for affording a discount necessitates complicated changes in the circuitry of the system. In addition, it is not possible in this type of circuit to provide a discount, as distinguished from a credit, in a form such that upon insertion of a larger amount of money into the vending machine the price of the goods is correspondingly reduced. In other words, the apparatus of the above patent cannot reduce the amount of credit required to buy a particular item from a coin operated vending machine.

OBJECTS OF THE INVENTION

In view of the above, it is the aim of the present invention to achieve the following objects singly or in combination:

- to provide a credit storage memory which is capable of providing either a bonus or of giving a discount as a function of the total amount of money inserted in the apparatus;
- to provide a credit storage memory device for a coin operated apparatus, which is capable of providing a bonus for a discount in response to the insertion of any individual coins, or any individual amount of money;
- to provide a credit storage memory which is flexible in its structural features, so that by means of simple modifications, the machine can be employed with any type of money, for example with coins of the United States, as well as with foreign coins;
- to provide a credit storage memory of the above described type, which is useful for a number of different discount ranges;
- to provide a matrix circuit arrangement capable of receiving at its input the credit value of inserted coins and providing at its output a correlated number of different outputs, for example a number of games or records which may be played, which may represent the credit granted; and
- to revalue and coin value and/or accumulative money value into a correlated credit value.

SUMMARY OF THE INVENTION

According to the invention, the above objects have been achieved by providing a coin value input means having a plurality of inputs which are correlated to each other in steps and in accordance with a given relationship. The coin value input means are coupled to encoding means, which provide a binary signal corresponding to the value of coins inserted in the apparatus. Means are provided for inserting the encoded binary signals in an intermediate coin value storage shift register, and a full adder is provided for adding the contents of the intermediate storage register to a coin value storage shift register for storage therein of binary data corresponding to the value of coins inserted in the device.

A decoder circuit is connected to the coin value storage register for providing a signal related to the monetary sstem of the inserted coins, with the output of the decoder being applied to an interrogation device and sequencing switch for sequentially applying outputs corresponding to the highest values stored in the coin value storage register to a conversion device. The conversion device, which may be a diode matrix, converts the signals received thereby to binary signals corresponding to units of operation of the apparatus involved. For example, in a jukebox, these units may be in the form of units corresponding to records which may be played. These signals are applied by way of an intermediate register to a "play" shift register, also by way of a full adder. The outputs of the play shift register are decoded, and means are provided for indicating the availability of adequate credit in the play shift register for performing the desired operations in the coin operated apparatus.

The transfer of the contents of the coin value storage unit may be effected in one mode of operation in response to the insertion of coins in the device, and in another mode of operation by the control of the operator in the utilization of the coin operated apparatus. The transfer is effected by subtraction of units corresponding to the highest value signals detected by the interrogation device from the coin value storage register. For this purpose, the subtraction is accomplished in the corresponding full adder. In a similar manner, units are subtracted from the play shift register in response to operation of the device, by means of a subtraction input to the full adder corresponding to the play shift register.

The arrangement of the present invention may also include means for adapting the operation of the coin operated apparatus to a number of different value units, so that different valued outputs may be available to the operator.

The entire circuit arrangement according to the present invention may be embodied in the form of integrated circuitry, preferably by MOS techniques so that a very compact structure may be obtained for the device.

The arrangement according to the invention provides the particular advantage that the credit storage memory is very variable in its discount stages, and the individual discount stages may be correlated as desired to any given type of coin, and/or to any given desired accumulated credit. In addition, the arrangement provides the advantage that the coin or credit values are converted automatically into game or credit units, so that the conversion device may be readily programmed in any desired manner. For example, in one type of operation, a half dollar may be converted into three game units and a dollar may be converted into seven game units, thereby providing the operator extra credit for the insertion of a whole dollar coin in the device.

BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 is a block circuit diagram of a coin value credit system according to the invention adapted for use in a jukebox;

FIG. 2 is a block diagram of a timing circuit for use in the arrangement of FIG. 1;

FIG. 3 is a block diagram of a strobe generator which may be employed in the circuit of FIG. 1;

FIG. 4 is a block diagram of a strobe control circuit which may be employed in the circuit of FIG. 1;

FIG. 5 is a block diagram of an indicating and register circuit which may be employed in combination with the circuit of FIG. 1; and

FIG. 6 is a block diagram of an additional element which may be employed in combination with the circuit of FIG. 1, and illustrating the manner in which the circuit of FIG. 1 may be employed in combination with a jukebox.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS:

Referring now to the drawings, and more in particular to FIG. 1, therein is illustrated a block diagram of a coin value credit system for a jukebox comprising the credit storage memory according to the invention. A plurality of coin operated switches C1 – C7 are provided with their normally closed circuit in series between a voltage source 10 and a coin strobe generator circuit 11. The normally open contacts of the switches are connected as inputs to separate AND-gates 12, the other inputs of these AND-gates being connected to a lead 13. The outputs of the AND-gates 12 are connected by way of separate OR-gates 14 to an encoder 15. The switches C1 – C7 are coin operated switches, and correspond to different valued coins which may be inserted in a jukebox. The number of switches is of course variable dependent upon the currency employed in the of installation. ofinstallation. When a coin of a given value is inserted in its respective slot in the jukebox, the corresponding switch C momentarily changes its contacts, so that a pulse is applied to the encoder circuit 15 by way of the corresponding AND-gate 12 and OR-gate 14. The functions of these gates will be discussed in further detail in the following paragraphs. Consequently, the insertion of coins in the jukebox effects the production in the encoder circuit 15 of a binary parallel code corresponding to the value of the inserted coins.

The binary coded outputs of the encoder 15 are applied in parallel to the separate stages 16 of a coin value intermediate storage circuit 17, also referred to as third register, by way of separate AND-gates 18. The other inputs of the AND-gates 18 are connected in common to the "C and S" strobe output of the coin strobe generator circuit 11. In addition, each of the lines between an AND-circuit 12 and OR-circuit 14 is connected to a separate input of an OR-circuit 19 by way of a separate pulse shaping circuit 20. As will be described in greater detail in the following paragraph, in one of the functions of the coin strobe generator circuit 11, a strobe pulse is produced on the output "C and S" strobe line 21 in response to an output of the OR-circuit 19 so that, in the simplest form of operation of the circuit of FIG. 1 it may be said that the insertion of a coin in the jukebox enables the AND-gates 18 to permit the passage of the binary coded output of the encoder 15 to the third or coin value intermediate storage shift register 17. The passage of the signal to the third register 17 is of course timed with respect to the operation of the remainder of the circuit, as will be apparent in the following paragraphs.

As shown in FIG. 2, the arrangement of the present invention is provided with a clock pulse generator 25

of conventional nature having a clock pulse output ϕ, which is connected to each of the inputs denoted ϕ in the circuit diagrams herein. The clock pulses ϕ are also applied to a divider circuit **26,** such as a ring counter, for producing a signal τ synchronized with the clock pulses. In the illustrated embodiment of the invention the pulse repetition rate of the clock pulses is eight times the pulse repetition rate of the pulses τ, although it will be apparent that this ratio is dependent upon the particular design and application of the system according to the invention. The clock pulse generator **25** may provide clock pulses of opposite phase for use in the circuit, although for the sake of simplicity in the description of the invention only a single clock pulse train has been assumed.

Referring again to FIG. **1,** the clock pulses ϕ are applied to the stages **16** of of the third register **17** to effect the shift of the binary data therein to one input of a serial full adder **28.** The stage **16** of the register **17** remote from the full adder is connected to logic **0** to effect the resetting of the register after the data has been read out therefrom.

The output of the adder **28** is connected to a "coin" terminal **29** for use in a further circuit of a system in accordance with the invention, and is also applied to the input stage **30** of a coin value storage register **31,** also referred to as the first register. The output stage **32** is connected to the second input of the full adder **28,** and the data in the first storage shift register **31** is shifted at the clock pulse rate. As a consequence, it is apparent that any data stored in the third or intermediate storage register **17** is continually added to data stored in the storage register **31,** so that the data stored in the storage register **31** corresponds to the coin values of coins inserted in the jukebox, less any values that have been subtracted therefrom by means which will be disclosed in greater detail in the following paragraphs. The carry circuits of the full adder **28** are synchronized by the τ signal, as illustrated in the drawings. **9**

The separate stages of the first storage register **31** are connected in parallel to a decoder **35** for producing a parallel coded signal corresponding to the monetary system employed. The output of the decoder **35** is applied in parallel to a sequencing switch **36** by way of gate **37** operated by the τ pulses. The sequencing switch **36** has a plurality of outputs **S1, S2, S3, S5, S10, S20** and **S50** corresponding to selected multiples of a basic coin unit of the monetary system for which the jukebox is adapted. The sequencing switch **36** includes means for sequentially selecting the highest value output of the decoder for transfer to a conversion device **38.**

As an example, assume that the output **S1** corresponds to 5 cents, the output **S3** corresponds to 15 cents, and the output **S20** corresponds to 60 cents. Further assume that the costs for playing a single record in the jukebox is 15 cents and that 80 cents has been inserted in the machine. By virtue of the decoding circuit **35,** there will be an output thereof corresponding to the line **S20** as well as outputs corresponding to the lines **S3** and **S1** denoting storage of 15 cents and 5 cents respectively. The sequencing switch **36** which may be an electronic sequencing switch, scans the outputs from the decoder from the highest value downward, and thus first detects the signal corresponding to 60 cents, and applies the signal to the conversion device **38.** Subsequently, the value corresponding to 15 cents is detected and applied by way of line **S3** to the conversion device **38.** The signal corresponding to 5 cents is then detected, but since this value is lower than the amount required to play a record, and hence does not correspond to a multiple of plays, a signal in response to detection of a value of 5 cents is applied by way of AND-gate **39** to an indicator **40.** The indicator **40** thus indicates that there is a credit in the jukebox for coins which are not sufficient, however, to enable the playing of a record.

The conversion device **38** is employed for the purpose of converting the signals applied thereto from the sequencing switch to parallel signals **P1, P2, P4, P8** and **P16** corresponding to the number of play units of records to which the operator is entitled. The conversion device may be, for example, a diode matrix and is preferably readily replaceable in the unit to enable the rapid and easy conversion of the control system to any desired correspondence between coin values and play units. For example, the conversion device may be programmed so that the greater the amount of money put in at a given time, the proportionately greater number of records that may be played, i.e., to give a discount or a credit depending upon the value of coins inserted. For example, if 15 cents enables an operator to play a single record, the device **38** may be programmed so that two records may be played for 25 cents, and five records may be played for 50 cents. The decoder **35,** which converts the binary coded signals to a monetary unit related signal, is employed to facilitate the programming of the device **38** since the use of a binary code at this point would make it difficult for a person adjusting the machine to readily provide the desired code.

The sequencing switch may, for example, include a plurality of comparators, one for each value to be tested, with each comparator being coupled to inhibit passage of signals through every lower valued comparator upon the occurrence of a signal in the higher value comparator. The sequential operation of testing the different values is, of course, dependent upon the subtraction of the detected high value from the storage register **4** to enable the sequencing switch to continue its testing, and this subtraction will be explained in greater detail in the following paragraphs.

The output of the conversion device **38** on the terminal **P** is thus in the form of a parallel coded signal corresponding to the number of play units to which the operator is entitled. The outputs of the conversion device **38** are applied by way of separate AND-gates **42** and separate AND-gates **43** to the separate stages **44** of an intermediate play shift register **45,** also referred to as the fourth register, the AND-gates **42** are gated by signals on a common line **46,** and the AND-gates **43** are gated in common by the τ signal. The data stored in the fourth shift register **45** is shifted out to one input of a full adder **50,** the end of the shift register **45** not connected to the adder being connected to a logic **0** reference so that the shift register is reset after being read out.

The sum output of the full adder **50** is applied to one AND-stage **51** of a play shift register **52,** also referred to as second register, the other AND-stage **53** of this register being connected to the full adder as the second input thereof. The operation in the serial full adder **50** is gated in the carry circuit thereof by the τ signal as indicated in the drawing. As a consequence, any data in

the fourth or intermediate play shift register **45** is continually added to the contents of the second or play shift register **52,** so that the play shift register continually stores the number of record play units to which the operator is entitled. It is apparent that the operation of the shift registers **45** and **52** and adder **50** is similar to the operation of the coin value intermediate storage register **17,** coin value storage register **31** and full adder **38** as above discussed.

The outputs of the stages of the play shift register **52** are applied in parallel to a decoder circuit **55.** The decoder circuit converts the binary signals applied thereto to a code more adaptable to the determination of the number of records that can be played.

In a typical jukebox, the records to be played may be assigned different values, so that it costs more to play one record than another. In the present instance, we shall denote the lower value record as a "single" selection and the higher valued record as a "album" selection. The necessary play units for these different types of selections are predetermined, and preferably adjustable as desired. In order to indicate to an operator that he has sufficient credit to play a single selection, and OR-gate **56** is connected to selected outputs of the decoder **55,** the outputs corresponding to the minimum value, and the output of the OR-gate **56** is applied to an indicator **57** visible on the front of the jukebox. If there are insufficient credits in the jukebox for playing a single record, this is indicated on an indicator **58** activated from the output of the OR-gate **56** by way of an invertor **59.** Similarly, suitable gates such as AND-gate **60** and OR-gate **61** are connected to the decoder for indicating on an indicator **62** that there is adequate credit registered in the device for an album selection.

In the apparatus according to the invention, several modes of operation are possible. The apparatus is provided with an "A" or "B" switch **70** which an operator controls to determine the side of the record to be played, and the device may also be provided with a credit option switch **71.** In one form of operation, the operator inserts as many coins as he wishes, which may exceed the minimum value for single or album selections as much as he desires, and in this mode of operation the transfer of the contents of the coin value storage or first register **31** to the play shift or second register **52** will be effective only upon the operator controlling the "A" or "B" switch **70,** so that the conversion of coin values to play units will be dependent upon the total value of coins stored in the coin value storage register **31** at the time the "A" or "B" switch is operated. In another mode of operation, the credit option switch **71** will be closed, and in this case, the contents of the coin value storage register **31** are directly transferred to the play shift register **52** by way of the conversion device **38,** in response to the insertion of a coin. The circuits employed for enabling these options of play will now be described.

Referring still to FIG. **1,** the credit option switch **71** is connected from a suitable voltage supply **72** to one input of an AND-gate **73,** the other input of the AND-gate **73** being a coin strobe output of the coin strobe generator circuit **11** on line **74***a*. The output of the AND-gate **73** is applied by way of an OR-gate **74** and an AND-gate **75** to the set terminal of a flip-flop **76.** The other input of the AND-gate **75** is controlled by the τ signal for synchronization. When the flip-flop **76** is toggled by the coin strobe pulse and the credit option switch in this manner, the resulting signal on the credit comparison line **77** at one output of the flip-flop **76** is applied to the subtract terminal of the full adder **28.** As a consequence, digits are subtracted from the coin value storage register **31.** The number of digits subtracted in this matter is controlled by the reset circuit of the flip-flop **76** which includes an OR-gate **78** and an AND-gate **79.** The inputs of the OR-gate **78** correspond to the signals on the lines S1 – S50 at the output of the sequencing switch, and each of these signals controls the OR-gate **78** for a number of clock pulses dependent upon the relative value of the signal. In other words, the S signals applied to the OR-gate **78** have durations corresponding to their respective values, the values being synchronized with the ϕ signal, and since the flip-flop **76** is set in synchronization with the τ signal, the flip-flop will be reset in dependence upon the duration of the S signal so that a determinable number of pulses may be applied to the subtract input of the full adder **28.** The AND-gate **79** is opened by the clock pulse for synchronization. Thus, in this mode of operation, since the coin strobe pulse on line **74** is responsive to the insertion of a coin, the detection of a high value by the sequencing switch **36** effects the subtraction of the related value from the coin value storage register **31,** so that the play units may be shifted to the play shift register **52** and the coin value storage register **31** emptied as soon as possible. At this point it is to be noted that the credit comparison line **77** is connected to the line **46** which effects the opening of the gates **42,** thereby permitting the output of the conversion device **38** to be applied to the intermediate play shift register **45.**

It is to be further noted that the negation of the credit comparison signal, at the other output of the flip-flop **76,** is connected to line **13** for controlling the opening of the gate **12,** so that these gates, which pass the coin insertion signal to the encoder, can only be opened when the flip-flop **76** is reset, so that the device accepts only a single coin at a time. The time of operation of the flip-flop **76,** however, is very short, so that no sequential insertion of coins in the jukebox will effect the accurate registering of all coins.

If the credit option above discussed is not employed, the operation of the device may be dependent upon the control of the A or B switch **70.** As shown in FIG. **1,** the A or B switch **70** is connected from a suitable source of voltage **80** to a strobe generator **81,** the strobe generator producing an output pulse on line **82** which is applied to the other input of the OR-gate **74.** In this case, the remainder of the operation of the device is the same as above discussed, the only difference being that the coin value shift register **31** is not emptied until the switch **70** is operated, so that the conversion in the conversion device **38** is dependent upon the total value of coins in the register **31.**

The credit comparison line **77** is also applied in common to one input of each of a plurality of AND-gates **85** connected to the OR-gates **14,** for a purpose that will be described in greater detail in the following paragraphs. In addition, the line **77** is connected to supply an input to the coin strobe generator circuit **11.**

It is further evident that operation of the device of FIG. **1** is dependent upon the subtraction of play units from the shift register **52** as selections are made. For this purpose, the output of the strobe generator **81** is

also connected to one input of a flip-flop **86**, one output of the flip-flop **86** being connected by way of AND-gate **87** to a flip-flop **88**, with one output of the flip-flop **88**, i. e. a "subtract" output, on line **89**, being applied to the subtract input of the full adder **50**. The flip-flop **86** is reset by a one bit delay circuit **90** connected from the output of the AND-gate **87** to the other input of the flip-flop. The flip-flop **88** is reset by a signal from the output of a signal generator **91** connected to the output of the one bit delay circuit **90**, the signal generator **91** providing an alpha output signal for use in the control of the jukebox itself in the initiation of carriage movement. The output of the signal generator **91** applied to reset the flip-flop **88** enables the subtraction of a single bit from the play shift register **52**.

As discussed above, the outputs of the AND-gates **85** are applied to separate inputs of the OR-gates **14**, and thence to the encoder **15**. The other terminals **95** may be connected by suitable means, for example, switches (not shown) to enable the addition of coin value units in the coin value registers without a necessity for insertion of coins. For example, such switches may be key operated switches controllable by an owner, for the purpose of enabling the storage of more play units than corresponds to the coins actually inserted in the device. This, of course, is another option in the control of the system.

In the arrangement as above discussed, an amount was subtracted from the play shift register corresponding to a single record. When an album selection is made, however, more units must be subtracted from the play shift register, but this cannot be done solely on the basis of the operation of the A or B switch. In order to subtract the play units from the play shift register corresponding to the actual album selected, Or-gates **96, 97**, and **98** are provided in three of the lines between the AND-gates **42** and AND-gates **43**. The other inputs of the OR-gates **96 – 98** are connected respectively to the outputs of AND-gates **99, 100** and **101**. The circuit is further provided with an album value input code circuit **102**, with one output of the circuit **102** being connected to a coding circuit **103** connected to selected inputs of the AND-gates **99 – 101**. The subtract signal, from the flip-flop **88**, is also applied to the coding circuit **103**. When an album has been selected, dependent upon the operation of conventional switches in the jukebox, the selection of the album is transferred to the circuit of FIG. 1 on terminal **104**, i. e. an indication that an album has been selected. The terminal **104** is applied to the coding circuit **103** by way of a pair of shift register stages **105** which are shifted in response to the selection of the second digit in the jukebox. (In jukeboxes the operator conventionally selects two digits corresponding to the different records, as well as A or B signals corresponding to the sides of the records). Depending upon the selection of the second digit, the code circuit **103** applies suitable signals to the AND-gates **99 – 101** and thence to the OR-gates **96 – 98** to effect the subtraction of the correct number of play units by means of the intermediate play shift register **45** and the adder/subtractor **50** from the play shift register **52**. The output of the input code circuit **102** is also applied to the gate circuit including gates **60** and **61** which indicate the presence of adequate play units to play an album, so that the album indicator may be controlled also in response to the particular album selected, i. e., so that albums of different values may be employed, and if a higher value album has been selected, the indicator **62** will indicate whether or not the higher valued album may be played.

Still referring to FIG. **1**, additional functions may be obtained in the circuit by providing additional inputs **110** connected by way of suitable pulse filtering circuits **111** to the gate **19**. These inputs may be responsive by a desired means to the insertion of coins in the apparatus, and may if desired also be connected to effect the storage of the information relating thereto in the suitable manner.

The reset input of the coin strobe generator circuit **11** is also connected to an input of the OR-gate **19**, by way of a filtering circuit **112**, although this filtering circuit is adapted to pass pulses of about one tenth the duration of the pulses applied thereto by way of the filters **20**.

FIG. **3** illustrates a strobe generator which may be employed for the A–B strobe generator **81**, as well as for a portion of the strobe generator circuit **11**. This arrangement comprises a shift register of a plurality of stages **120** with the last stage being connected to one input of a half adder **121**. The outputs of all but the last stage of the shift register are applied as inputs to a NOR-gate **122**, and the output of the next to the last stage of the shift register is also applied as a second input of the half adder. The sum output of the half adder is applied as one input to an OR-gate **123**, another input being derived from the output of the NOR-gate **122**. The output of the OR-gate **123** is connected to the input stage of the shift register. The stages of the shift register have common reset lines and common shift lines. When the circuit is employed as the strobe generator **81**, the switch **70** is connected to energize the reset line, and the clock pulses energize the shift line. When the strobe generator is used in the circuit **11**, the output of the OR-gate **19** energizes the reset line, and the clock pulses energize the shift line. The output terminal **124** of the strobe generator of FIG. **3** is connected to the output of the NOR-gate **122**.

In one embodiment of the coin strobe generator circuits **11**, as illustrated in FIG. **4**, the OR-input from the OR-gate **19** is applied to a strobe generator **130**, for example the strobe generator of FIG. **3**, the output of the strobe generator **130** being connected to the set input of a flip-flop **131**. The reset input of the flip-flip **131** is synchronized with the τ and clock pulses, for example by means of an AND-gate **132**. The output of the flip-flop **131** and a τ pulse are applied to separate inputs of an AND-gate **133**. The output of the AND-gate **133** is connected to one input of an AND-gate **134** and one input of an AND-gate **135**. The reset input to the circuit **11** is connected to the other input of the AND-gate **135**. The output of the AND-gate is applied to one input of a flip-flop **136**, one output of the flip-flop **136** being connected as a second input to the AND-gate **134**. A negated reset input is applied as a third input to the AND-gate **134** by way of an invertor **137** connected to the reset inputs of the circuit, and the fourth input of the AND-gate **134** is connected to the negated credit comparison terminal **138** derived from the flip-flop **76** of FIG. **1**. Still referring to FIG. **4**, the output of the AND-gate **134** constitutes the coin strobe output for application to line **74**, this line further being connected to the other input of the flip-flop **136** and to an input of an OR-gate **139**. The output of the OR-gate **139** constitutes the C and S strobe output of the circuit applied

to line 21. A further input to the OR-gate 139 is constituted by an AND-gate 140 having as inputs the credit compensation signal from line 77, the subtract signal from line 89, and the coincidence of the τ and clock pulses. The circuit according to the invention may be further provided with a money value counter 150 as illustrated in FIG. 5, for storing the coin value credit, the circuit 150 being adapted to be connected externally to a credit memory, for example, for driving a coin counter or register. As shown in FIG. 5, such circuit may constitute a divide-by-two divider and control circuit 151 to which a 20Hz strobe signal from source 152 is applied. The credit compensation signal and coin signal from the circuit of FIG. 1 are applied to an AND-circuit 153, the output of the AND-circuit 153 and an output of the divider circuit 151 being applied as one input of a full adder 154 by way of an OR-circuit 155. A subtract input for the full adder is derived from the divider circuit 151. The sum output of the full adder 154 is applied to one end of a shift register 156, the other end of the shift register being fed back to the full adder 154 as the second input thereof. The output of each of the stages of the shift register are connected by way of an OR-gate 157 to the divider 151. A negated C and S strobe pulse is applied to the divider 151 as a further input and the output of the divider is connected to a sum counter 158 operating at 10Hz.

A further circuit employed in combination with the arrangement of FIG. 1 is illustrated in FIG. 6. FIG. 6 illustrates a control gate 160 having "single" and "album" inputs 161 and 162 respectively. These inputs are responsive to the selection by the operator of a single record or an album record in the jukebox. The system of FIG. 6 is employed to determine, after checking of the play shift register 62, whether the selection made by the operator is to be permitted or not. In the event that this comparison indicates that not enough credit is available in the device to play the selected record, the control gate 160 provides an inhibit output to prevent operation of the jukebox. For example, the circuit may inhibit the operation of the record carrier. If there is a malfunction in the apparatus, this may be signalled to the control gate 160 as a "not allowed" input, which also provides an inhibit output to prevent operation of the device. The "album" input on line 163 may be derived from the circuit of FIG. 1 for comparison in the control gate 160. The details of the control gate 160 do not form a part of the present invention and this system has been presented, primarily in order to clarify the operation of the system of FIG. 1 when employed in a jukebox.

While the invention has been disclosed with reference to specific example embodiments, it is to be understood, that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. A credit storage device for coin operated apparatus, comprising a coin input device, means responsive to insertion of coins in said input device for producing an encoded signal corresponding to the value of coins inserted therein, a coin value storage means for storing said encoded signal, means for adding said encoded coin value signals to the contents of said coin value storage means, conversion means for converting encoded signals corresponding to coin values to encoded signals corresponding to credit units, sensing means connected to apply encoded signals stored in said coin value storage means to said conversion means, credit unit storage means for storing encoded credit unit signals, means for adding the encoded credit unit signals from said conversion means to said credit unit storage means, and sensing means connected to said credit unit storage means for producing a control signal.

2. The device of claim 1, wherein said conversion means is a diode matrix.

3. A credit storage device for coin operated apparatus comprising a coin input device for separately receiving coins of different value, encoding means responsive to the insertion of coins in said input device for producing a first encoded signal corresponding to the value of coins inserted therein, a first shift register, means adding the contents of said encoding means to said first shift register, means connected to said first shift register for producing a second encoded signal, conversion means for converting signals corresponding to coin values to signals corresponding to credit units, first sensing means connected to apply signals corresponding to signals stored in said first shift register to said conversion means, a second shift register, means for adding signals corresponding to credit units from said conversion means to said second shift register, and sensing means connected to said second shift register for producing an output signal.

4. The device of claim 3, comprising means for subtracting data from said first register to permit transfer of data to said second shift register by way of said conversion device, and means for subtracting data from said second shift register in response to operation of said apparatus.

5. The device of claim 3, wherein said means adding the contents of said encoding means to said first shift register comprises a third shift register connected to receive the output of said encoding means in parallel, first full adder means connected to receive data from said third shift register as one input, means applying the sum output of said first full adder means to said first shift register, and means connecting the output of said first shift register to a second input of said first full adder.

6. The device of claim 5, further comprising means responsive to insertion of coins in said input device for actuating a coin strobe, and means responsive to said coin strobe for subtracting data from said first shift register.

7. The device of claim 6, wherein said first sensing means comprises sequencing switch means for detecting the highest value signal corresponding to data stored in said first shift register, and wherein said means for subtracting data comprises means responsive to said highest value signal and said coin strobe for applying subtraction pulses to said full adder means, whereby highest value signals are sequentially applied from said first sensing means to said conversion means.
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8. The apparatus of claim 7, wherein said first sensing means further comprises decoding means connected to apply the data of said first shift register to said sequencing switch means, said decoding means converting the code of said first shift register to a code corresponding to the monetary system of coins to be inserted in said coin input device.

9. The device of claim 3, wherein said means for adding signals corresponding to credit units from said con-

version means comprises a fourth shift register connected to receive signals from said conversion means, and a full adder having a first input connected to receive data from said fourth shift register, a sum output connected to apply signals to said second shift register, and means applying the output of said second shift register to said full adder as a second input thereof.

10. The device of claim **9,** comprising means responsive to operation of said apparatus for applying pulses to said full adder as subtraction pulses.

11. The apparatus of claim **3** in which said means adding the contents of said encoding means to said first shift register comprises a third shift register connected to receive data from said encoding means, a full adder having a first input connected to receive data from said third shift register, a second input connected to receive data from said first shift register, an output connected to apply data to said first shift register, and a subtraction input, and further comprising means selectively responsive to insertion of a coin in said coin input device and operation of said apparatus for applying subtraction pulses to said subtraction input of said full adder.

12. The apparatus of claim **11,** wherein said means for applying subtraction pulses to said subtraction inputs further comprises means for limiting the application of subtraction input in response to data applied from said sensing means to said conversion means, whereby said first shift register is read out as signals are stored in said second shift register.

13. The device of claim **3,** wherein said first sensing means comprises means for selecting highest value signals of said second encoded signal, and further comprising means responsive to the selection of a highest value signal for subtracting corresponding data from said first shift register, whereby second encoder signals corresponding to the highest value remain in storage in said first shift register are sequentially applied to said conversion means.

14. The device of claim **13,** wherein said first sensing means comprises electronic switching means.

15. The device of claim **13,** comprising means connected to said coin input device to produce a pulse upon the insertion of a coin in said storage device, and switch means for selectively enabling said pulse to affect said subtraction in said first shift register.

16. The credit storage device of claim **13,** comprising manually operable switch means for enabling said subtraction in said first shift register.

17. The credit storage device of claim **16,** further comprising means responsive to operation of said external switch means for subtracting data from said second shift register.

18. The credit storage device of claim **17,** comprising external condition responsive means for controlling the value of data subtracted in said second shift register.

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