

SIGNAL GENERATOR AND WIRELESS MOBILE SYSTEM INCLUDING THE SAME ✓

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to a signal generator and a wireless (radio) mobile system including such a signal generator. More specifically, the present invention is directed to a signal generator used to control TDMA (Time Division Multiple Access) type digital portable telephones, for generating signals at timings set within a constant time period, while easily controlling the timings of plural signals, and also to a radio mobile system employing such a general generator.

Description of the Related Art

Most of control apparatuses require that signals are produced at timings preset within a constant time period. As a signal generating apparatus capable of generating a signal at a preset timing, there are typically two different types of signal generating apparatuses, i.e., one signal generating apparatus constructed by employing only the hardware, and the other signal generating apparatus by employing the hardware and the software. In comparison as to the circuit scale and the power consumption, the former hardware signal generator is superior to the latter

hardwared/software signal generator.

Fig. 22 schematically shows one example of the conventional signal generating apparatus constructed of only the hardware, for generating two sets of signals "E" and "F" at preselected timings. This conventional hardwared signal generating apparatus is arranged by the timer 21 for counting time at a constant time period in response to the timer increment signal 22, the signal line constructed of a plurality of bit lines indicating the output value "r" of the timer 21, and the first to fourth coincidence detecting units 23 to 26 for comparing the output value of the timer 21 with the desired producing timing set in the internal data register to produce the coincidence detecting pulses s, t, u, v when the coincidence between them is made. This signal generating apparatus further includes the first and second output controlling units 27 and 28 for producing the signals "E" and "F" at the predetermined timings by using the coincidence detecting pulses s, t indicative of the timing producing commencements, outputted from the first and third coincidence detecting units 23, 24, and also the coincidence detecting pulses u, v representative of the timing producing completion, outputted from the second and fourth coincidence detecting units 25, 26.

It should be understood that although this conventional signal generating apparatus shown in Fig. 22 generates the two signals "E" and "F" at the

predetermined timings, the total number of these coincidence detecting units and output controlling units may be further increased in order that a large number of signals at the preselected timings are produced.

5 Subsequently, the operations of this conventional signal generating apparatus will now be described. Fig. 23 shows timing chart of this signal generating apparatus. The waveform of the output value "r" from the timer 21 is represented such that a change
10 in the output values of this timer 21 is indicated in the ordinate when the time is indicated in the abscissa, and the count value of the timer 21 is counted up while the time elapses. It should be noted that since this counting up operation is digitally performed, this
15 waveform of the timer output has actually a step shape, but this waveform is indicated in a straight line form for the sake of image representation.

 The first to fourth coincidence detecting units 23 to 26 produce the coincidence detecting pulses
20 s, t, u, v when the output value "r" of the timer 21 is coincident with the values set in the respective coincidence detecting units 23 to 26. The coincidence detecting pulses s, u outputted from the first and second coincidence detecting units 23 and 25 are entered
25 into the first output controlling unit 27. The first output controlling unit 27 controls the rising portion of the signal "E" based on this coincidence detecting pulse s, and also controls the falling portion of this

signal "E" based upon the coincidence detecting pulse u, so that the signal "E" is produced. The coincidence detection pulses t and V outputted from the third and fourth coincidence detecting units 24 and 26 are entered
5 into the second output controlling unit 28. The second output controlling unit 28 controls the rising portion of the signal "F" based on the coincidence detecting pulse t, and the falling portion of this signal "F" based upon the coincidence detecting pulse v.

10 In case that the producing positions of the signals "E" and "F" are varied, the positional data, which are used to detect the coincidence and have been stored in the data registers provided inside the respective coincidence detecting units 23 to 26, is
15 changed, so that the generation timings of the signals may be freely set.

However, the conventional signal generating apparatus own such a problem. That is, when the generation timings of the plural signals are shifted by
20 the same time amount at the same time, and also the generation time periods of the plural signals are simultaneously shifted by the same amount, such a control operation is necessarily required that both of the generating position and the generation ending
25 position with respect to each of the plural signals are written into the registers employed in the coincidence detecting units. As a result, when the total number of signals generated from this conventional signal

generating apparatus is increased, the more complex signal controlling operations would be required.

SUMMARY OF THE INVENTION

The present invention has been made to solve these problems of the conventional signal generating apparatus, and therefore has an object to provide such a signal generating apparatus capable of effectively controlling both generation timings and generation ending timings for a large number of signals.

10 A first signal generating apparatus of the present invention is such a signal generating apparatus for generating a signal whose generation starting timing and generation ending timing are controlled, and comprises:

15 a timer for producing a timer output value by incrementing or decrementing a count value in response to a clock signal;

control means for correcting said timer output value inputted from said timer to produce a correction value;

20 value;

coincidence detecting means into which a predetermined set value is set, for outputting a coincidence detecting pulse when said correction value inputted from said control means is coincident with said set value; and

25 set value; and

output control means for controlling the generation starting timing and the generation ending

timing of said signal in response to said coincidence detection pulse inputted from said coincidence detecting means.

In the first signal generating apparatus of the present invention, said control means includes first and second correction means for producing first and second correction values different from each other by correcting said timer output value;

said coincidence detecting means outputs said coincidence detection pulses corresponding to said first and second correction values inputted from said control means, respectively; and

said output control means controls the generation starting timing of said signal based on the coincidence detection pulse corresponding to said first correction value which is inputted from said coincidence detecting means, and also controls the generation ending timing of said signal based upon the coincidence detection pulse corresponding to said second correction value which is inputted from said coincidence detecting means.

Furthermore, in the first signal generating apparatus of the present invention, said first correction means includes:

a first register for storing a first predetermined other set value; and

a first subtracter for subtracting said first predetermined other set value inputted from said first

register from said timer output value inputted from said timer to produce said first correction value; and

said second correction means includes:

a second register for storing a second

5 predetermined other set value; and

a second subtracter for subtracting said second predetermined other set value inputted from said second register from said timer output value inputted from said timer to produce said second correction value.

10 As a consequence, in the first signal generating apparatus of the present invention, when a plurality of signals are generated, for example, the first other set value stored in the first register and the second other set value stored in the second register
15 are varied, and the correcting manner of the timer output value performed by the control means is changed. The generation positions of the plural signals can be simultaneously shifted by the same time, and also the generation periods of the plural signals can be
20 simultaneously shifted by the same time.

A second signal generating apparatus of the present invention is featured by that said correction means receives as an input value the output value of said first correction means.

25 Accordingly in the second signal generating apparatus of the present invention, when a plurality of signals are generated, only the generation positions of the plural signals can be simultaneously changed without

changing the generation periods of the plural signals.

A third signal generating apparatus of the present invention further comprises synchronization control means for resetting a count value of said timer
5 in order that the count value of said timer is synchronized with an external condition.

As a result, in the third signal generating apparatus of the present invention, when a plurality of signals are generated, the synchronization control means
10 resets the count value of the timer in adaptation to the external condition so as to correct the count value of the timer, so that the generation timings of all signals can be simultaneously changed.

A fourth signal generating apparatus of the present invention comprises a plurality of said control
15 means and said coincidence detecting means; and a set-value supply register for supplying said predetermined set value; and

when said correction value inputted from
20 corresponding one of said plural control means is coincidence with said set value inputted from said set-value supply register, each of said coincidence detecting means outputs a coincidence detection pulse.

As a consequence, in the fourth signal
25 generating apparatus of the present invention, since a plurality of coincidence detecting means for generating a plurality of signals commonly use the set value supply register, the timings of the plural signals generated in

the different sequences can be simultaneously changed by merely changing the predetermined set value which is supplied from the set value supply register to the respective coincidence detecting means.

5 A fifth signal generating apparatus of the present invention further comprises: a plurality of said output control means; and logic operation means for performing a logic operation of signals outputted from more than two arbitrary output control means among said
10 plural output control means.

Accordingly, in the fifth signal generating apparatus of the present invention, for instance, the signals outputted from a plurality of output controlling means are OR-gated, or AND-gated, so that it is possible
15 to produce such signals which raise at several times at a preselected timing during a predetermined time period.

A sixth signal generating apparatus according to the present invention further comprises clock generating means for generating a clock signal; and
20 clock logic operation means for performing a logic operation between the signal outputted from said output control means and said clock signal outputted from said clock generating means.

As a result, in the sixth signal generating
25 apparatus of the present invention, for instance, the clock logic operation means OR-gates, or AND-gates the signal outputted from the output control means and the clock signal outputted from the clock generating means,

so that the clock signal can be outputted during only such a time period when the signal outputted from the output control means becomes high, or low.

In a seventh signal generating apparatus of
5 the present invention, said output control means includes a reset pulse register for outputting a reset pulse when a predetermined numeral value is written;

starts to generate said signal when said
coincidence detection pulse is inputted from said
10 coincidence detecting means; and

completes to generate said signal when said
reset pulse is outputted from said reset pulse register.

As a consequence, in the seventh signal
generating apparatus of the present invention, since the
15 generation of the signal is commenced in response to the coincidence detection pulse derived from the coincidence detecting means and also the generation of the signal is ended in response to the reset pulse derived from the reset pulse register, for instance, this seventh signal
20 generating apparatus of the present invention may be utilized so as to periodically produce the interrupt signal to the CPU. In this case, for example, the CPU writes "0" into the reset pulse register when the interrupt process is completed, thereby outputting the
25 reset pulse. Thus, the generation of this interrupt signal is ended.

A wireless mobile apparatus according to the
present invention is such a wireless mobile apparatus

for transmitting/receiving a signal to/from a base station system. This wireless mobile apparatus comprises:

receiving means for receiving a signal which
5 contains a baseband signal and is transmitted from said base station system, and for extracting the baseband signal from the received signal;

demodulating means for demodulating said extracted baseband signal to reproduce a data series
10 synchronized with said base station system;

error correction decoding means for error-correction-decoding said reproduced data series;

audio decoding means for decoding audio data when said error-correction decoded data series is such
15 audio data;

D/A converting means for D/A-converting said decoded audio data into an audio signal;

speaker means for outputting said converted audio signal as voice;

20 a microphone for converting voice into an audio signal;

A/D converting means for A/D-converting said converted audio signal into audio data;

audio coding means for coding said converted
25 audio data;

error correction coding means for error-correction coding said coded audio data;

modulating means for modulating said error-

correction coded audio data with a transmission carrier;

transmitting means for transmitting said modulated audio data to said base station system;

signal generating means for generating a
5 timing signal used to a transmitting/receiving operation of said wireless mobile apparatus;

a central processing unit for controlling the transmitting/receiving operation of said wireless mobile apparatus; and

10 a memory for storing therein command data and control data used to said central processing unit;
wherein:

said signal generating means is one of the first to seventh signal generating means of the present
15 invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic block diagram for indicating an arrangement of a signal generating apparatus according to a first embodiment of the present
20 invention;

Fig. 2 is a schematic block diagram for showing a concrete arrangement of a sequence control unit employed in the signal generating apparatus of the first embodiment;

25 Fig. 3 is a timing chart for explaining operation of the sequence control unit shown in Fig. 2;

Fig. 4 is a timing chart for explaining

operation of the signal generating apparatus according to the first embodiment;

Fig. 5 is a schematic block diagram for representing an arrangement of a signal generating apparatus according to a second embodiment of the present invention;

Fig. 6 is a timing chart for explaining operation of the signal generating apparatus according to the second embodiment;

10 Fig. 7 is a block diagram for indicating an arrangement of a signal generating apparatus according to a third embodiment of the present invention;

Fig. 8 is a timing chart for describing the normal operation of the signal generating apparatus according to the third embodiment;

Fig. 9 is a timing chart for explaining such operation when the timing of the signal generating apparatus according to the third embodiment is delayed in the mode 1;

20 Fig. 10 is a timing chart for explaining such operation when the timing of the signal generating apparatus according to the third embodiment is advanced in the mode 2;

Fig. 11 is a timing chart for explaining such operation that the timing of the signal generating apparatus according to the third embodiment is delayed in the mode 2;

Fig. 12 is a schematic block diagram for

indicating an arrangement of a signal generating apparatus according to a fourth embodiment of the present invention;

Fig. 13 is a timing chart for explaining
5 operation of the signal generating apparatus according to the fourth embodiment;

Fig. 14 is a schematic block diagram for indicating an arrangement of a signal generating apparatus according to a fifth embodiment of the present
10 invention;

Fig. 15 is a timing chart when an OR-gate circuit is employed in the signal generating apparatus of the fifth embodiment;

Fig. 16 is a timing chart when an AND-gate
15 circuit is employed in the signal generating apparatus of the fifth embodiment;

Fig. 17 is a schematic block diagram for showing an arrangement of a signal generating apparatus according to a sixth embodiment of the present
20 invention;

Fig. 18 is a timing chart for explaining operation of the signal generating apparatus of the sixth embodiment;

Fig. 19 is a schematic block diagram for
25 indicating an arrangement of a signal generating apparatus according to a seventh embodiment of the present invention;

Fig. 20 is a schematic block diagram for

showing a concrete arrangement of the output controlling unit employed in the signal generating apparatus of the seventh embodiment;

Fig. 21 is a timing chart for explaining
5 operation of the signal generating apparatus according to the seventh embodiment;

Fig. 22 is a schematic block diagram for indicating the arrangement of the conventional signal generating apparatus;

10 Fig. 23 is a timing chart for explaining operation of the conventional signal generating apparatus;

Fig. 24 is a schematic block diagram for representing an arrangement of a wireless mobile system
15 according to an embodiment of the present invention; and

Fig. 25 is a timing chart for explaining a frame structure of the wireless mobile system and operation of a signal generating apparatus employed in the wireless mobile system according to the embodiment.

20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(FIRST EMBODIMENT)

As indicated in Fig. 1, a signal generating apparatus for generating four sets of signals "A", "B", "C", "D", according to a first embodiment of the present
25 invention, is comprised of a reference time timer 1 whose counting value is incremented in response to an externally supplied reference clock signals (timer

increment signal 2), and a first sequence control unit 5 for controlling both of signal generation starting positions and signal generation ending positions for the two signals "A" and "B" at the same time while the two sets of signals "A" and "B" among the signals "A", "B", "C", "D" are handled as one group (as a first sequence). This signal generating apparatus further includes a second sequence control unit 8 for simultaneously controlling both the signal generation starting position and the signal generation ending position of the signals "C" and "D" while the signals "C" and "D" are handled as one group (a second sequence). The first sequence control unit 5 is arranged by a first sequence generation starting position controlling unit 3 for controlling the output value of the timer 1 to output a correction value "b" so as to control the first sequence generation starting position, and a first sequence generation ending position controlling unit 4 for controlling the output value of the timer 1 to output another correction value "c" so as to control the first sequence generation ending position. The second sequence control unit 8 includes a second sequence generation starting position controlling unit 6 for controlling the output value of the timer 1 to output another correction value "j" in order to control the second sequence generation starting position, and a second sequence generation ending position controlling unit 7 for controlling the output of the timer 1 to

output another correction value "k" in order to control the second sequence generation ending position.

The signal generating apparatus is arranged by a first coincidence detecting unit 9 for comparing the
5 setting position of starting the generation of the signal "A" with the correction value "b" of the timer 1 and for producing a coincidence detection pulse "d" when both values are coincident with each other, a second coincidence detecting unit 11 for comparing the setting
10 position of ending the generation of the signal "A" with the correction value "c" and for producing a coincidence detection pulse "f" when both values are made coincident with each other, and further a first output controlling unit 17 for controlling a rising portion of the signal
15 "A" and a falling portion thereof in response to the generation starting coincidence detection pulse "d" outputted from the first coincidence detecting unit 9 and the generation ending coincidence detection pulse "f" outputted from the second coincidence detecting unit
20 11, thereby producing the signal "A". The signal generating apparatus further includes a third coincidence detecting unit 10 for comparing the setting position of starting the generation of the signal "B" with the correction value "b" of the timer 1 and for
25 producing a coincidence detection pulse "e" when both values are coincident with each other, a fourth coincidence detecting unit 12 for comparing the setting position of ending the generation of the signal "B" with

the correction value "c" of the timer 1 and for producing a coincidence detection pulse "g" when both values are coincident with each other, and a second output controlling unit 18 for controlling a rising portion of the signal "B" and a falling portion thereof in response to the generation starting coincidence detection pulse "e" outputted from the third coincidence detecting unit 10 and the generation ending coincidence detection pulse "g" outputted from the four coincidence detecting unit 12, thereby producing the signal "B". The signal generating apparatus is further comprised of a fifth coincidence detection unit 13 for comparing the setting position of starting the generation of the signal "C" with the correction value "j" of the timer 1 and for producing a coincidence detection pulse "l" when both values are coincident with each other, a sixth coincidence detecting unit 15 for comparing the setting position of ending the generation of the signal "C" with the correction value "k" and for producing a coincidence detection pulse "n" when both values are made coincident with each other, and further a third output controlling unit 19 for controlling a rising portion of the signal "C" and a falling portion thereof in response to the generation starting coincidence detection pulse "l" outputted from the fifth coincidence detecting unit 13 and the generation ending coincidence detection pulse "n" outputted from the sixth coincidence detecting unit 15, thereby producing the signal "C". The signal

generating apparatus further includes a seventh coincidence detecting unit 14 for comparing the setting position of starting the generation of the signal "D" with the correction value "j" of the timer 1 and for
5 producing a coincidence detection pulse "m" when both values are coincident with each other, an eighth coincidence detecting unit 16 for comparing the setting position of ending the generation of the signal "D" with the correction value "k" of the timer 1 and for
10 producing a coincidence detection pulse "o" when both values are coincident with each other, and a fourth output controlling unit 20 for controlling a rising portion of the signal "D" and a falling portion thereof in response to the generation starting coincidence
15 detection pulse "m" outputted from the seventh coincidence detecting unit 14 and the generation ending coincidence detection pulse "o" outputted from the eighth coincidence detecting unit 16, thereby producing the signal "D".

20 As represented in a sequence generation starting position controlling unit 31 of Fig. 2, each of the first sequence generation starting position controlling unit 3 employed in the first sequence control unit 5, and the second sequence generation
25 starting position controlling unit 6 employed in the second sequence control unit 8 includes a register 30 for setting the sequence generation starting position, and a subtracter 29 for subtracting the set value of the

register 30 from an input signal indicative of the value of the timer 1 (timer output signal 35). As illustrated in a sequence generation ending position controlling unit 34 of Fig. 2, each of the first sequence generation
5 ending position controlling unit 4 employed in the first sequence control unit 5 and the second sequence generation ending position controlling unit 7 employed in the second sequence control unit 8 includes a register 33 for setting the sequence generation ending position, and
10 a subtracter 32 for subtracting the set value of the register 33 from the timer output signal 35.

The first sequence control unit 5 and the second sequence control unit 8 corrects the value of the timer 1 as shown in Fig. 3. For the sake of simple
15 explanation, it is assumed that the value of the timer 1 is indicated by 3 bits. The timer 1 shown in Fig. 1 starts its counting operation from "000", and then increments the count value by "1" every time one clock of the timer increment signal 2 is supplied. When the
20 counting value reaches "111", this counting value is returned to "000". That is, the timer 1 outputs such a periodical counting value. Assuming now that the set value of the register 30 employed in the sequence generation starting position controlling unit 31 shown
25 in Fig. 2 is equal to "2", since the subtracter 29 subtracts the set value "2" of the register 30 from the timer output signal 35 to output the subtraction value, an output signal 36 of the sequence generation starting

position controlling unit is such a signal delayed by 2
clocks from the timer output signal 35. As a conse-
quence, from the first and third coincidence detecting
units 9 and 10 connected to the first sequence genera-
5 tion starting position controlling unit 3 of the first
sequence control unit 5, and also the fifth and seventh
coincidence detecting units 13 and 15 connected to the
second sequence generation starting position controlling
unit 6 of the second control unit 8, the respective
10 coincidence detection pulses d, e, l, m are produced
which each is delayed by 2 clocks with respect to the
output signal of the timer 1.

As a consequence, both the first sequence
generation starting position controlling unit 3 and the
15 second sequence generation starting position controlling
unit 6 may delay and advance (quicken) the output signal
from the timer 1 in response to the set value of the
register. Similarly, both the first sequence generation
ending position controlling unit 4 of the first sequence
20 control unit 5 and the second sequence generation ending
position controlling unit 7 of the second sequence
control unit 8 may delay and advance the output signal
of the timer 1 in accordance with the set value of the
register (register 33). It should be noted that when
25 the sequence generation starting positions and the
sequence generation ending positions of the respective
signals "A" to "D" are previously fixed, instead of the
registers 30 and 33 shown in Fig. 2, circuits for

setting the fixed value may be employed in the first sequence generation starting position controlling unit 3, the second sequence generation starting position controlling unit 6, the first sequence generation ending position controlling unit 4, and the second sequence generation ending position controlling unit 7.

Next, operations of the signal generating apparatus according to the first embodiment of the present invention will now be described with reference to a timing chart of Fig. 4. For the sake of simplicity, this timing chart represent only the operations to generate the signal "A" and the signal "B" of the first sequence. An output value "a" of the timer 1 is inputted into the first sequence generation starting position controlling unit 3. The first sequence generation starting position controlling unit 3 delays this output value "a" of the timer 1 by time "y" to output a correction value "b". Also, the output value "a" of the timer 1 is inputted to the first sequence generation ending position controlling unit 4. The first sequence generation ending position controlling unit 4 outputs such a correction value "c" obtained by delaying the output value "a" of the timer 1 by time "zz".

The correction value "b" outputted from the first sequence generation starting position controlling unit 3 is entered into the first coincidence detecting unit 9 and the third coincidence detecting unit 10,

which control the generation starting positions of the signals "A" and "B", respectively. When this correction value "b" is coincident with the generation starting position data of the signal "A" internally set, the
5 first coincidence detecting unit 9 outputs the coincidence detection pulse "d" to the first output controlling unit 17. When this correction value "b" is coincident with the generation starting position data of the signal "B" internally set, the third coincidence
10 detecting unit 10 outputs the coincidence detection pulse "e" to the second output controlling unit 18. In response to the coincidence detection pulse "d", the first output controlling unit 17 controls the rising portion of the signal "A". In response to the
15 coincidence detection pulse "e", the second output controlling unit 18 controls the rising portion of the signal "B".

The correction value "c" outputted from the first sequence generation ending position controlling
20 unit 4 is entered into the second coincidence detecting unit 11 and the fourth coincidence detecting unit 12, which control the generation ending positions of the signals "A" and "B", respectively. When this correction value "c" is coincident with the generation ending
25 position data of the signal "A" internally set, the second coincidence detecting unit 11 outputs the coincidence detection pulse "f" to the first output controlling unit 17. When this correction value "c" is

coincident with the generation ending position data of the signal "B" internally set, the fourth coincidence detecting unit 12 outputs the coincidence detection pulse "g" to the second output controlling unit 18. In response to the coincidence detection pulse "f", the first output controlling unit 17 controls the falling portion of the signal "A". In response to the coincidence detection pulse "g", the second output controlling unit 18 controls the falling portion of the signal "B".

In this way, the signal "A" and the signal "B", the rising timing and the falling timing of which are controlled (namely, generation starting position and generation ending position are controlled) are outputted from the first output controlling unit 17 and the second output controlling unit 18, respectively.

The generation starting positions and the generation ending positions of the signal "A" and the signal "B" may be separately controlled by varying the data setting values used to determine the generation positions of the coincidence detection pulses "d" to "g" in the respective coincidence detecting units 9 to 12. In addition, the combination between the signal "A" and the signal "B" may be controlled in sequence unit by changing either the set value of the register 30 employed in the first sequence generation position controlling unit 3 of the first sequence control unit 5, or the set value of the register 33 employed in the

first sequence generation ending position controlling unit 4.

It should also be noted that a total number of signals and also a total number of sequences may be
5 freely increased/decreased by changing the combinations of these sequence control unit, coincidence detecting unit, and output controlling unit. The various signal generating apparatuses may be constructed by employing optimum circuits thereof.

10 Furthermore, it should be noted that in this embodiment, as shown in the timing chart of Fig. 4, the rising portions and falling portions of the signals "A" to "D" are made coincident with the falling portions of the coincidence detection pulses. Alternatively, the
15 rising portions and falling portions of these signals "A" to "D" may be again synchronized with the timer increment signal 2 with employment of flip-flop circuits and the like.

Although the present embodiment has described
20 such a timer operation (up-counter) that the counting value is incremented in response to the clock signal, a similar effect may be achieved even when a down-counter for decrementing a counting value in response to the clock signal is employed.

25 (SECOND EMBODIMENT)

As represented in Fig. 5, a signal generating apparatus according to a second embodiment of the

present invention owns such a different arrangement from that of the signal generating apparatus according to the first embodiment of the present invention, shown in Fig. 1. That is, first, the first sequence control unit 5 includes a first sequence generation width controlling unit 38 instead of the first sequence generation ending position controlling unit 4. This first sequence generation width controlling unit 38 outputs a correction value "cc", which is obtained by further correcting the correction value "b" outputted from the first sequence generation starting position controlling unit 3, into the second and fourth coincidence detecting units 11 and 12. Secondly, the second sequence control unit 8 includes a second sequence generation width controlling unit 39 instead of the second sequence generation ending position controlling unit 7. This second sequence generation width controlling unit 39 outputs a correction value "kk", which is obtained by further correcting the correction value "j" outputted from the second sequence generation starting position controlling unit 6, into the sixth and eighth coincidence detecting units 15 and 16. It should be noted that each of the first sequence generation width controlling unit 38 and the second sequence generation width controlling unit 39 may be arranged by a subtracter and a register in a similar manner to the sequence generation ending position controlling unit 34 shown in Fig. 2.

Subsequently, operations of the signal generating apparatus according to the second embodiment will now be explained with reference to a timing chart of Fig. 6. In this timing chart, only generation
5 operations of the signals "A" and "B" in the first sequence are illustrated, for the sake of simple explanation. The output value "a" of the timer 1 is inputted into the first sequence generation starting position controlling unit 3. The first sequence
10 generation starting position controlling unit 3 outputs the correction value "b" obtained by delaying this output value "a" of the timer 1 by the time "y". Similar to the first embodiment, the first coincidence detecting unit 9 and the third coincidence detecting
15 unit 10 supply the coincidence detection pulse "d", and the coincidence detection pulse "e" to the first output controlling unit 17 and the second output controlling unit 18, respectively. The first output controlling unit 17 and the second output controlling unit 18
20 controls the rising portion of the signal "A" and the rising portion of the signal "B" in response to the coincidence detection pulse "d" and the coincidence detection pulse "e", respectively.

The correction value "b" is also supplied to
25 the first sequence generation width controlling unit 38. The first sequence generation width controlling unit 38 outputs a correction value "cc" obtained by delaying this correction value "b" by time "zz".

The correction value "cc" is inputted to the second coincidence detecting unit 11 and the fourth coincidence detecting unit 12, which control the generation ending positions of the signals "A" and "B", respectively. The second coincidence detecting unit 11 outputs the coincidence detection pulse "f" to the first output controlling unit 17 when the correction value "cc" is coincident with the internally set generation ending position data of the signal "A". The fourth coincidence detecting unit 12 outputs the coincidence detection pulse "g" to the second output controlling unit 18 when the correction value "cc" is coincident with the internally set generation ending position data of the signal "B". The first output controlling unit 17 control the falling portion of the signal "A" in response to the coincidence detection pulse "f", whereas the second output controlling unit 18 controls the falling portion of the signal "B" in response to the coincidence detection pulse "g".

In the signal generating apparatus according to the second embodiment, since the set value of the register 30 (see Fig. 2) employed in the first sequence generation starting position controlling unit 3 is changed, the generation starting positions of the signal "A" and the signal "B" can be simultaneously changed while the generation periods of the signals "A" and "B" (namely, the pulse widths of the signals "A" and "B") are maintained at constant values. Also, since the set

value of the register 33 (see Fig. 2) employed in the first sequence generation width controlling unit 38 is changed, the generation periods of the signals "A" and "B" can be simultaneously varied while the generation starting positions of the signals "A" and "B" are kept constant. Further, since the set value of the register 30 (see Fig. 2) of the second sequence generation starting position controlling unit 6 is changed, the generation starting positions of the signal "C" and the signal "D" can be simultaneously changed while the generation periods of the signals "C" and "D" are maintained at constant values. Also, since the set value of the register 33 (see Fig. 2) employed in the second sequence generation width controlling unit 39 is changed, the generation periods of the signals "C" and "D" can be simultaneously varied while the generation starting positions of the signals "C" and "D" are kept constant.

(THIRD EMBODIMENT)

As represented in Fig. 7, a signal generating apparatus, according to a third embodiment of the present invention, owns such a different arrangement from that of the signal generating apparatus according to the first embodiment of the present invention as shown in Fig. 1. That is, a synchronization controlling unit 40 is interposed between the timer 1 and the first and second sequence control units 5 and 8, and this

synchronization controlling unit 40 initiates the resetting operation of the timer 1 and outputs a corrected count value "aa" so as to make the count of the timer 1 coincident with the external condition.

5 Then, a description will now be made of operations of this signal generating apparatus according to the third embodiment with reference to timing charts shown in Fig. 8, Fig. 9, Fig. 10 and Fig. 11. For the sake of simple explanation, the timing of the final
10 output signal is typically represented as the signal "A". It is assumed that the first sequence generation starting position controlling unit 3 and the first sequence generation ending position controlling unit 4, employed in the first sequence control unit 5 output a
15 value identical to the corrected count value "aa" derived from the synchronization controlling unit 40 as a correction value "b" and another correction value "c", respectively. It is also assumed that the first coincidence detecting unit 9 and the second coincidence
20 detecting unit 11 output the coincidence detection pulses "d" and "f" at the fixed timing with respect to the correction values "b" and "c". Accordingly, the first output controlling unit 17 outputs the signal "A" at the fixed timing with respect to the corrected count
25 value "aa".

Fig. 8 represents a timing of the signal "A" in case that no specific control is carried out in the synchronization controlling unit 40. Every time the

count value of the timer 1 takes a constant timer count value "TC1", the synchronization controlling unit 40 outputs a timer reset signal "tr" to the timer 1. As a consequence, the timer 1 repeats the counting operation
5 at a constant period "T1", and the synchronization controlling unit 40 directly outputs the output value of the timer 1 as the corrected count value "aa". Therefore, the signal "A" is generated with keeping the time period of "T1".

10 Next, an explanation will now be made of operation for a mode 1 where the generation timing of the signal "A" is delayed by time "T2" in accordance with the externally supplied synchronization correcting condition with reference to the timing chart of Fig. 9.

15 First, both of the mode "1" and the count value (reset timing "TC2") of the timer 1 corresponding to the time "T2" used to delay the signal "A" are set to the synchronization controlling unit 40. Thereafter, the timer 1 continues the counting operation, and when
20 the output value "a" of the timer 1 reaches the first timer count value "TC1" at time t_1 , the synchronization controlling unit 40 outputs the timer reset signal "tr" to the timer 1. When the count value of the timer 1 which after the resetting operation, restarts its
25 counting operation from the count value of "0", has reached the reset timing "TC2" at time t_2 , the synchronization controlling unit 40 again outputs the timer reset signal "tr" to the timer 1. Upon receipt of

the timer reset signal "tr", the timer 1 resets the count value and restarts its counting operation from "0". Thereafter, every time the count value of the timer 1 reaches the timer count value "TC1", the

5 synchronization control unit 40 outputs the timer reset signal "tr" and the timer 1 continues its counting operation at a time period of "T1".

While after the output value "a" of the timer 1 has reached the timer count value "TC1" immediately

10 after setting the mode and then the timer 1 has been reset, the output value "a" of the timer 1 has reached the reset timing "TC2" to restart the resetting operation of the timer 1 (namely, a time duration from time t_1 to time t_2), the synchronization controlling unit

15 40 continues to output the fixed value "0" (otherwise, timer count value "TC1") as the corrected count value. Thereafter, this synchronization controlling unit 40 outputs the same value as the output value "a" of the timer 1. Since the generation starting timing and the

20 generation ending timing of the signal "A" are measured on the basis of this corrected count value "aa", the signal "A" is delayed by the time "T2" during one time period after the mode setting operation, and the delayed signal "A" is outputted.

25 Next, operation (mode 2) in case that the generation timing of the signal "A" is advanced, or quickened by the time "T3" in accordance with the externally supplied synchronization correction condition

will now be described with reference to the timing chart shown in Fig. 10.

First, both of the mode "2" and a timer count value (reset timing) "TC4" ($=TC1-TC3$) corresponding to a
5 reset interval "T4" ($=T1-T3$) used to advance the generation timing of the signal "A" are set to the synchronization controlling unit 40. At this time, it is determined as $TC4 > TC6$ (TC6 indicate the timer count value corresponding to the generation ending position of
10 the signal "A").

When the output value "a" of the timer 1 reaches the timer count value "TC1" at time t_1 after the mode setting operation, the synchronization controlling unit 40 resets the timer 1, and then when the output
15 value "a" of the timer 1 reaches the count value "TC4" (i.e., at time t_2), again resets the timer 1. Thereafter, the synchronization controlling unit 40 repeats the resetting operation of the timer in the time period of "T1" in the normal operation. During this time
20 duration, the synchronization controlling unit 40 outputs the same value as the output value "a" of the timer 1 as the corrected count value "aa".

As a result, the signal "A" is raised when the output value "a" of the timer 1 reaches the count value
25 "TC5" ($TC5 < TC4$) and also the signal "A" is lowered when the output value "a" of the timer 1 reaches the count value "TC6" ($TC5 < TC6 < TC4$), so that the generation timing of the signal "A" generated at the second timing after

the mode setting operation can be quicken by the time "T3", as indicated in Fig. 10.

In the mode "2", even when the generation timing of the signal "A" generated at the first timing after the mode setting operation is delayed by the time T7 ($=T1-T3$), the signal "A" can be produced at the same position, although the generation timing of the signal "A" generated at the second timing after the mode setting operation has been advanced by the time "T3". The operations of the signal generating apparatus at this time will now be explained with employment of the timing chart shown in Fig. 11. Assuming that a count value (namely, reset timing) of the timer 1 for delaying the generation timing of the signal "A" generated at the first timing after the mode setting operation by the time "T7" is selected to be "TC7", the mode "2" is set and also the reset timing "TC7" is set to the synchronization controlling unit 40. At this time, assuming now that the reset timing "TC7" is smaller than the count value "TC5" indicative of the timing at which the signal "A" is raised, since the signal generating apparatus performs the same operation as that of the mode "1" setting operation, as shown in Fig. 9, the generation timing of the signal "A" generated at the first timing after the mode setting operation is delayed by the time T7 from the generation timing when no mode is set. As a consequence, the generation timing of the signal "A" which is produced at the first timing after the mode

setting operation is quickened, or advanced by the time "T3" with respect to such a signal "A" on the right side of this drawing among the signals "A" when no mode is set, as illustrated in Fig. 11 by a broken line.

5 As previously explained, in the signal generating apparatus according to the third embodiment, since the corrected count value "aa" outputted from the synchronization controlling unit 40 is entered into the first sequence control unit 5 and the second sequence
10 control unit 8, the generation timings of all the signals "A", "B", "C", "D" can be changed at the same time.

(FOURTH EMBODIMENT)

A signal generating apparatus according to a
15 fourth embodiment of the present invention owns such a different arrangement, as compared with that of the signal generating apparatus according to the first embodiment of the present invention as shown in Fig. 1. That is, two sets of the above-described coincidence
20 detecting units connected to the first sequence generation starting position controlling unit 3, and also two sets of the above-mentioned coincidence detecting units connected to the second sequence generation starting position controlling unit 6 commonly
25 use one set-value supply register, whereas two sets of these coincidence detecting units connected to the first sequence generation ending position controlling unit 4

and also two sets of these coincidence detecting units connected to the second sequence generation starting point controlling unit 7 commonly use the other set-value supply register. As represented in Fig. 12, for instance, both of a first coincidence detecting unit 43 for defining the generation timing of the signal "A", and a fifth coincidence detecting unit 44 for defining the generation timing of the signal "C" commonly use a single piece of set-value supply register 45. The first coincidence detecting unit 43 is constructed of a first comparator 41 which outputs a coincidence detection pulse "d" when the correction value "b" derived from the first sequence generation starting position controlling unit 3 is compared with a predetermined set value "rr" derived from the set-value supply register 45, and then both of these values are coincident with each other. Also, the fifth coincidence detecting unit 44 is constructed of a fifth comparator 42 which outputs a coincidence detection pulse "l" when the correction value "j" derived from the second sequence generation starting position controlling unit 6 is compared with a predetermined set value "rr" derived from the set-value supply register 45, and then both of these values are coincident with each other.

25 A description will now be made of operations of the signal generating apparatus according to the fourth embodiment of the present invention with reference to Fig. 13. To simplify this description,

only the signal "A" produced by the first sequence control unit 5 and the signal "C" produced by the second sequence control unit 8 will now be explained. Assuming now that a predetermined set value "rr" set in the set-value supply register 45 corresponds to the count value "TC1", when the correction value "b" derived from the first sequence generation starting position controlling unit 3 is coincident with the count value "TC1" corresponding to the set value "rr" of the set-value supply register 45, the coincidence detection pulse "d" is outputted from the first coincidence detecting unit 43. As a result, the signal "A" is raised, so that the signal "A" is produced. Also, when the correction value "j" derived from the second sequence generation starting position controlling unit 6 is coincident with the count value "TC1" corresponding to the set value "rr" of the set-value supply register 45, the coincidence detection pulse "l" is outputted from the fifth coincidence detecting unit 44. As a result, the signal "C" is raised, so that the signal "C" is produced. At this time, the time duration defined by that the correction value "b" derived from the first sequence generation starting position controlling unit 3 starts from the count value "o" and then reaches the count value "TCI" is equal to the time duration defined by that the correction value "j" derived from the second sequence generation starting position controlling unit 6 starts from the count value "o" and then reaches the count

value "TCI". It should be noted that this time duration is assumed as "TI".

Assuming now that the set value "rr" of the set-value supply register 45 is changed from the count value "TCI" to another count value "TCI+ Δ TCI", when the correction value "b" is coincident with the count value "TCI+ Δ TCI", the coincident detection pulse "d" is outputted from the first coincident detecting unit 43, and also when the correction value "j" is coincident with the count value "TCI+ Δ TCI", the coincidence detection pulse "l" is outputted from the fifth coincidence detecting unit 44. As a result, both of the signal "A" and the signal "C" are produced with having such a delay time " Δ TI" required to increase the correction value "b" and the correction value "j" by the count value " Δ TCI", as compared with such a case that the set value "rr" of the set-value supply register 45 is set to the count value "TCI". In other words, the rising timings of the signal "A" and the signal "B" are delayed by the time " Δ TI" from the time "TI".

As previously described, in accordance with the signal generating apparatus of the fourth embodiment, since the coincidence detecting units for the different sequences commonly use the set-value supply register, the timings of the signals "A", "B" and the signals "C", "D", which are produced in the different sequences can be simultaneously changed.

(FIFTH EMBODIMENT)

As illustrated in Fig. 14, a signal generating apparatus, according to a fifth embodiment of the present invention, has such a different arrangement from that of the signal generating apparatus according to the first embodiment, shown in Fig. 1. That is, this signal generating apparatus of the fifth embodiment is comprised of a first logic operation circuit 46 for performing a logic operation between the signal "A" outputted from the first output controlling unit 17 and the signal "C" outputted from the third output controlling unit 19 to produce a signal "G", and a second logic operation circuit 47 for performing a logic operation between the signal "B" outputted from the second output controlling unit 18 and the signal "C" outputted from the third output controlling unit 19 to produce a signal "H".

Fig. 15 is a timing chart of the signals "A", "B", "C", "G", "H" generated from the signal generating apparatus according to this embodiment when the first logic operation circuit 46 and the second logic operation circuit 47 are OR-gate circuits. In this case, the signal "G" outputted from the first logic operation circuit 46 corresponds to such a signal produced by OR-gating the signal "A" and the signal "C", whereas the signal "H" outputted from the second logic operation circuit 47 corresponds to a signal obtained by OR-gating the signal "B" and the signal "C". As a result, the

signal "G" and the signal "H" are raised only two times at a predetermined timing within one time period of the signal "A".

It should be noted that when the signal "D" outputted from the fourth output controlling unit 20 is also inputted into the first logic operation circuit 46 and/or the second logic operation circuit 47, it is possible to obtain such a signal which is raised only three times at a preselected timing during one time period of the signal "A".

In the example shown in Fig. 15, the signals "A" to "D" are such active low signals which become low levels during the normal condition and become high levels during the timing generation. Alternatively, in such a case that these signals "A" to "D" are active low signals which become high levels during the normal operation and become low levels during the timing generation, both of the first logic operation circuit 46 and the second logic operation circuit 47 are constructed of AND-gate circuits, so that it is possible to obtain two signals "G", "H" which are lowered plural times at a preselected timing during one time period of the signal "A".

(SIXTH EMBODIMENT)

As indicated in Fig. 17, a signal processing apparatus, according to a sixth embodiment of the present invention, owns such a different arrangement

from that of the signal processing apparatus according to the first embodiment of the present invention, shown in Fig. 1. That is, this signal processing apparatus further includes a clock generating circuit 49 for
5 generating a clock "CK", and a clock combining circuit 48 for combining the signal "A" outputted from the first output controlling unit 17 with the clock "CK" outputted from the clock generating circuit 49 to produce a signal "I". The clock combining circuit 48 is arranged by such
10 a logic operation circuit as an OR-gate circuit and an AND-gate circuit, and a circuit unit for suppressing hazard caused by timing shifts between the signal "A" and the clock "CK" while the signal "A" is combined with the clock "CK".

15 For instance, when the signal "A" is an active-high signal, the logic operation unit of the clock combining circuit 48 is arranged by an AND-gate circuit, so that as illustrated in the timing chart of Fig. 18, such a signal "I" having the same waveform as
20 that of the clock "CK" only during the high-level period of the signal "A" can be generated.

(SEVENTH EMBODIMENT)

As shown in Fig. 19, a signal generating apparatus, according to a seventh embodiment of the
25 present invention, owns the following different circuit arrangement, as compared with that of the signal generating apparatus indicated in Fig. 1, according to

the first embodiment of the present invention. That is, the first output controlling unit 50 contains a reset pulse register 52 for outputting a reset pulse "RP" when a predetermined numeral value is written into this reset pulse register 52, starts to generate the signal "A" when the coincident detection pulse "d" from the first coincidence detecting unit 9 is entered therein, and completes to generate the signal "AA" when the reset pulse "RP" is outputted from the reset pulse register 52. In other words, as represented in Fig. 20, the first output controlling unit 50 of the signal generating apparatus according to this embodiment is constructed of the reset pulse register 52 for producing the reset pulse "RP" when "o" is written into this reset pulse register, and also a coincidence detection clear circuit 51 for raising the signal "AA" when the coincidence detection pulse "d" is inputted from the first coincident detecting unit 9 and for lowering the signal "AA" when the reset pulse "RP" is outputted from the reset pulse register 52.

Subsequently, operation of the signal generating apparatus according to the seventh embodiment will now be described with reference to the timing chart of Fig. 21. When the coincidence detection pulse "d" of the active-high signal is inputted from the first coincidence detecting circuit 9, the coincidence detection clear circuit 51 of the first output controlling unit 50 raises the signal "AA" in synchronism with

falling of the coincidence detection pulse "d".

Thereafter, when "o" is directly written into the reset pulse register 52 from a central processing unit (CPU), the reset pulse register 52 produces the reset pulse

5 "RP" of the active-low signal. Upon receipt of the reset pulse "RP", the coincidence detection clear circuit 51 causes the signal "AA" to fall in synchronism with lowering of the reset pulse "RP". As a result, the signal "AA" of the active-high signal is produced.

10 As a result, since in the signal generating apparatus of this embodiment, raising of the signal "AA" can be controlled by the coincidence detection pulse "d" and also lowering of the signal "AA" can be controlled by writing a predetermined numeral value (for example,
15 "o") into the reset pulse register 52, this signal generating apparatus may be employed as an apparatus for periodically generating an interrupt signal to a CPU. With employment of such a signal generating apparatus, the interrupt signal to the CPU can be periodically
20 produced in response to the coincidence detection pulse. Furthermore, when the interrupt process is ended, the CPU will write "o" into the reset pulse register 52 so as to accomplish the generation of the interrupt signal, so that the interruption to the CPU can be released.

25 (EMBODIMENT OF WIRELESS MOBILE APPARATUS)

Fig. 24 is a schematic block diagram for representing an arrangement of a wireless (radio) mobile

apparatus according to an embodiment of the present invention. The wireless mobile apparatus 60 according to this embodiment is such a radio mobile system for transmitting and receiving the signals to/from a base station system 61 including a base station antenna 62, which includes an antenna 63 receives the electromagnetic waves transmitted from the base station system 61. The radio mobile apparatus 60 is arranged by as a reception unit thereof, a receiver 64 for receiving a signal, which is contains a baseband signal and is transmitted from the base station system 61, and also for extracting the baseband signal from the received signal; a demodulator 65 for demodulating the extracted baseband signal to reproduce a data series synchronized with the base station system 61; and a channel codec unit 66 functioning as an error correction decoding means for executing error correction decoding operation to the reproduced data series. The radio mobile apparatus 60 further includes a speech codec unit 67 functioning as an audio decoding means for decoding such audio data when the error-correction decoded data series corresponds to the audio data; a D/A converter 68 for digital-to-analog-converting the decoded audio data into an audio (voice) signal; and a speaker 69 for outputting the converted audio signal as a voice. The radio mobile apparatus 60 is arranged by as a transmission unit, a microphone 70 for converting voice into an audio (voice) signal; an A/D converter 71 for analog-to-digital-

converting the converted audio signal into audio data;
the speech codec unit 67 functioning also as an audio
encoding means for encoding the converted audio data;
and the channel codec unit 66 functioning also as an
5 error correction encoding means for error-correction
encoding the encoded audio data. This radio mobile
apparatus 60 further includes a modulator 72 for
modulating the error-correction encoded audio data with
a transmission carrier; and a transmitter 74 for
10 transmitting the modulated audio data to the base
station apparatus 61. Furthermore, the radio mobile
apparatus 60 is constructed of as a control unit, a
signal generating apparatus 74 for generating timing
signals used to perform the signal transmitting/
15 receiving operation of the radio mobile apparatus 60; a
central processing unit (CPU) 75 for controlling the
signal transmitting/receiving operation of the radio
mobile apparatus 60; and a memory 76 for storing therein
command data and control data used to the central
20 processing unit 75. It should be noted that the above-
described signal generating apparatus 74 owns a similar
arrangement to that of one of the above-explained signal
generating apparatuses according to the first to seventh
embodiments of the present invention.

25 In Fig. 25, there is shown an example of a
frame structure defined between the base station system
61 and the radio mobile apparatus 60, two sets of
reception timing signals "RT1", "RT2" generated by the

signal generating apparatus 74, and two sets of transmission timing signals "TT1", "TT2". Referring now to Fig. 25, operations of the signal generating apparatus 74 employed in the radio mobile apparatus 60 will be
5 described.

In the frame structure shown in Fig. 25, a single TDMA (Time Division Multiple Access) frame is constructed of eight time slots "TS0" to "TS7". Among them, the time slot "TS0" is used as a reception time
10 slot of the radio mobile apparatus 60, whereas the time slot "TS3" is used as a transmission time slot of the radio mobile apparatus 60. In such a frame structure, both the transmitting operation and the receiving operation of the radio mobile apparatus 60 are carried
15 out in the time divisional manner. The signal generating apparatus 74 generates the reception timing signals "RT1", "RT2" at a timing located near the reception time slot, which will then be supplied to the receiver 64 and the demodulator 65, and also generates
20 the transmission timing signals "TT1", "TT2" at a timing located near the transmission time slot, which will then be supplied to the modulator 72 and the transmitter 73. Even when the timings of the reception time slot/
transmission time slot are varied, both the reception
25 timing signals "RT1", "RT2" and the transmission timing signals "TT1", "TT2" may be generated at proper timings in accordance with the operations as previously explained in the signal generating apparatuses according

to the first to seventh embodiments of the present invention by employing the signal generating apparatus 74 having an arrangement similar to that of one of the first to seventh signal generating apparatuses of the
5 present invention. It should be understood that this signal generating apparatus 74 is controlled by the CPU 75.



What is claimed is:

1. A signal generating apparatus for generating a signal whose generation starting timing and generation ending timing are controlled, comprising:

a timer for producing a timer output value by incrementing or decrementing a count value in response to a clock signal;

control means for correcting said timer output value inputted from said timer to produce a correction value;

coincidence detecting means into which a predetermined set value is set, for outputting a coincidence detection pulse when said correction value inputted from said control means is coincident with said set value; and

output control means for controlling the generation starting timing and the generation ending timing of said signal in response to said coincidence detection pulse inputted from said coincidence detecting means.

2. A signal generating apparatus as claimed in claim 1 wherein:

said control means includes first and second correction means for producing first and second correction values different from each other by correcting said timer output value;

said coincidence detecting means outputs said coincidence detection pulses corresponding to said first



and second correction values inputted from said control means, respectively; and

said output control means controls the generation starting timing of said signal based on the coincidence detection pulse corresponding to said first correction value which is inputted from said coincidence detecting means, and also controls the generation ending timing of said signal based upon the coincidence detection pulse corresponding to said second correction value which is inputted from said coincidence detecting means.

3. A signal generating apparatus as claimed in claim 2 wherein:

said first correction means includes:

a first register for storing a first predetermined other set value; and

a first subtracter for subtracting said first predetermined other set value, which is inputted from said first register, from said timer output value which is inputted from said timer to produce said first correction value; and

said second correction means includes:

a second register for storing a second predetermined other set value; and

a second subtracter for subtracting said second predetermined other set value, which is inputted from said second register, from said timer output value which is inputted from said timer to produce said second



correction value.

4. A signal generating apparatus as claimed in claim 2 or claim 3 wherein said second correction means receives as an input value the output value of said first correction means.

5. A signal generating apparatus as claimed in claim 1, further comprising:

synchronization control means for resetting a count value of said timer in order that the count value of said timer is synchronized with an external condition.

6. A signal generating apparatus as claimed in claim 1 wherein:

said signal generating apparatus further comprises:

a plurality of said control means and said coincidence detecting means; and

a set-value supply register for supplying said predetermined set value; and

when said correction value inputted from corresponding one of said plural control means is coincident with said set value inputted from said set-value supply register, each of said coincidence detecting means outputs a coincidence detection pulse.

7. A signal generating apparatus as claimed in claim 1 wherein:

said signal generating apparatus further comprises:



a plurality of said output control means; and
logic operation means for performing a logic
operation of signals outputted from more than two
arbitrary output control means among said plural output
control means.

8. A signal generating apparatus as claimed in
claim 1, further comprising:

clock generating means for generating a clock
signal; and

clock logic operation means for performing a
logic operation between the signal outputted from said
output control means and said clock signal outputted
from said clock generating means.

9. A signal generating apparatus as claimed in
claim 1 wherein:

said output control means includes a reset
pulse register for outputting a reset pulse when a
predetermined numeral value is written;

starts to generate said signal when said
coincidence detection pulse is inputted from said
coincidence detecting means; and

completes to generate said signal when said
reset pulse is outputted from said reset pulse register.

10. A wireless mobile apparatus for transmitting/
receiving a signal to/from a base station system,
comprising:

receiving means for receiving a signal which
contains a baseband signal and is transmitted from said



base station system, and for extracting the baseband signal from the received signal;

demodulating means for demodulating said extracted baseband signal to reproduce a data series synchronized with said base station system;

error correction decoding means for error-correction-decoding said reproduced data series;

audio decoding means for decoding audio data when said error-correction decoded data series is such audio data;

digital-to-analog converting means for digital-to-analog-converting said decoded audio data into an audio signal;

speaker means for outputting said converted audio signal as voice;

a microphone for converting voice into an audio signal;

analog-to-digital converting means for analog-to-digital-converting said converted audio signal into audio data;

audio coding means for coding said converted audio data;

error correction coding means for error-correction coding said coded audio data;

modulating means for modulating said error-correction coded audio data with a transmission carrier;

transmitting means for transmitting said modulated audio data to said base station system;



signal generating means for generating a timing signal used to a transmitting/receiving operation of said wireless mobile apparatus;

a central processing unit for controlling the transmitting/receiving operation of said wireless mobile apparatus; and

a memory for storing command data and control data used to said central processing unit; wherein:

said signal generating means is such a signal generating means for generating a signal whose generation starting timing and generation ending timing are controlled; comprising:

a timer for producing a timer output value by incrementing or decrementing a count value in response to a clock signal;

control means for correcting said timer output value inputted from said timer to produce a correction value;

coincidence detecting means into which a predetermined set value is set, for outputting a coincidence detection pulse when said correction value inputted from said control means is coincident with said set value; and

output control means for controlling the generation starting timing and the generation ending timing of said signal in response to said coincidence detection pulse inputted from said coincidence detecting means.



11. A wireless mobile apparatus as claimed in claim 10 wherein:

said control means includes first and second correction means for producing first and second correction values different from each other by correcting said timer output value;

said coincidence detecting means outputs said coincidence detection pulses corresponding to said first and second correction values inputted from said control means, respectively; and

said output control means controls the generation starting timing of said signal based on the coincidence detection pulse corresponding to said first correction value which is inputted from said coincidence detecting means, and also controls the generation ending timing of said signal based upon the coincidence detection pulse corresponding to said second correction value which is inputted from said coincidence detecting means.

12. A wireless mobile apparatus as claimed in claim 11 wherein:

said first correction means includes:

a first register for storing a first predetermined other set value; and

a first subtracter for subtracting said first predetermined other set value, which is inputted from said first register, from said timer output value which is inputted from said timer to produce said first



correction value; and

said second correction means includes:

a second register for storing a second predetermined other set value; and

a second subtracter for subtracting said second predetermined other set value, which is inputted from said second register, from said timer output value which is inputted from said timer to produce said second correction value.

13. A wireless mobile apparatus as claimed in claim 11 or claim 12 wherein said second correction means receives as an input value the output value of said first correction means.

14. A wireless mobile apparatus as claimed in claim 10, further comprising:

synchronization control means for resetting a count value of said timer in order that the count value of said timer is synchronized with an external condition.

15. A wireless mobile apparatus as claimed in claim 10 wherein:

said wireless mobile apparatus further comprises:

a plurality of said control means and said coincidence detecting means; and

a set-value supply register for supplying said predetermined set value; and

when said correction value inputted from



corresponding one of said plural control means is coincident with said set value inputted from said set-value supply register, each of said coincidence detecting means outputs a coincidence detection pulse.

16. A wireless mobile apparatus as claimed in claim 10 wherein:

said wireless mobile apparatus further comprises:

a plurality of said output control means; and logic operation means for performing a logic operation of signals outputted from more than two arbitrary output control means among said plural output control means.

17. A wireless mobile apparatus as claimed in claim 10, further comprising:

clock generating means for generating a clock signal; and

clock logic operation means for performing a logic operation between the signal outputted from said output control means and said clock signal outputted from said clock generating means.

18. A wireless mobile apparatus as claimed in claim 10 wherein:

said output control means includes a reset pulse register for outputting a reset pulse when a predetermined numeral value is written;

starts to generate said signal when said coincidence detection pulse is inputted from said



coincidence detecting means; and

 completes to generate said signal when said
reset pulse is outputted from said reset pulse register.



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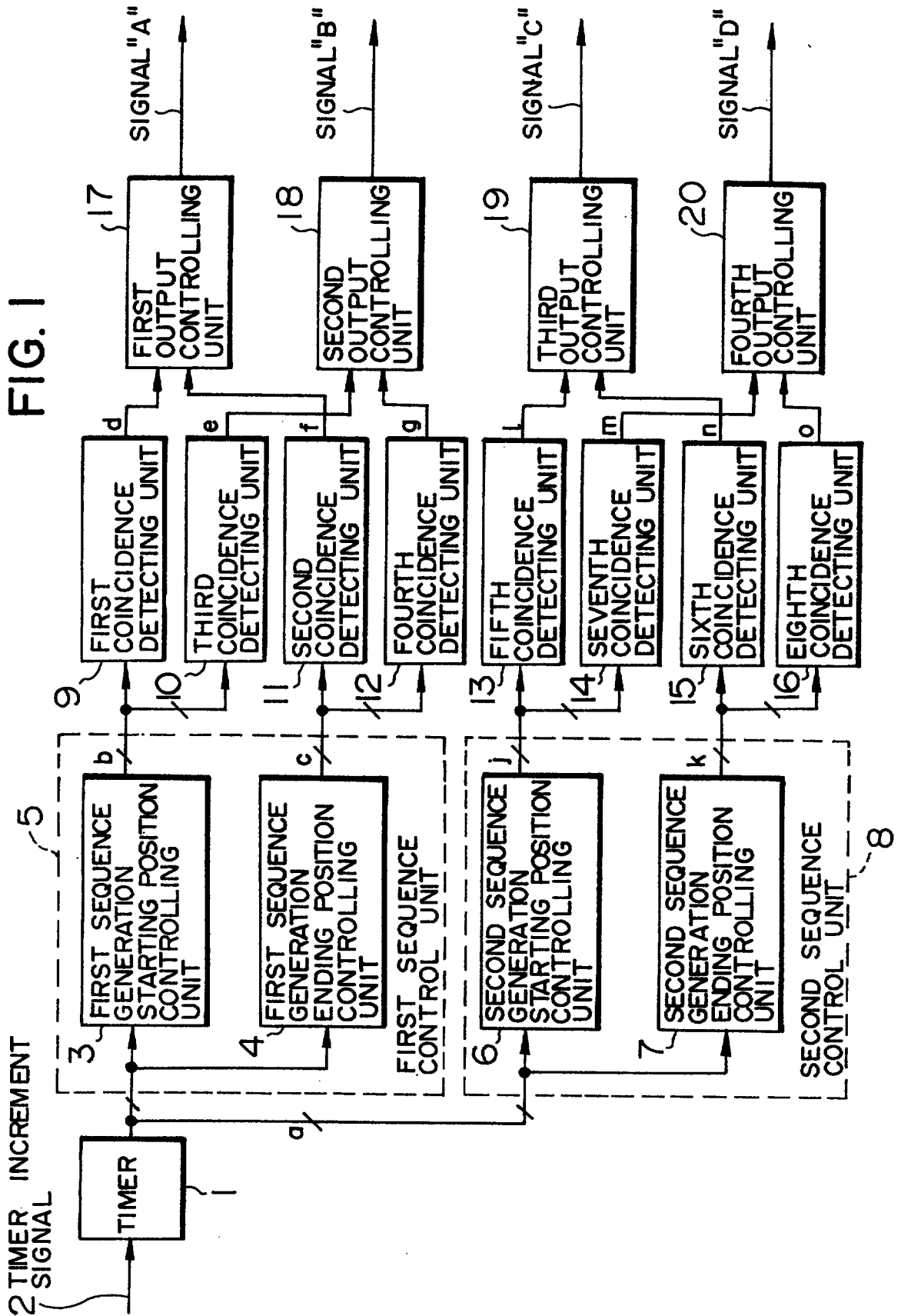
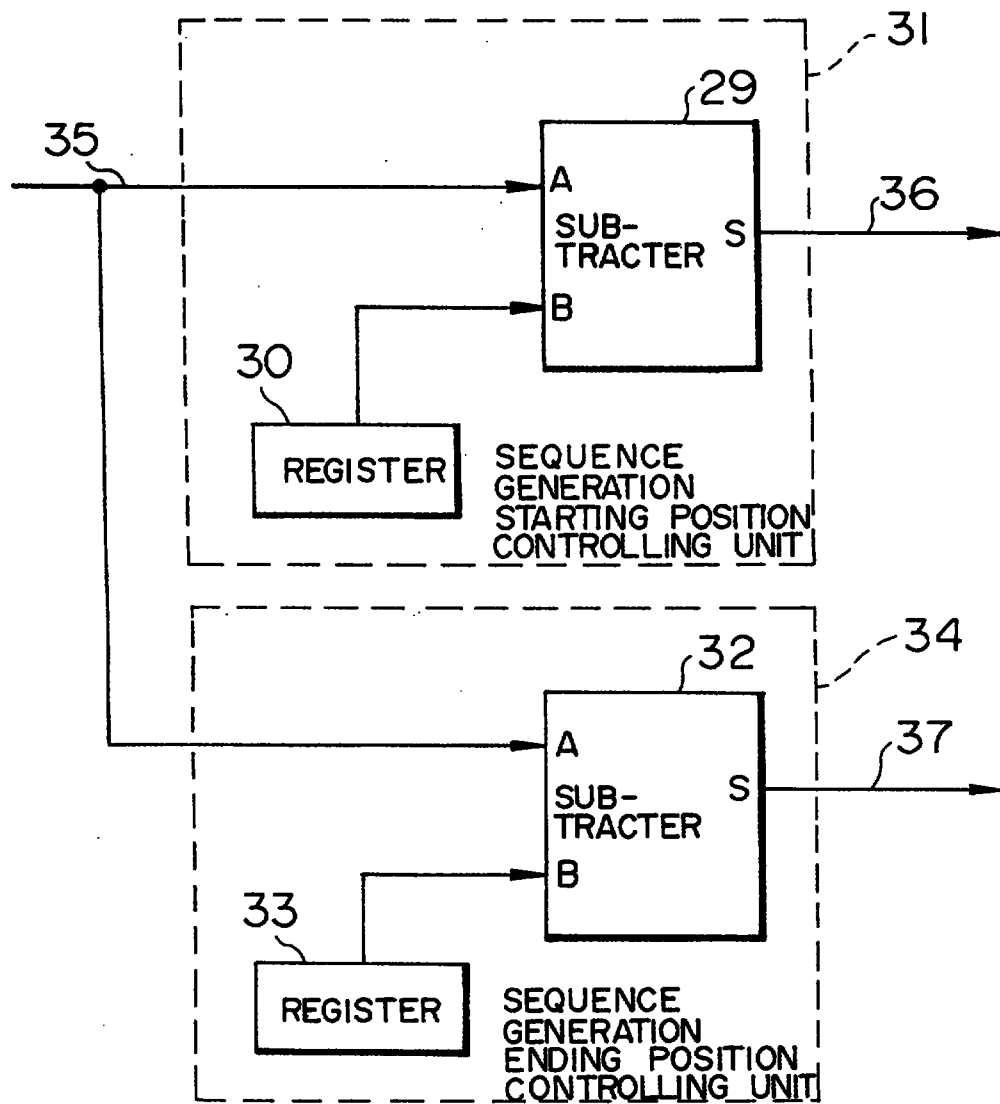
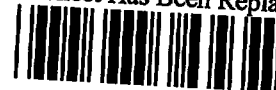




FIG. 2

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FIG. 3

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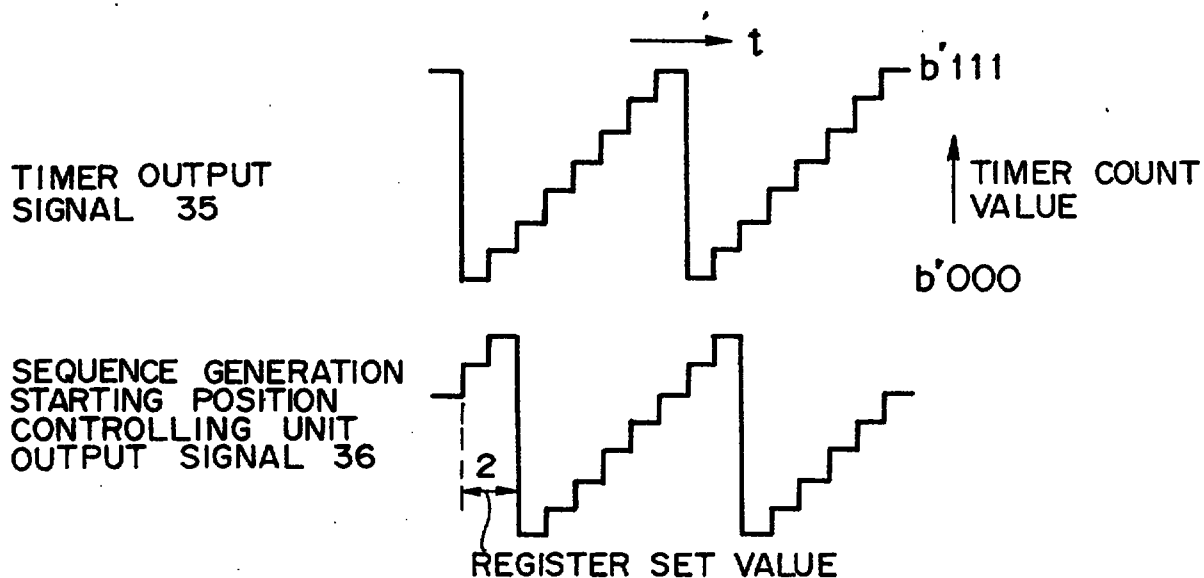


FIG. 4

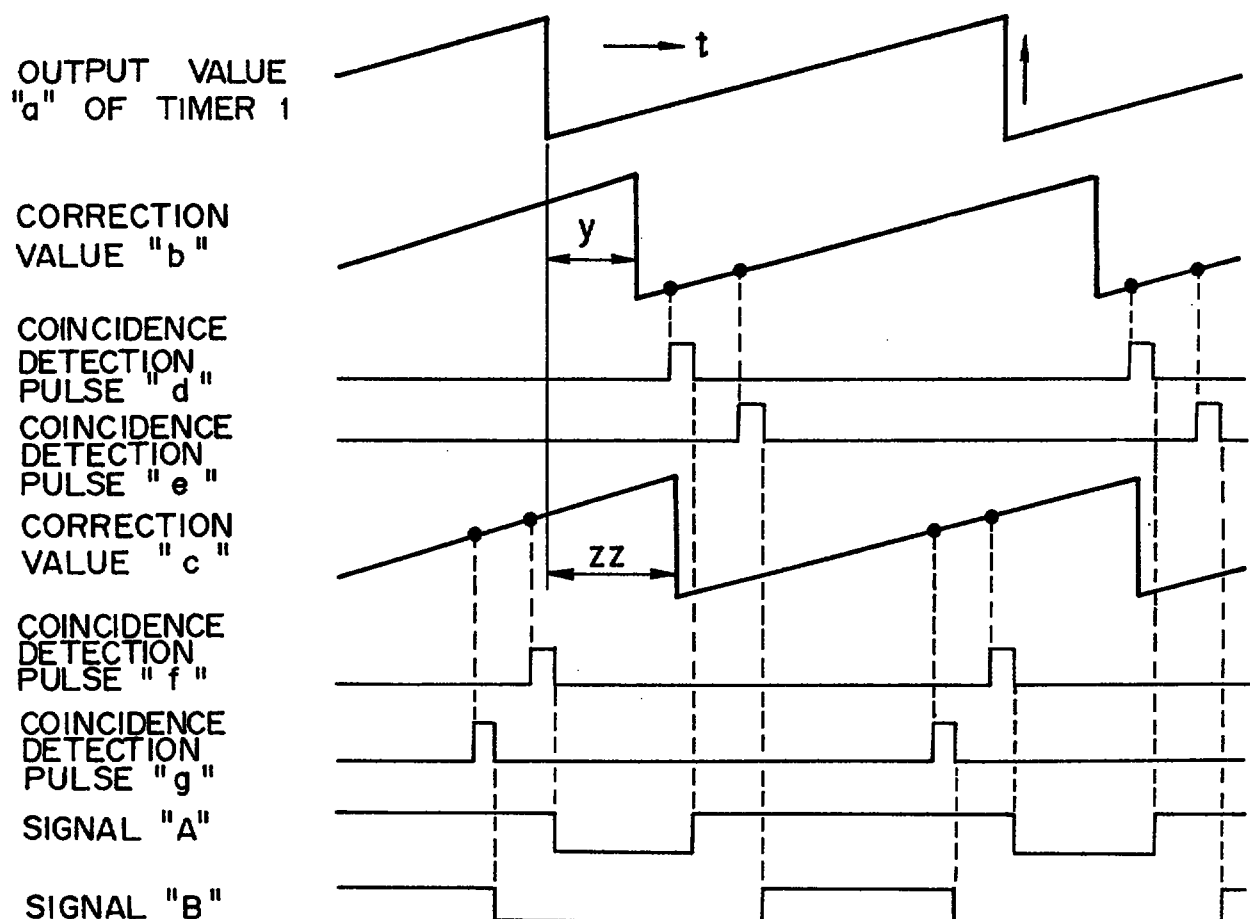
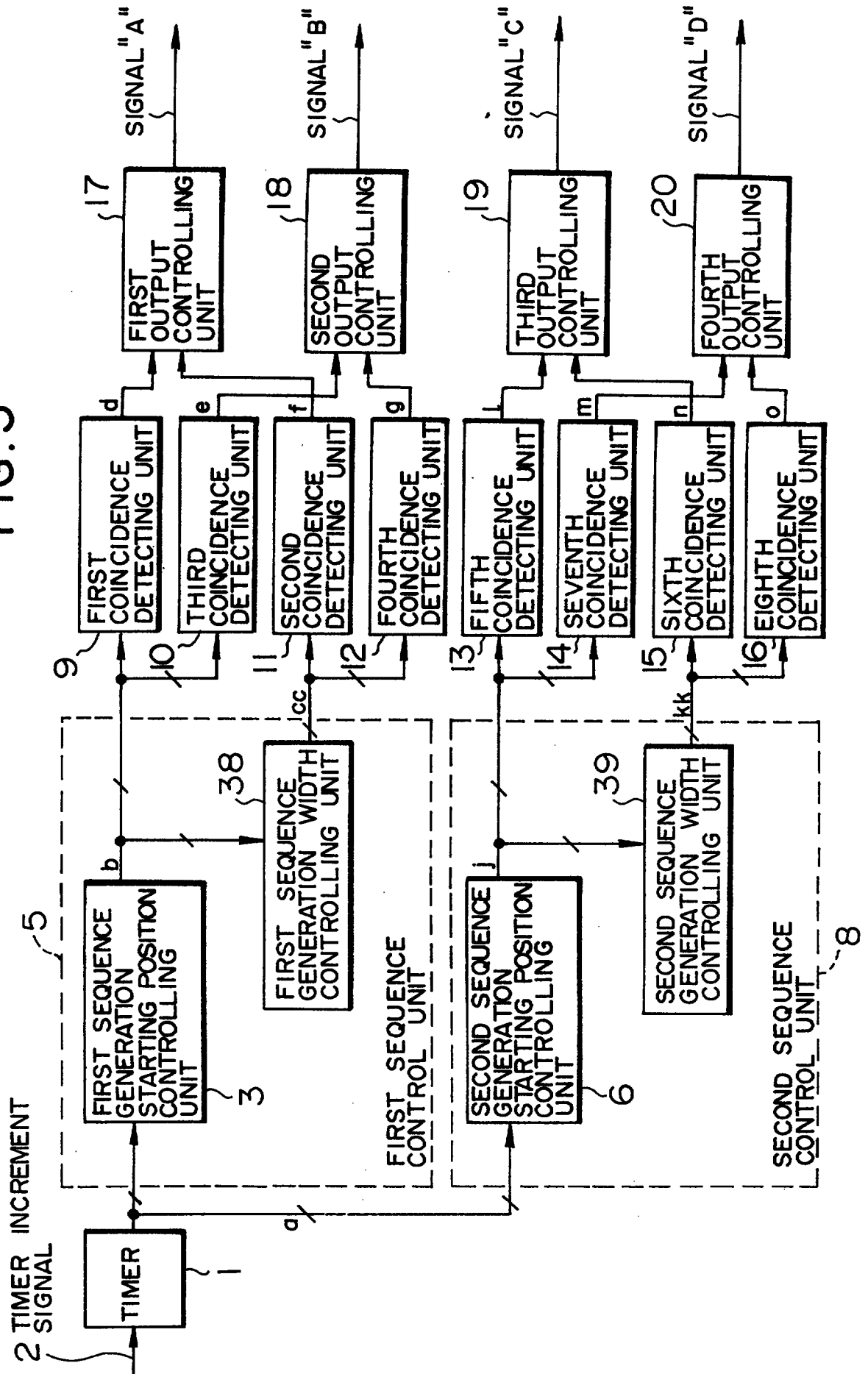




FIG. 5

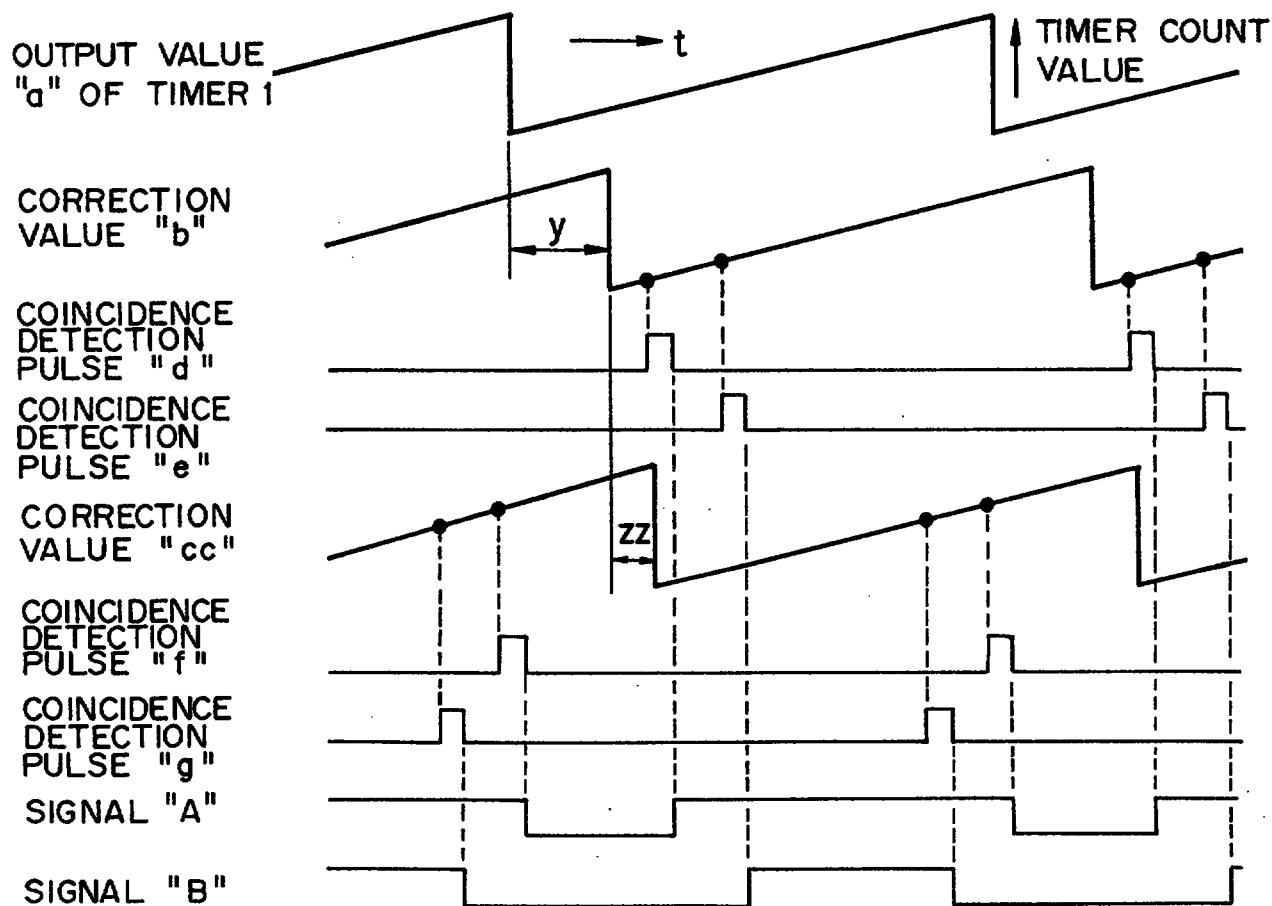




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FIG. 6

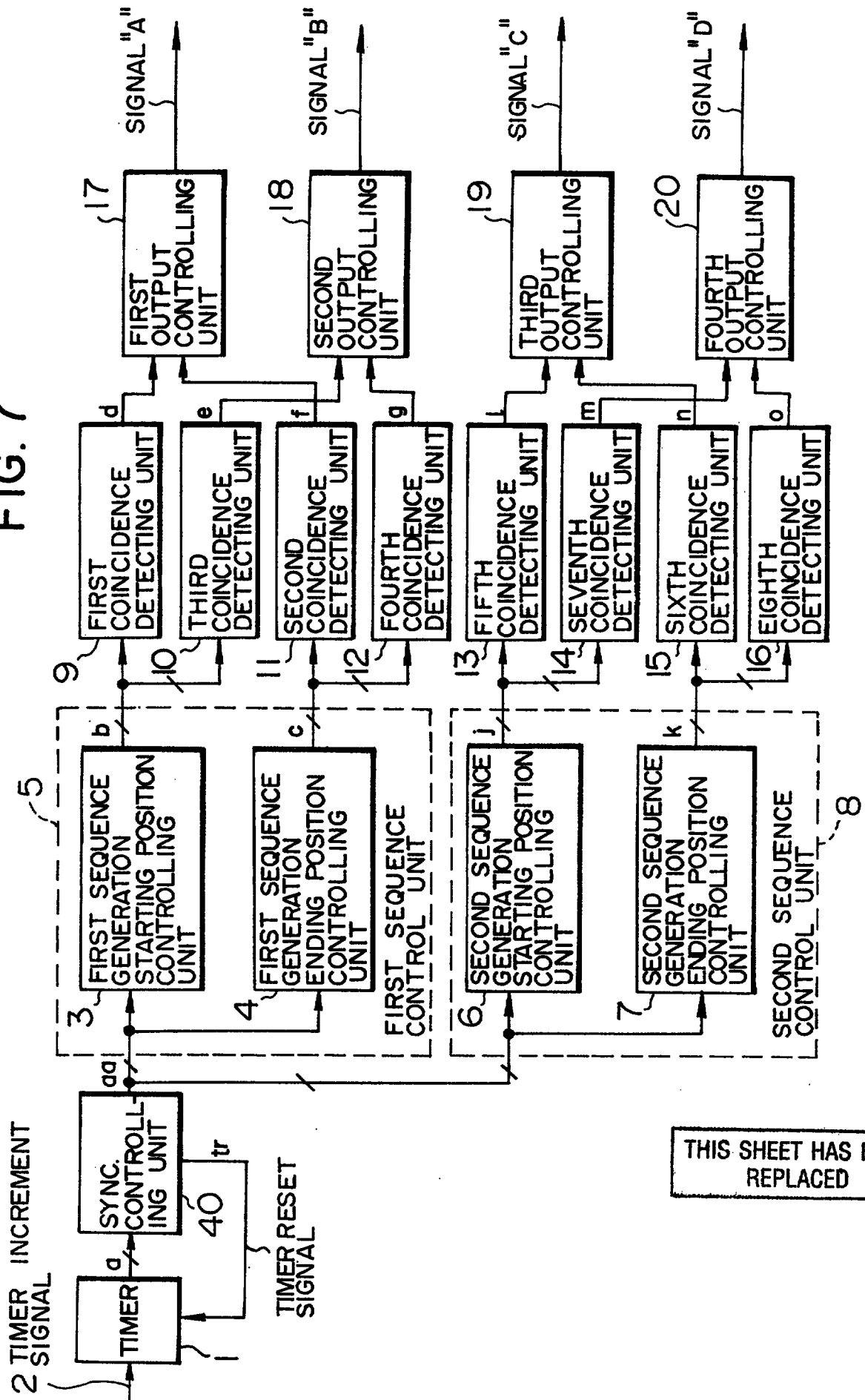
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FIG. 7

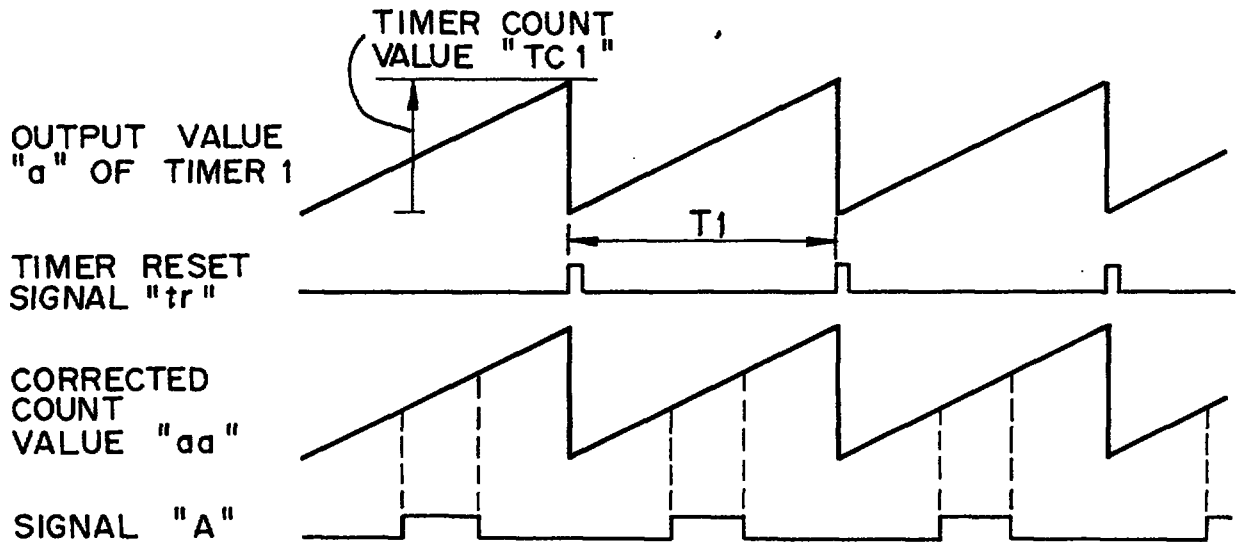


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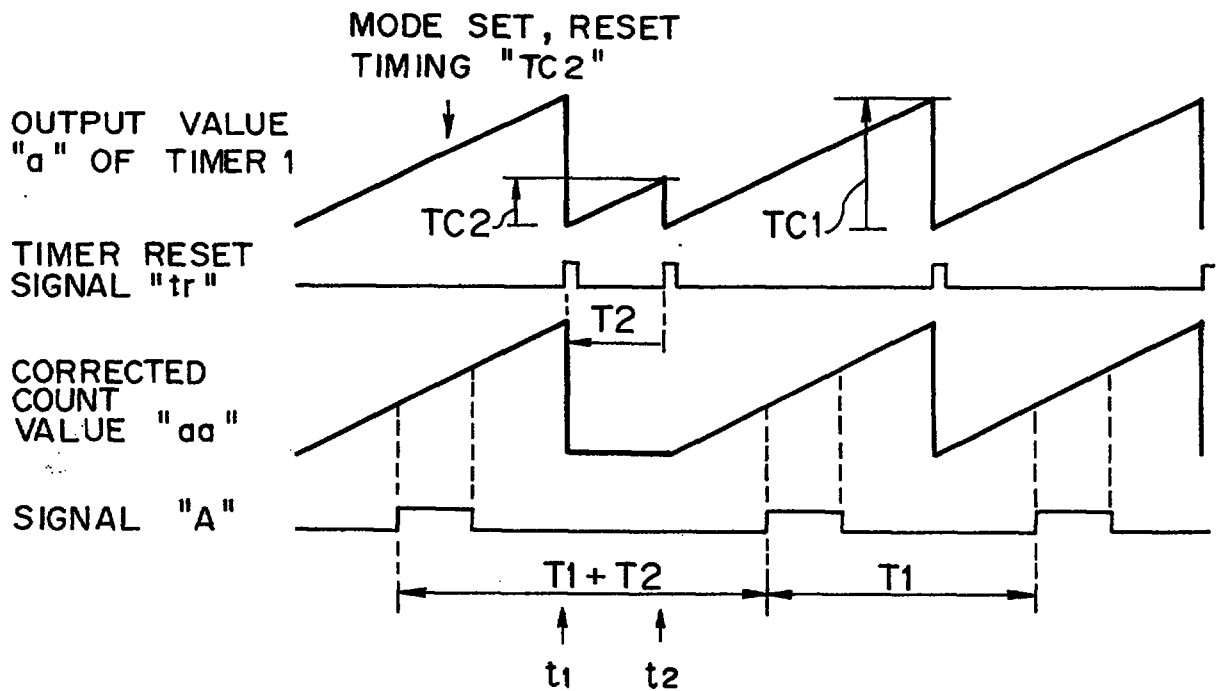
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FIG. 8



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FIG. 9





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FIG. 10

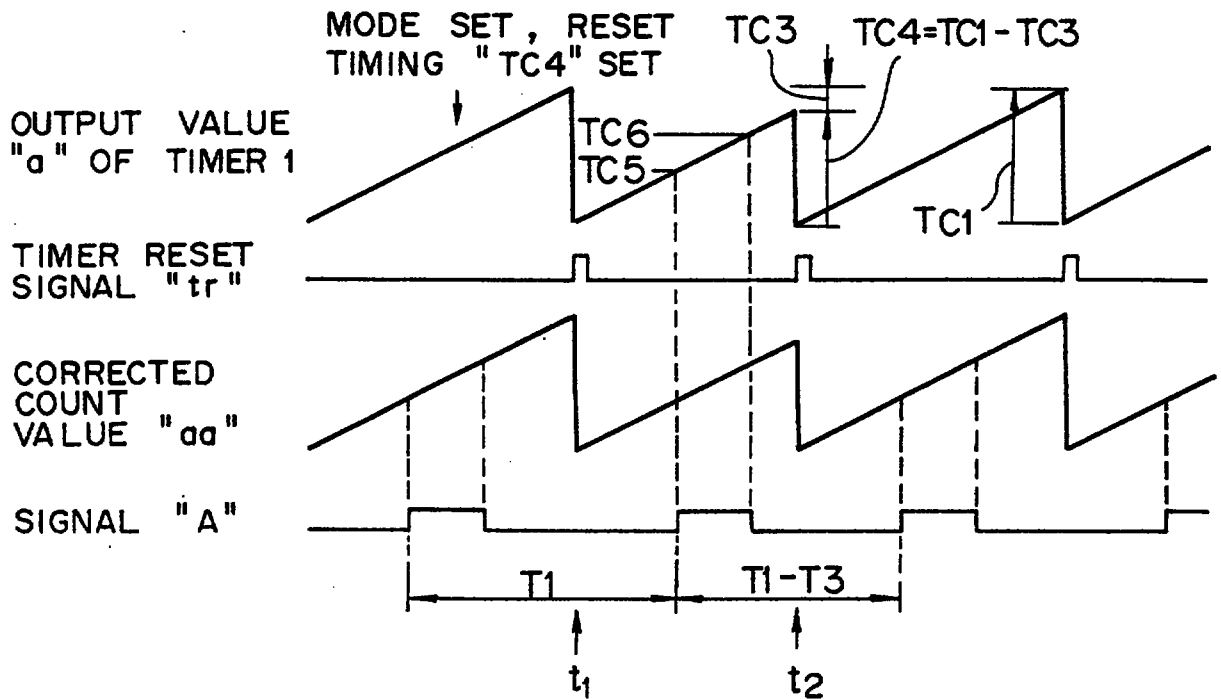
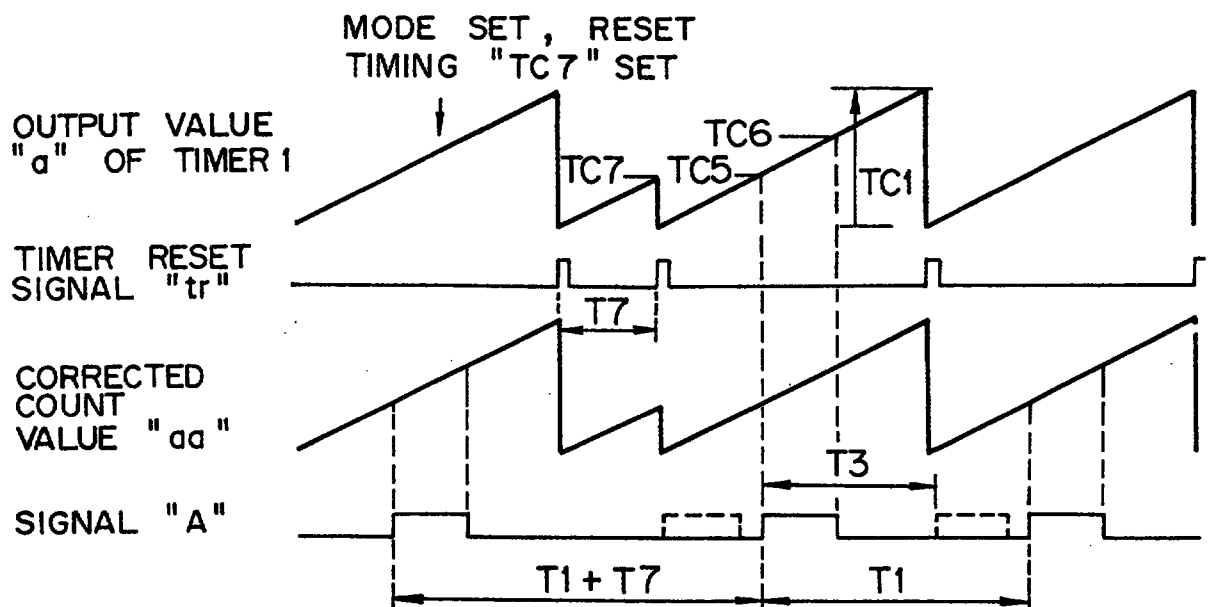
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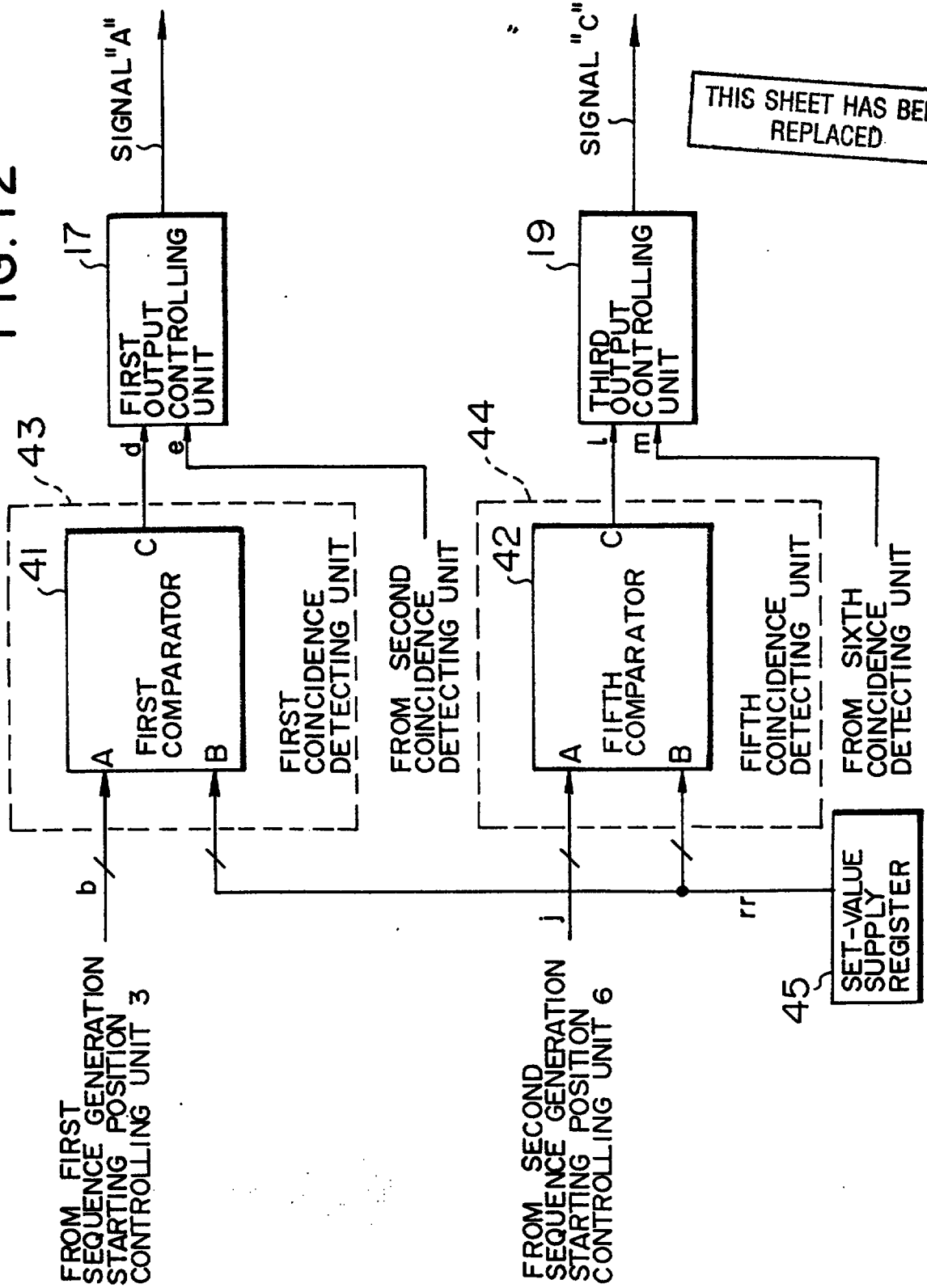
FIG. 11





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FIG. 12



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FIG. 13

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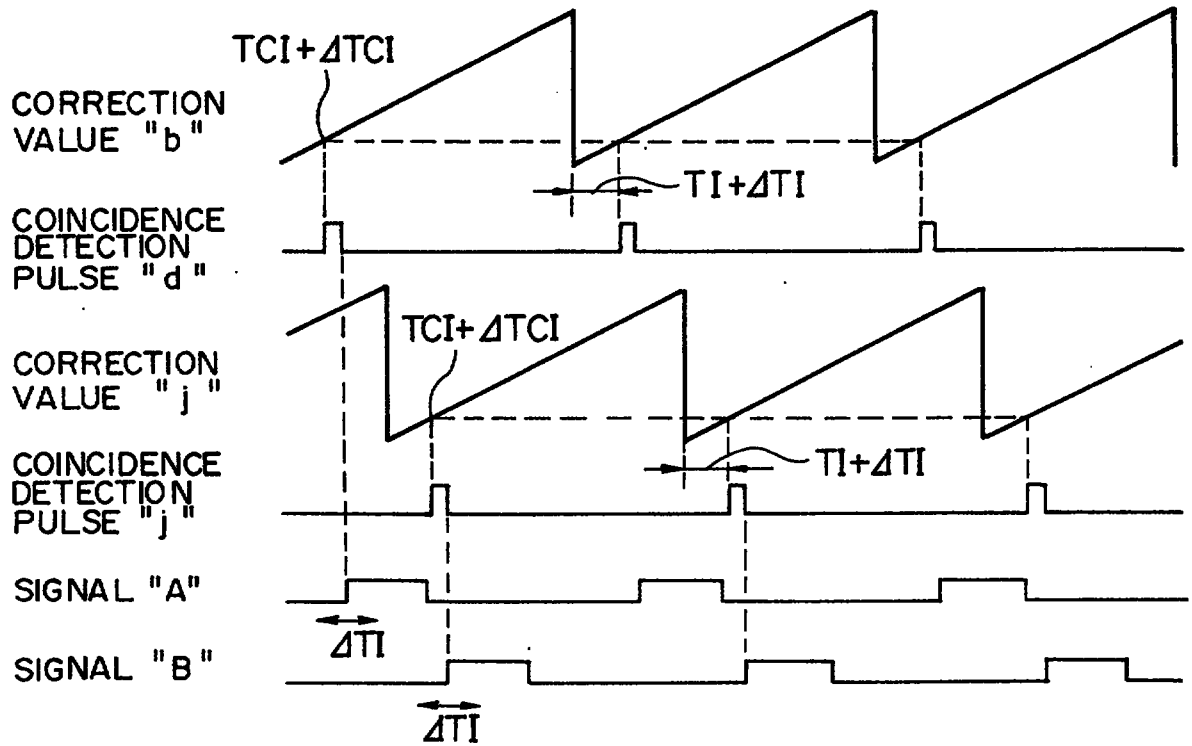
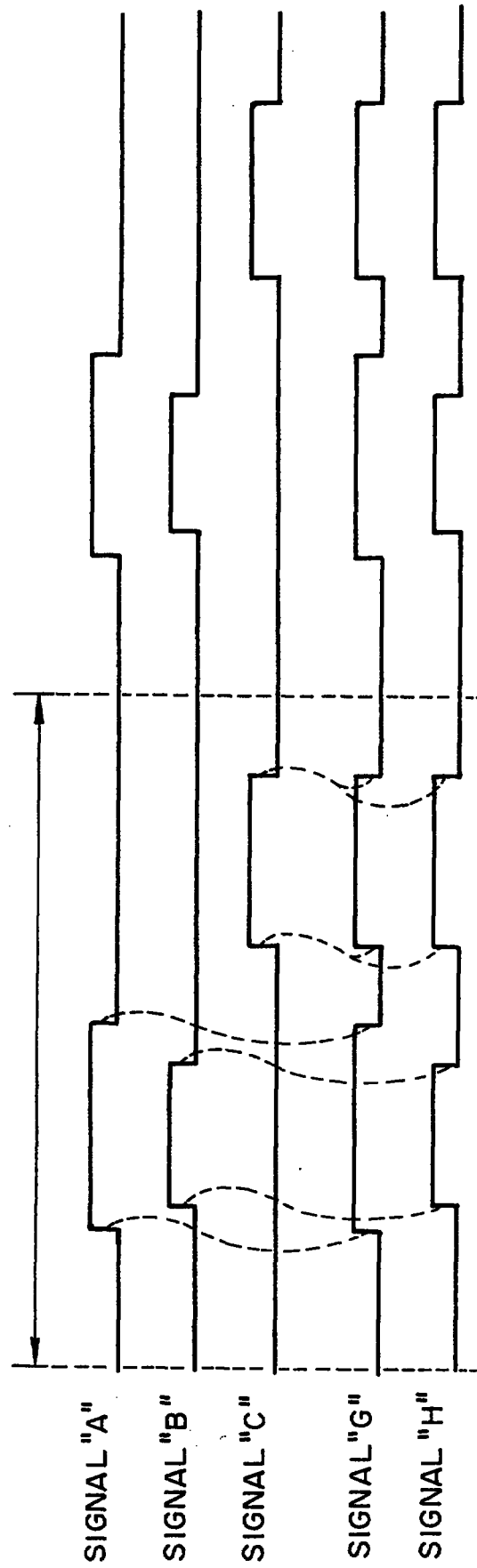


FIG. 14



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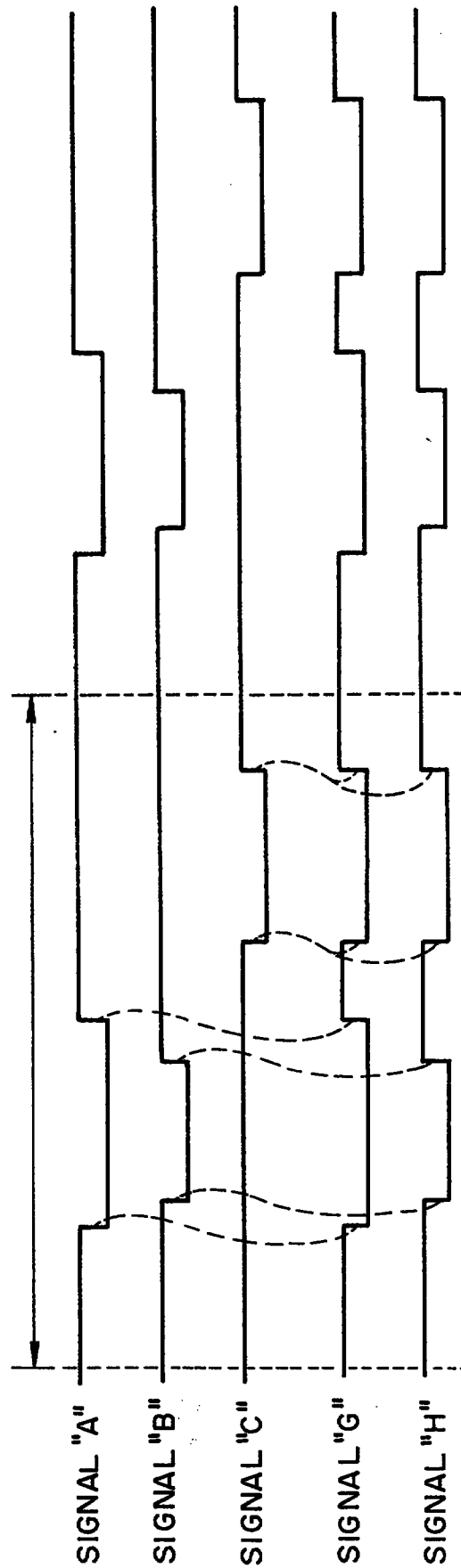
FIG. 15



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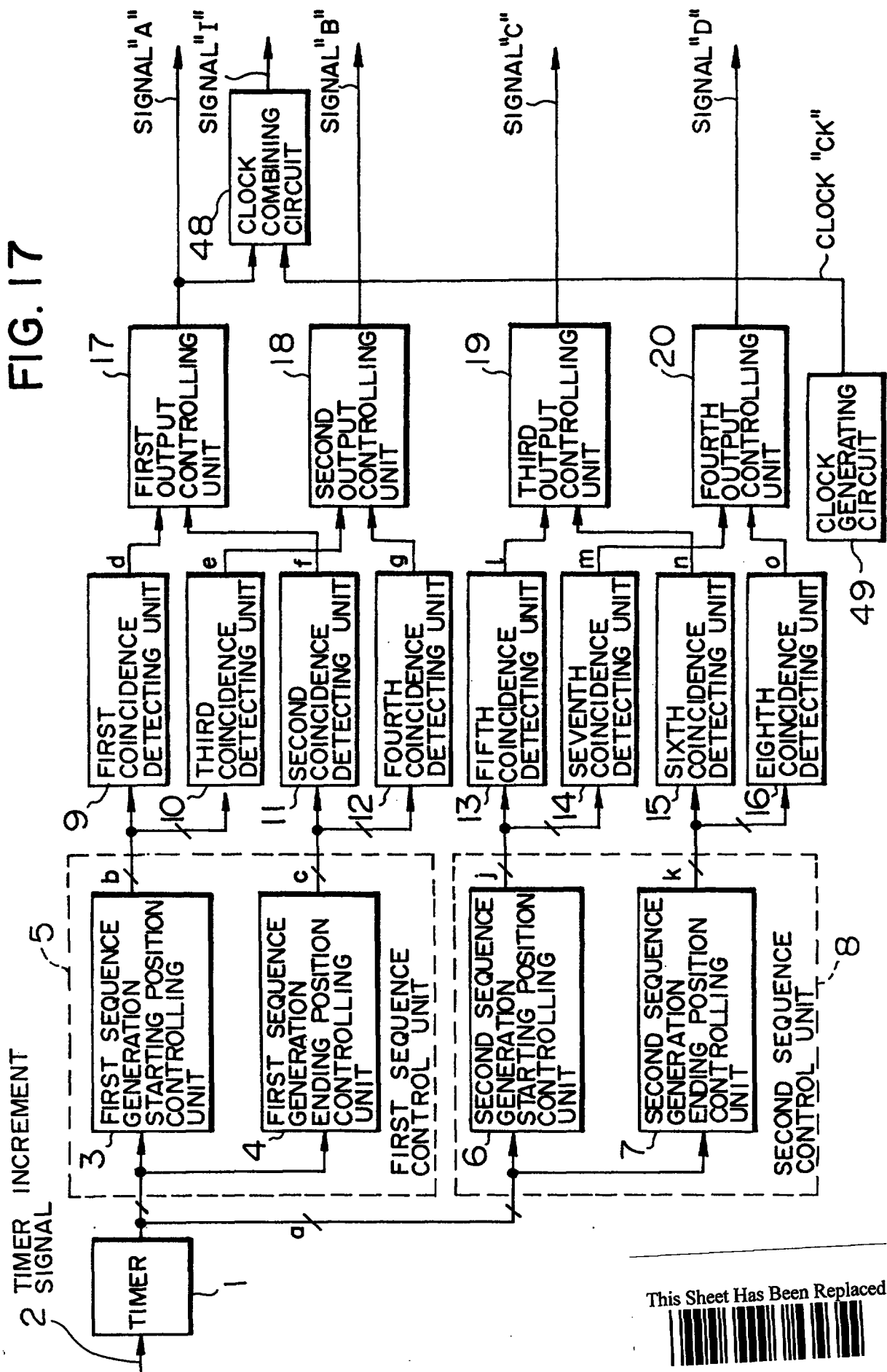


FIG. 16



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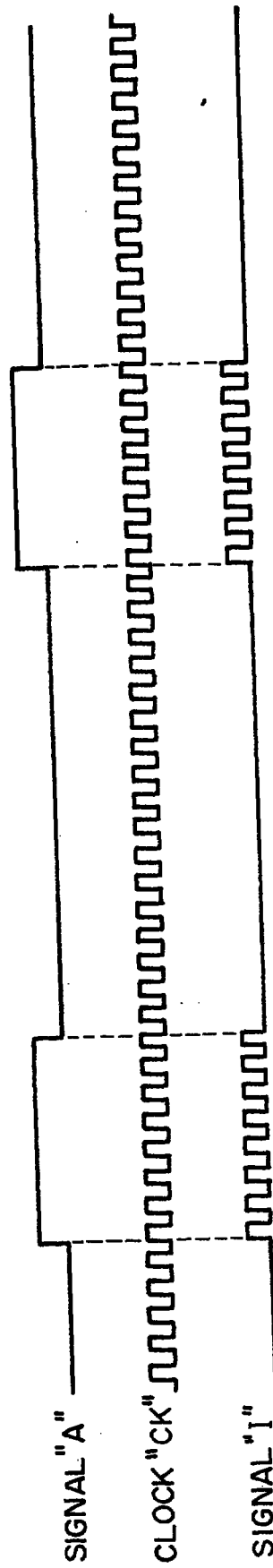
FIG. 17





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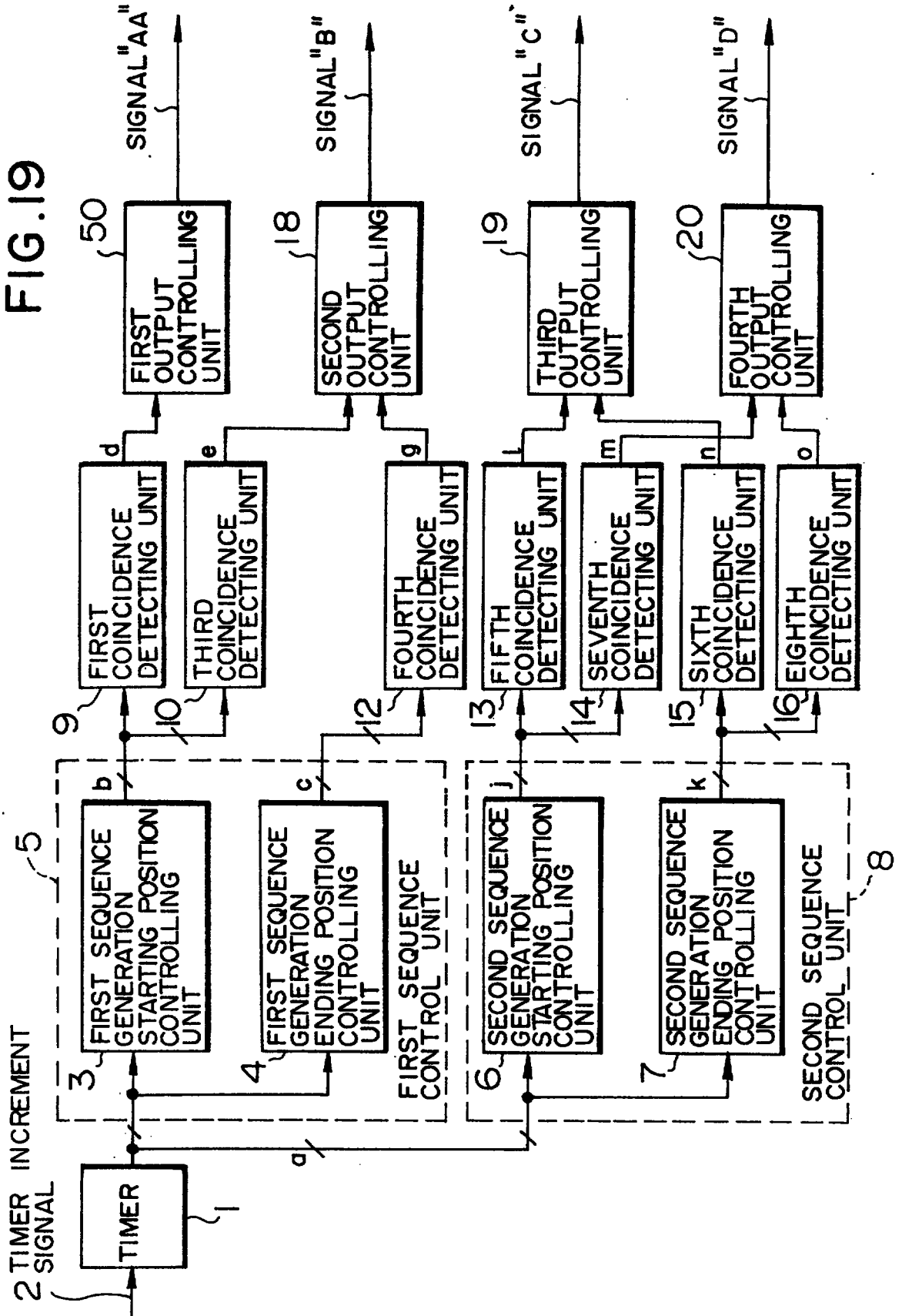
FIG. 18





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FIG. 19





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FIG. 20

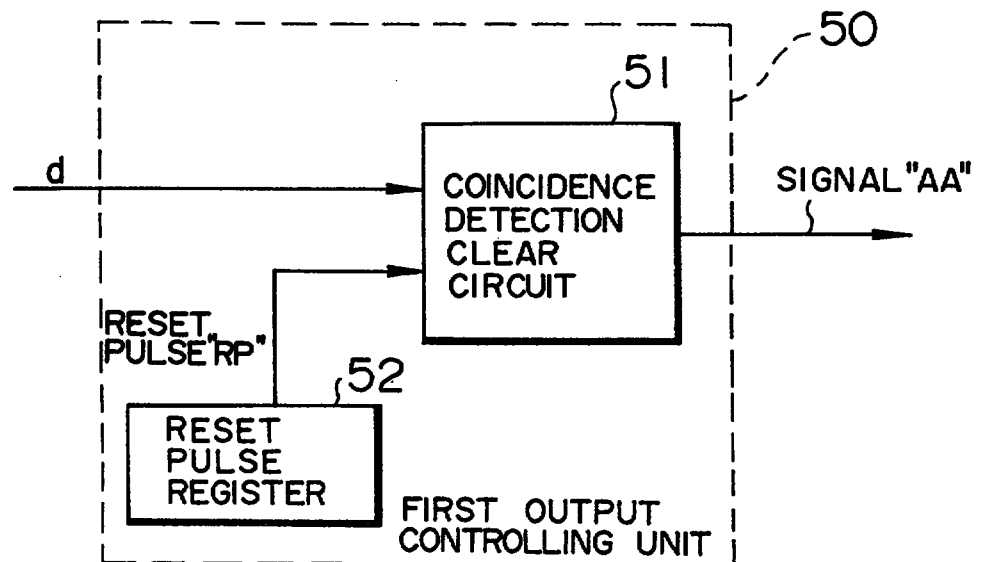


FIG. 21

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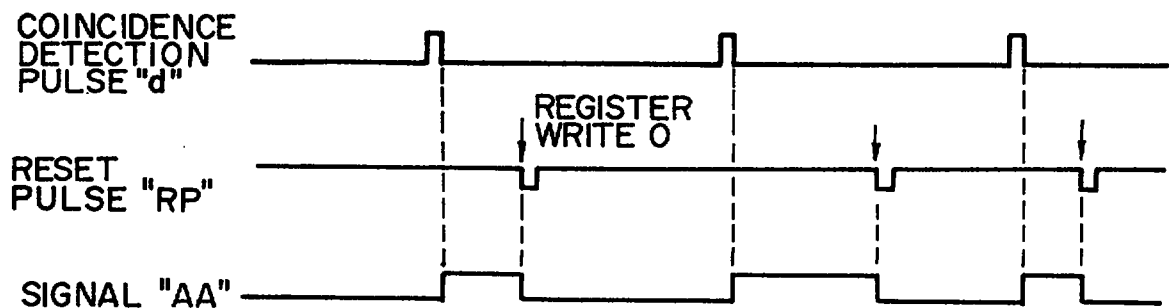
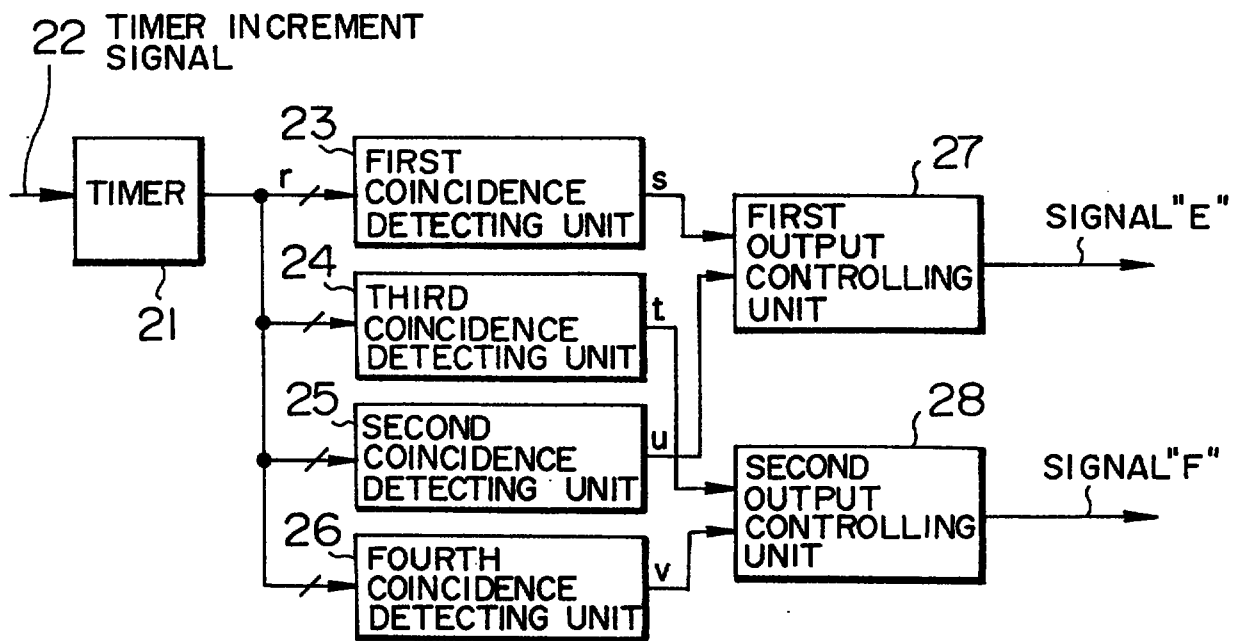




FIG. 22
PRIOR ART



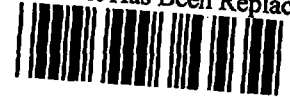


FIG. 23
PRIOR ART

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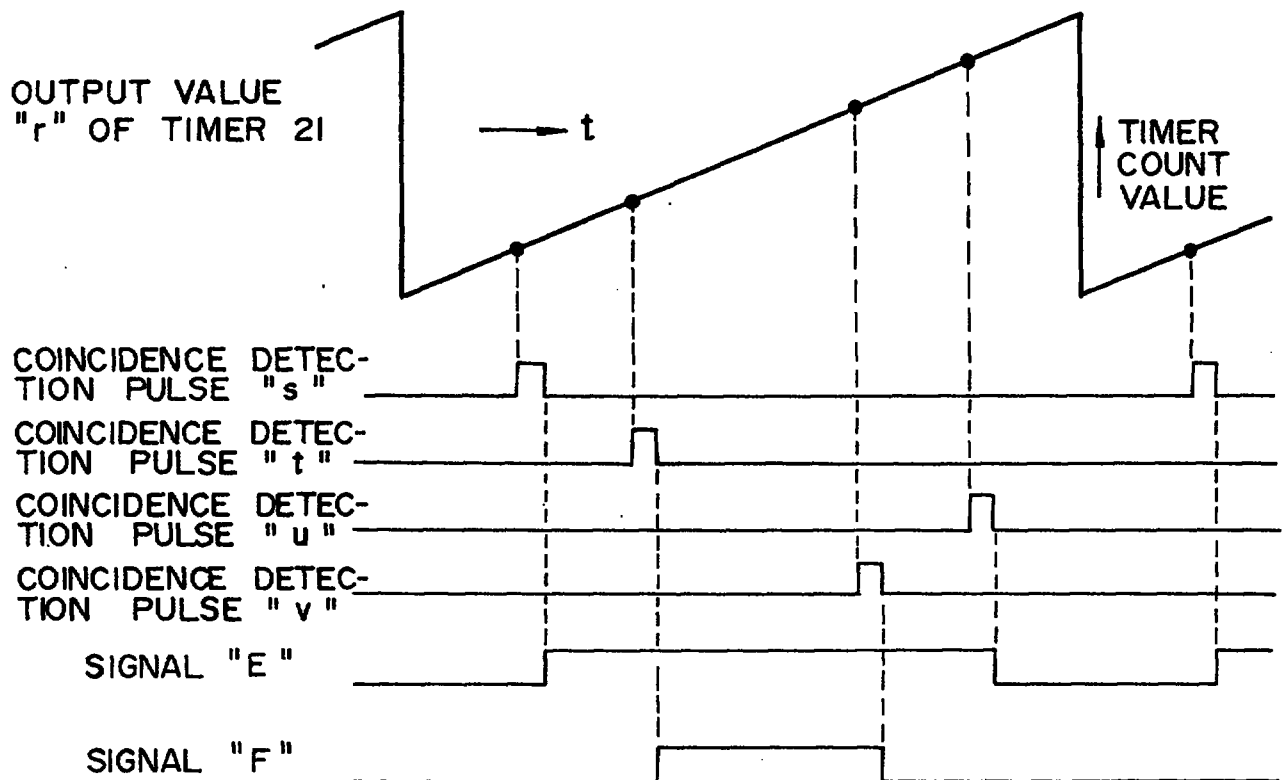
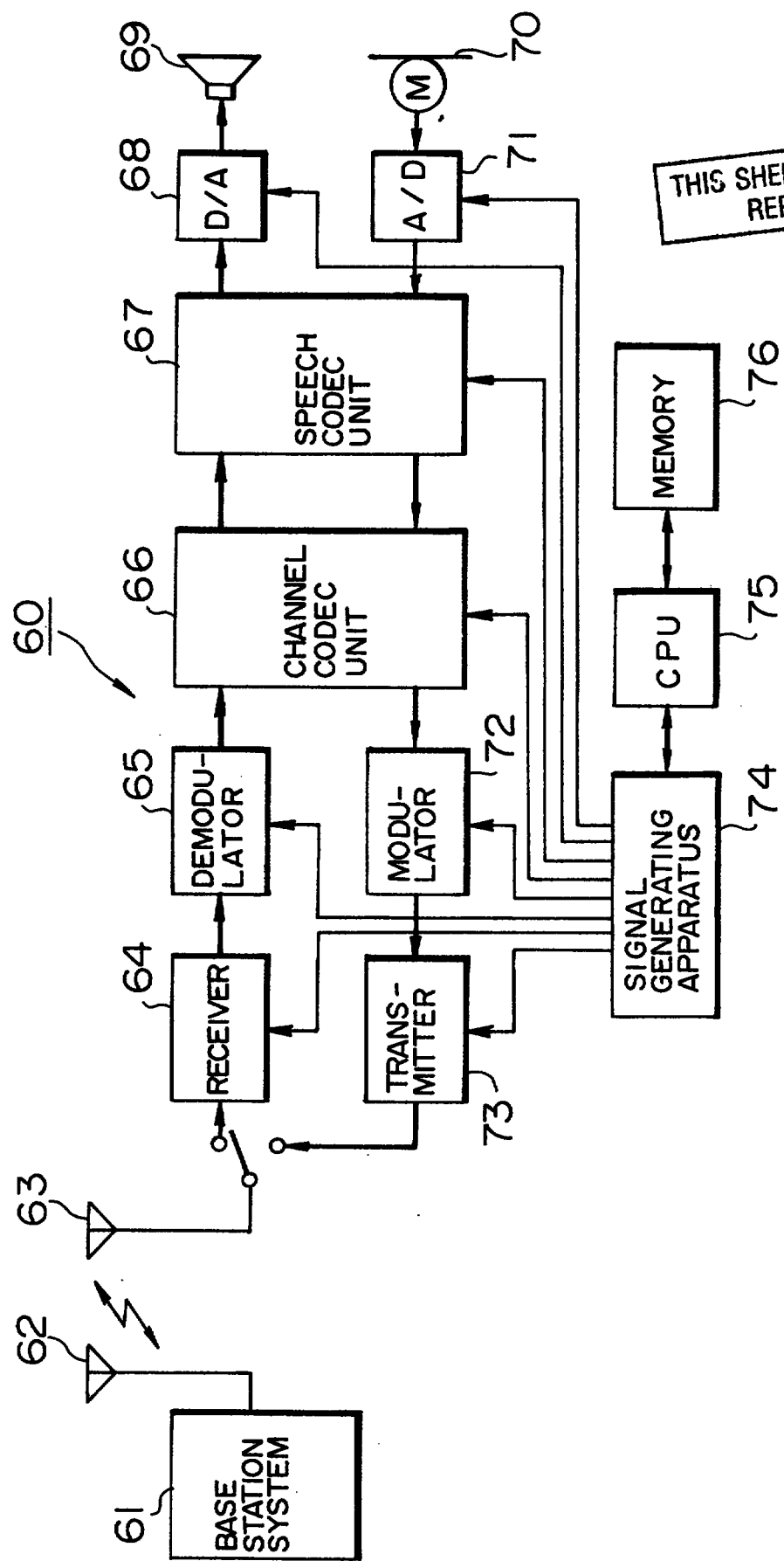


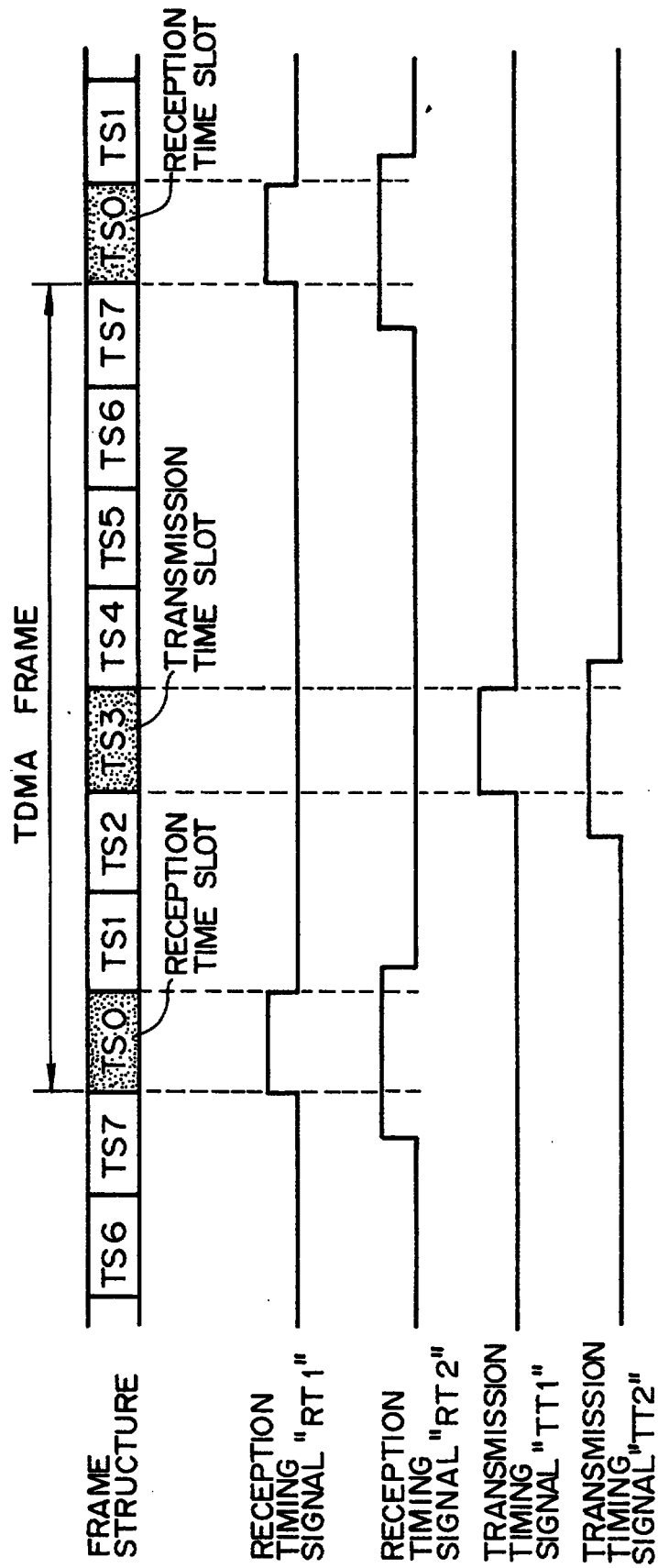


FIG. 24



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FIG. 25



ABSTRACT OF THE DISCLOSURE

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SIGNAL GENERATOR AND WIRELESS MOBILE SYSTEM INCLUDING THE SAME

A signal generating apparatus generates four sets of signals whose rising timing and falling timing are controlled. One signals among the four signals is produced by employing a first sequence control unit, a first coincidence detecting unit a second coincidence detecting unit, and a first output controlling unit. A timer increments a count value in response to a timer increment signal to produce a timer output value. The first sequence controlling unit produces two correction values obtained by correcting the timer output value inputted from the timer. The first coincidence detecting unit outputs a coincidence detection pulse when the correction value inputted from the first sequence control unit is coincident with the internally set set value. The second coincidence detecting unit outputs another coincidence detection pulse when the correction value inputted from the first sequence control unit is coincident with the internally set set value. The first output controlling unit controls the rising timing of the signal in response to the coincidence detection pulse inputted from the first coincidence detecting unit, and also controls the falling timing of the signal in response to another coincidence detection pulse inputted from said second coincidence detecting unit.

Fig. 1 to accompany abstract when published

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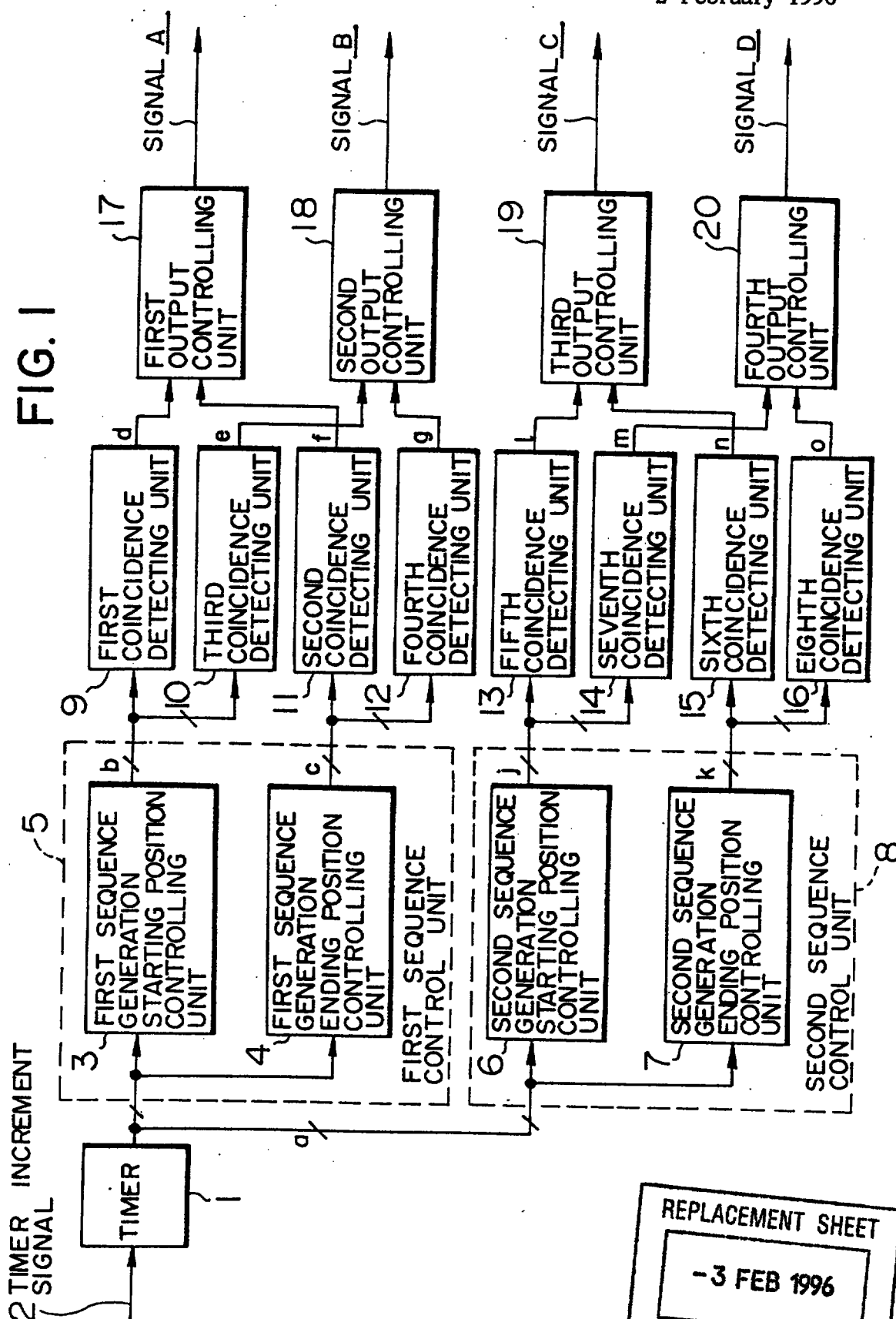


FIG. 3

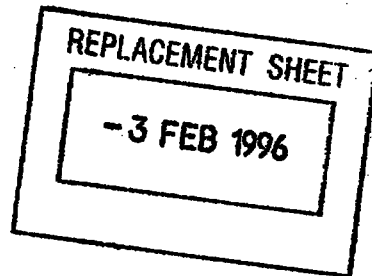
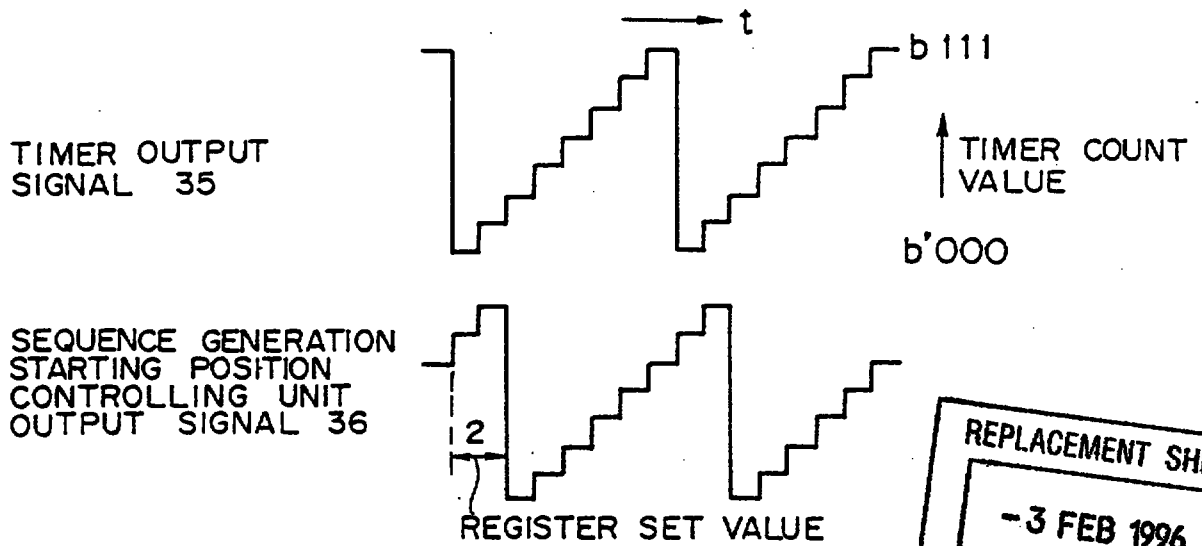


FIG. 4

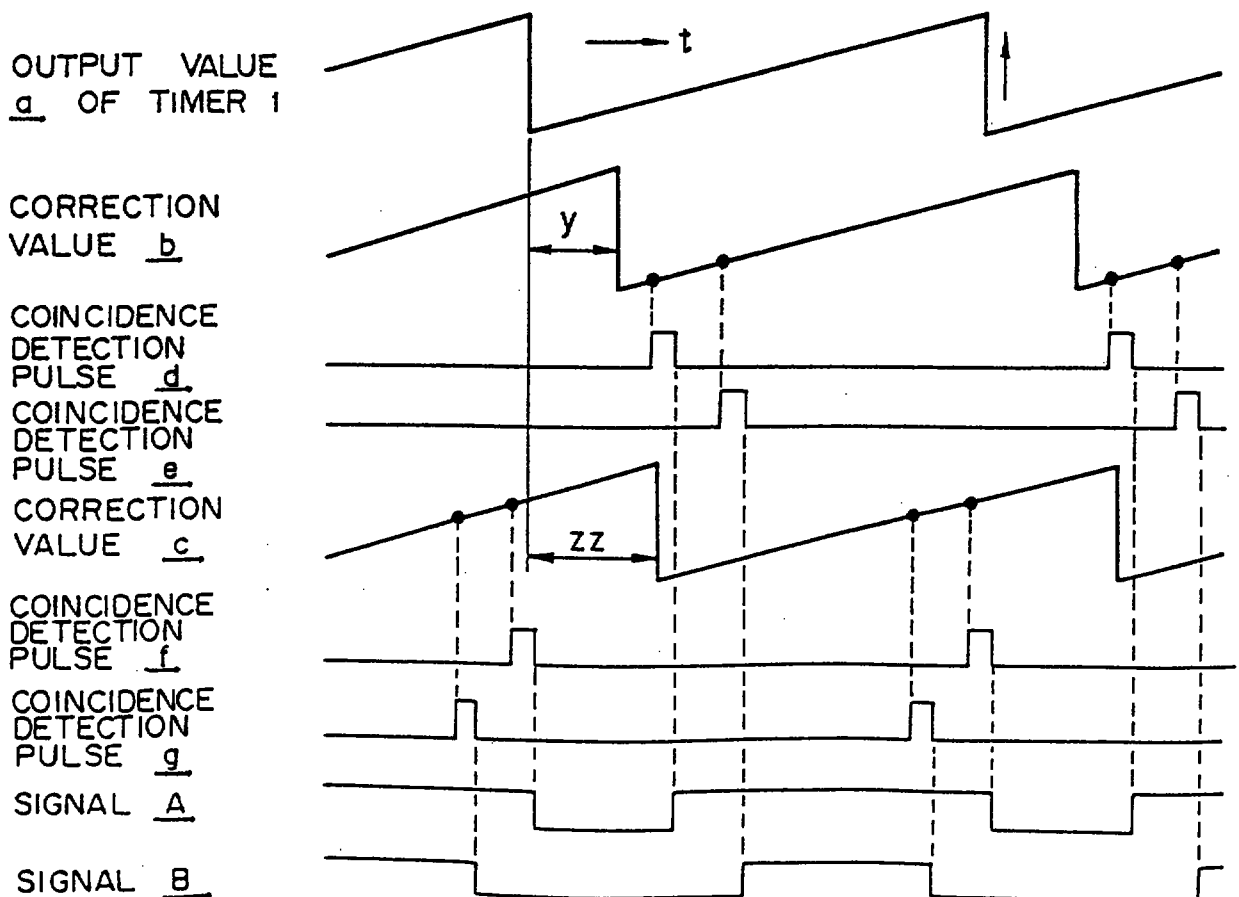
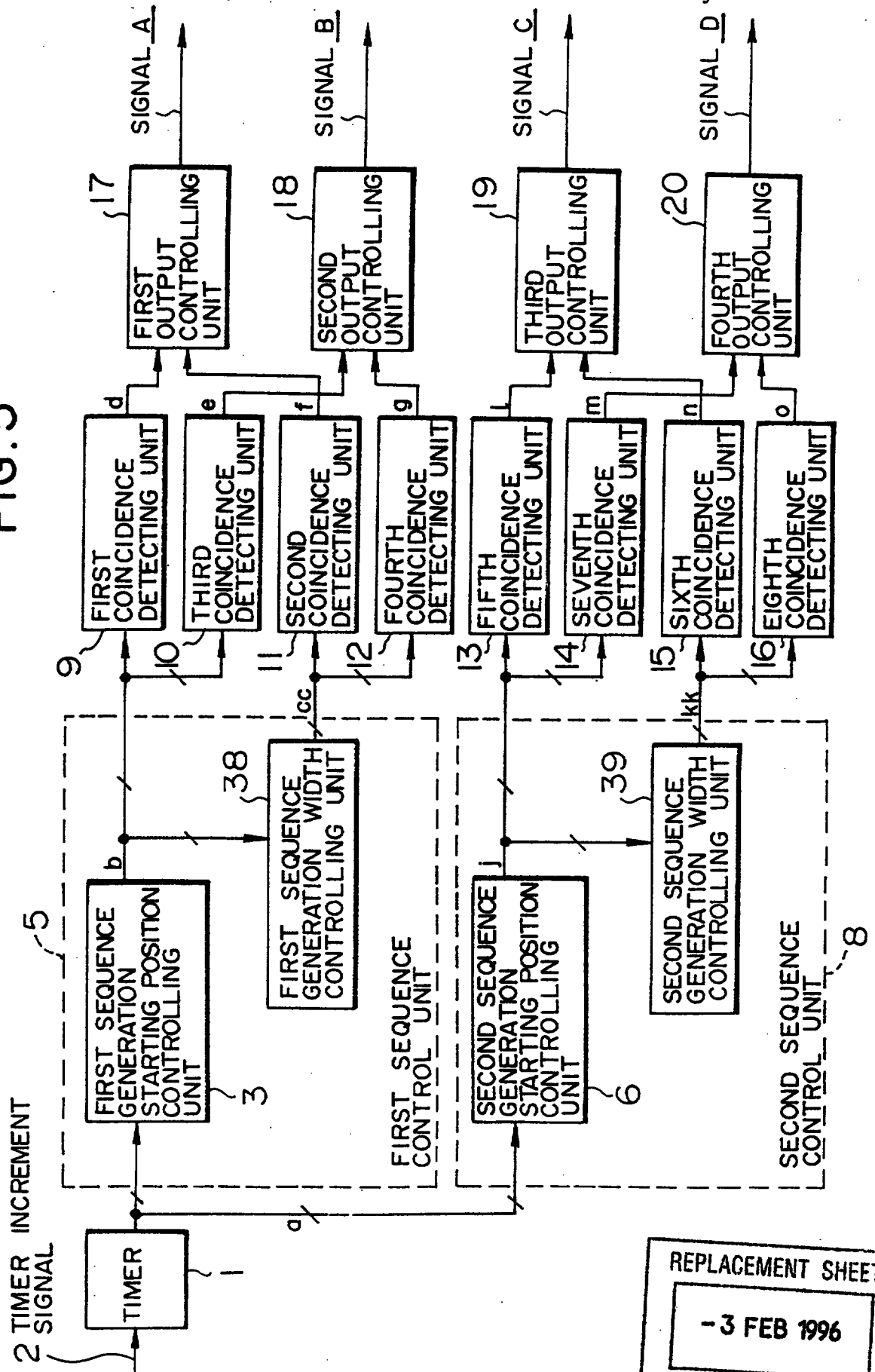


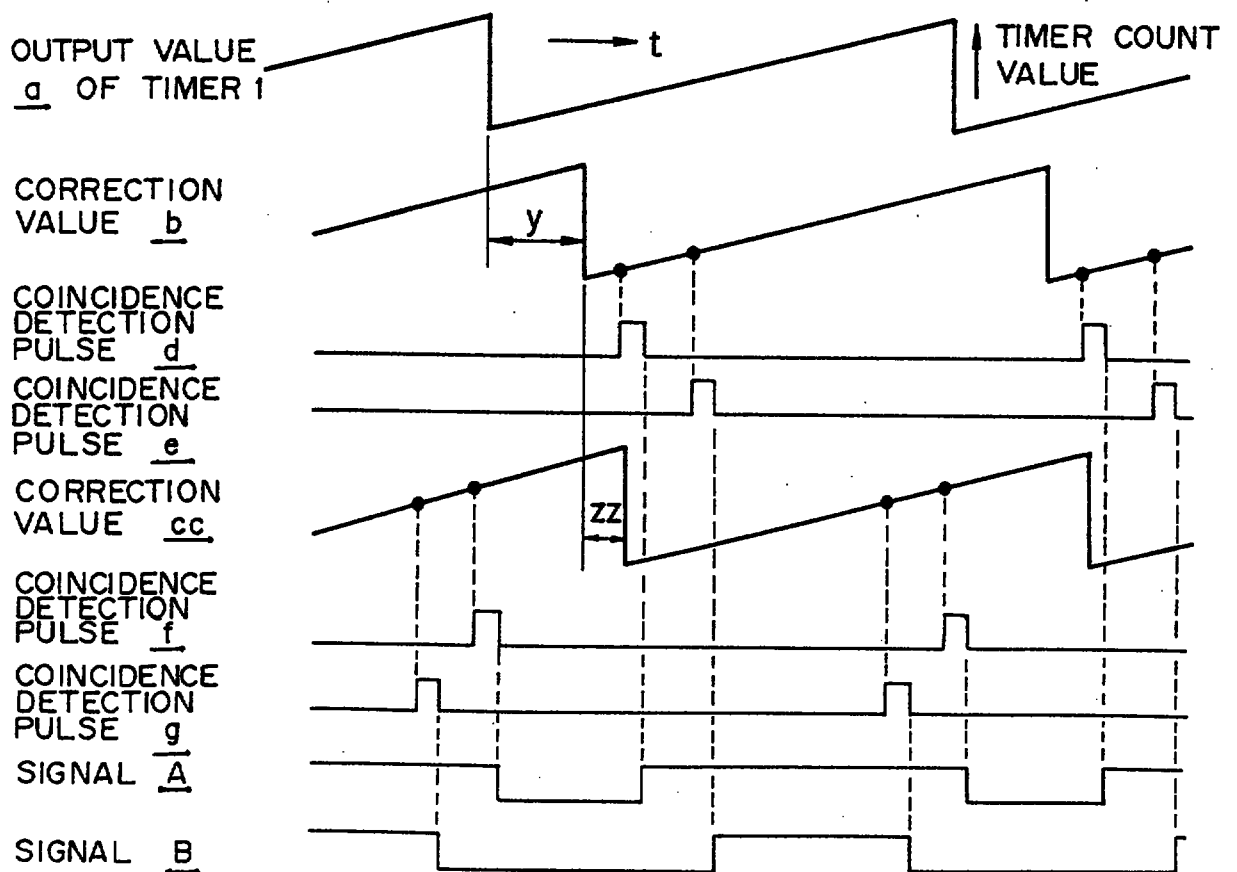
FIG. 5



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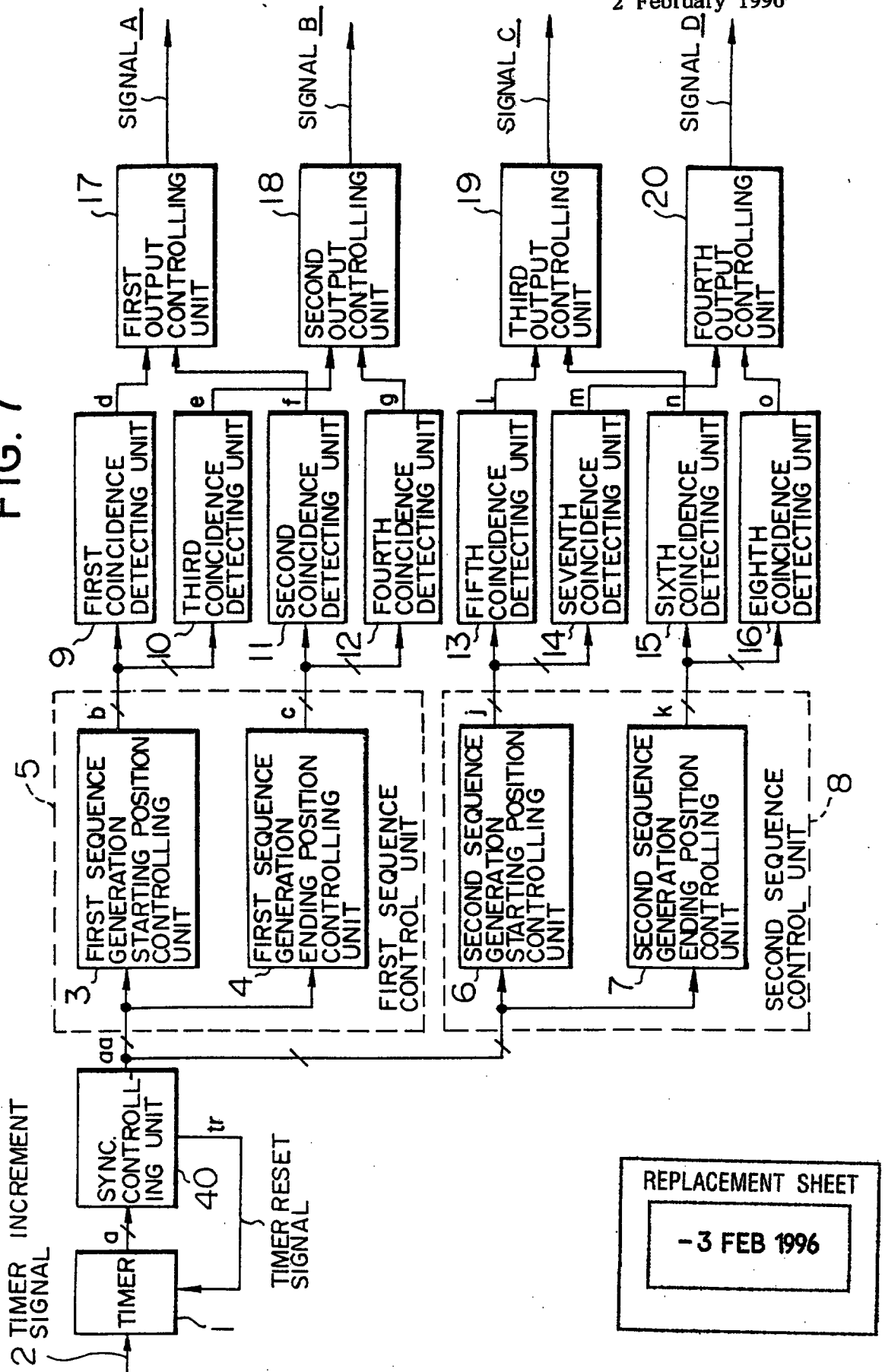
FIG. 6



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FIG. 7



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2 February 1996

FIG. 8

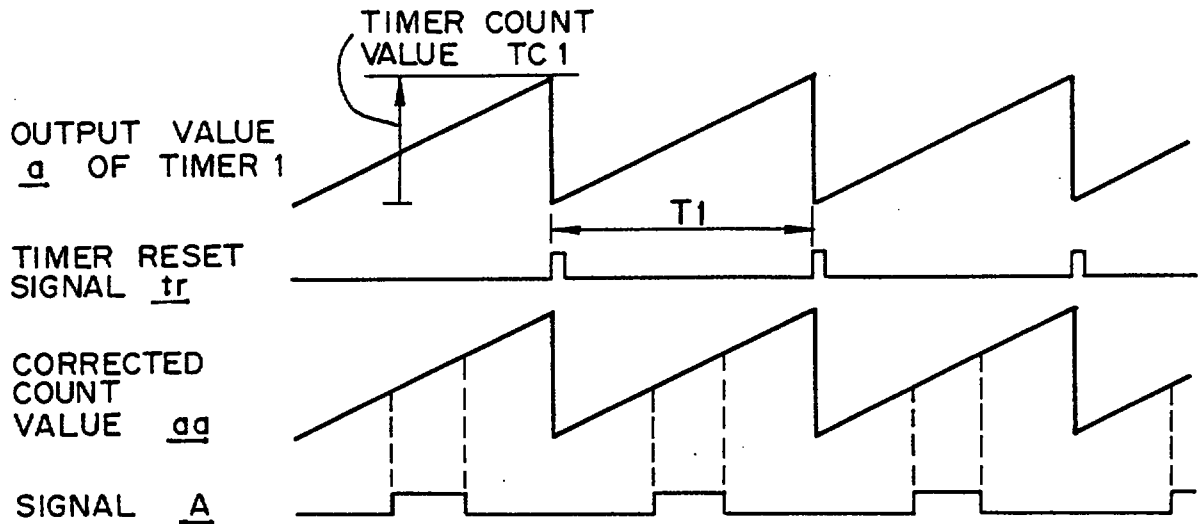


FIG. 9

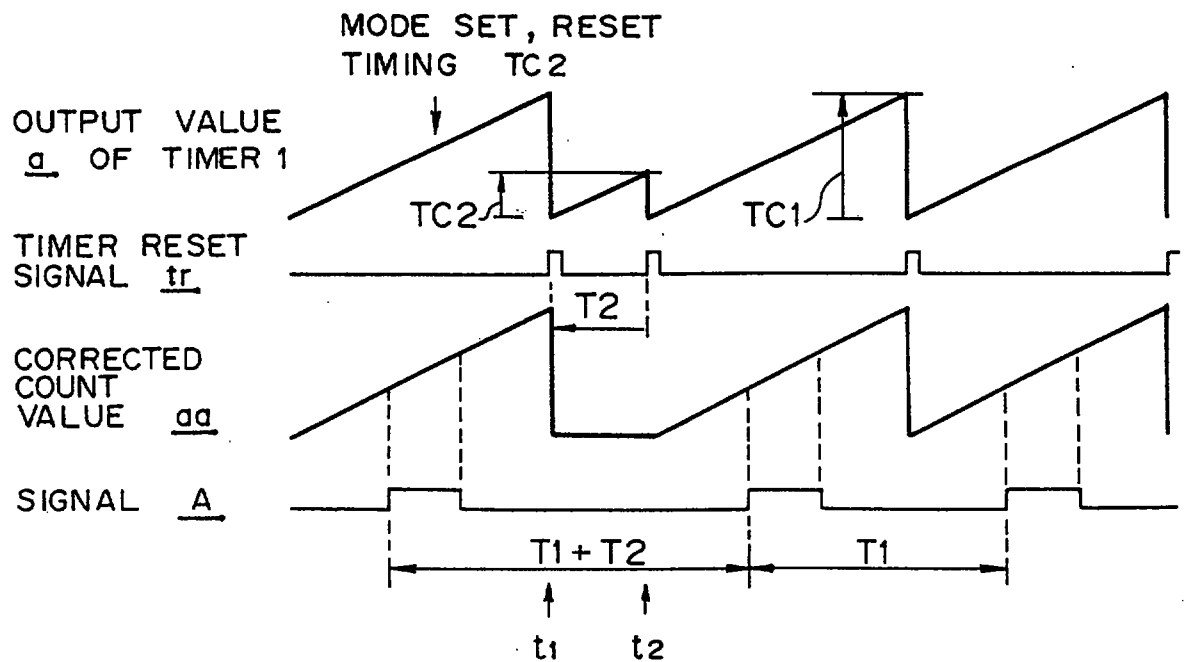
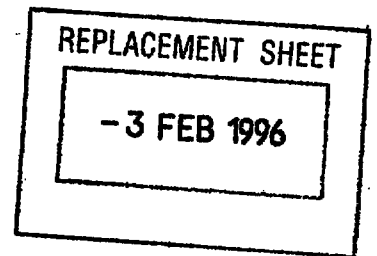


FIG. 10

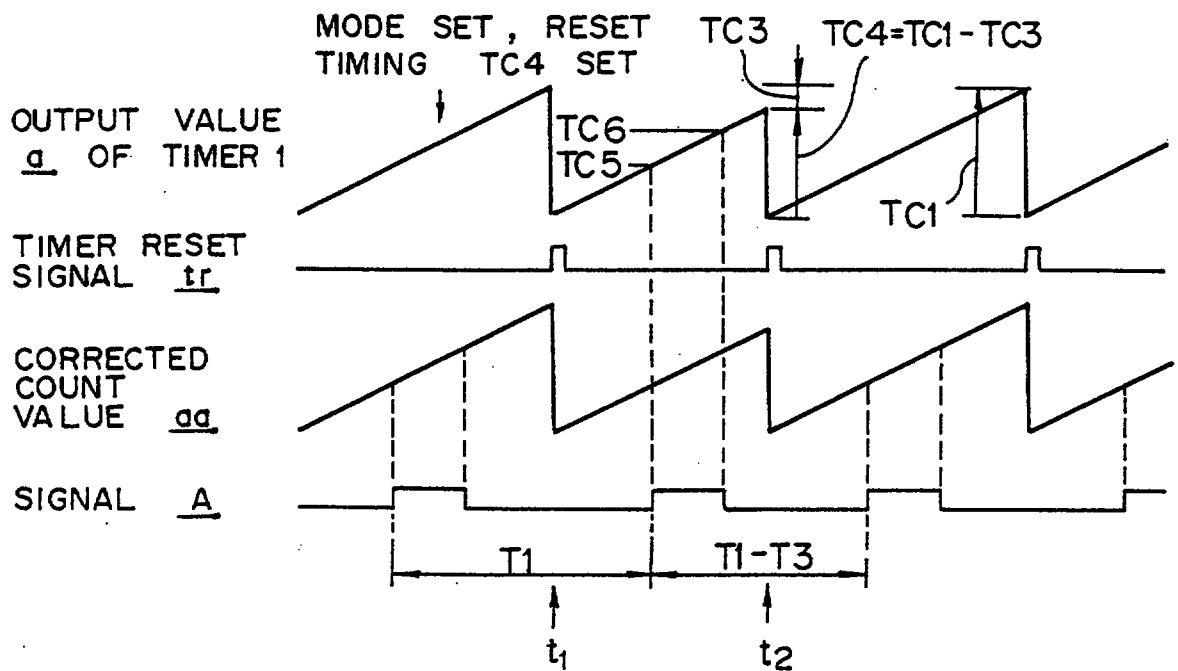
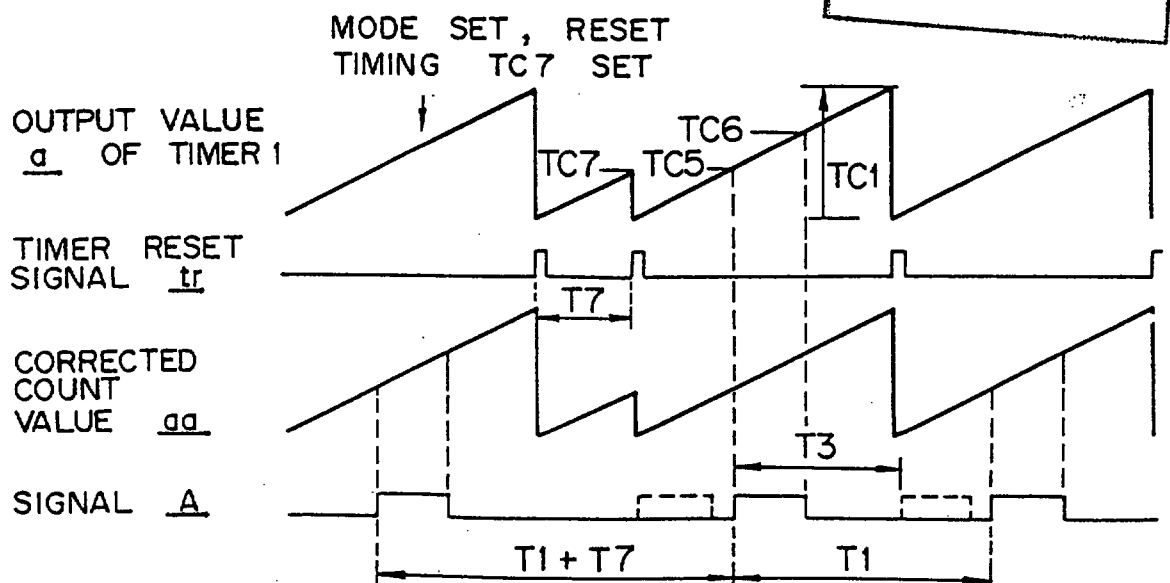


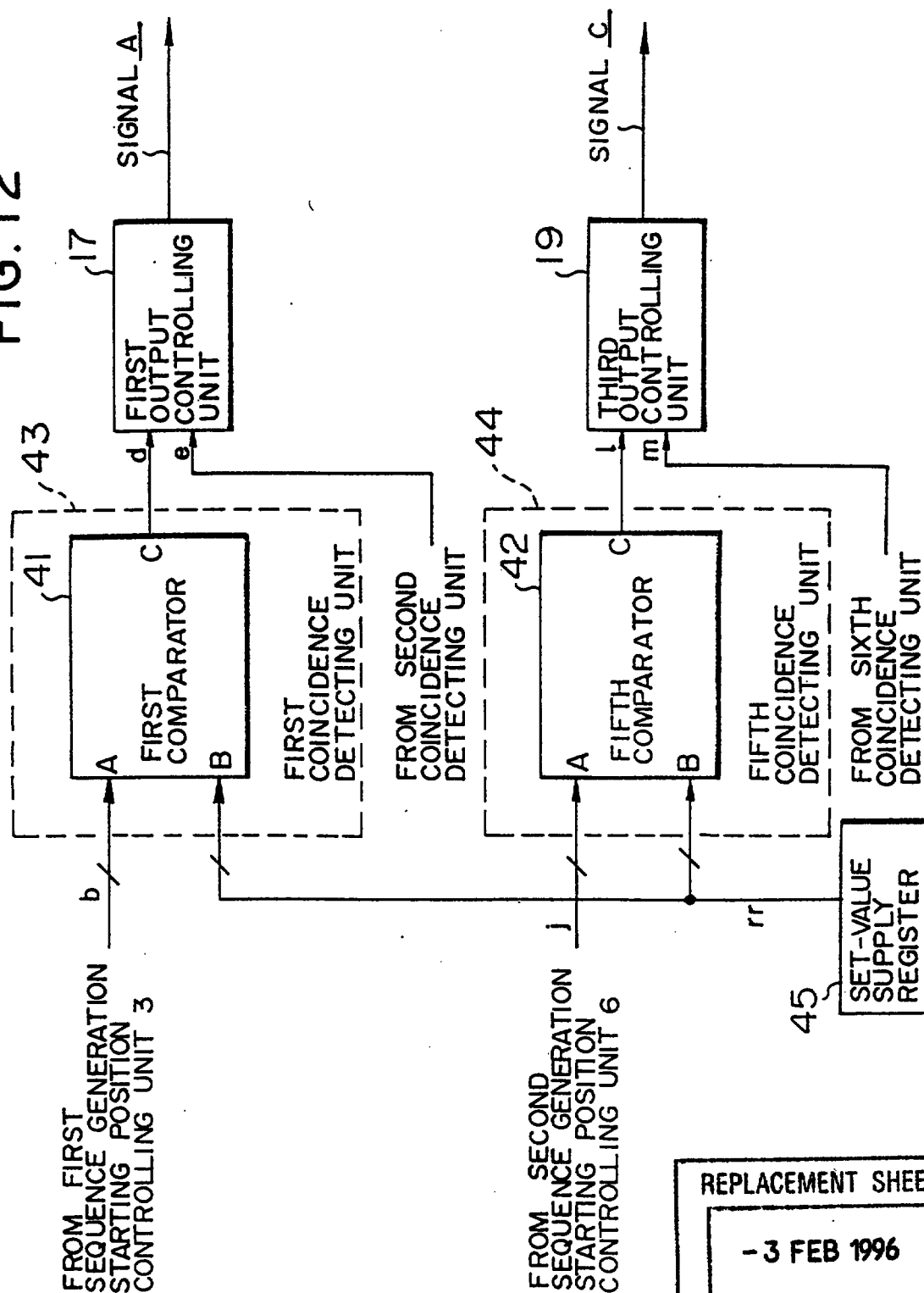
FIG. 11



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FIG. 12



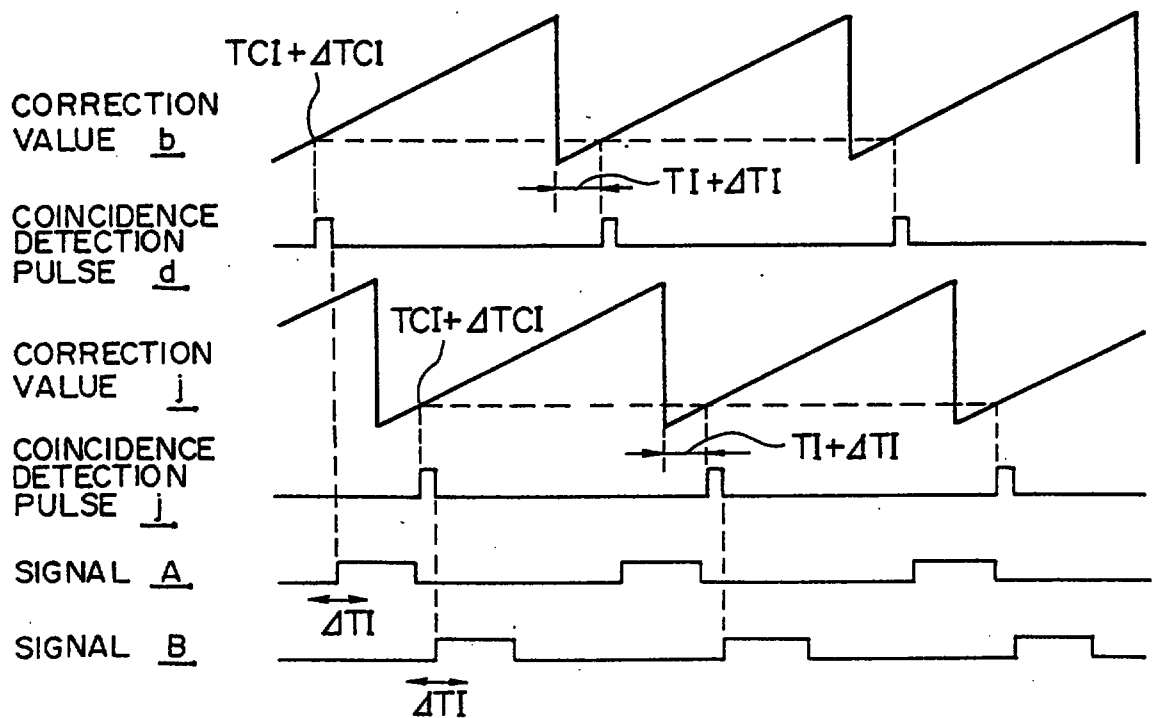
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FIG. 13



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FIG. 14

2 TIMER SIGNAL

3 TIMER INCREMENT

1 TIMER

4 FIRST SEQUENCE GENERATION STARTING POSITION CONTROLLING UNIT

5

6 FIRST SEQUENCE GENERATION ENDING POSITION CONTROLLING UNIT

7 FIRST SEQUENCE CONTROL UNIT

8

9 FIRST SEQUENCE GENERATION STARTING POSITION CONTROLLING UNIT

10 FIRST SEQUENCE GENERATION ENDING POSITION CONTROLLING UNIT

11 SECOND SEQUENCE GENERATION STARTING POSITION CONTROLLING UNIT

12 SECOND SEQUENCE GENERATION ENDING POSITION CONTROLLING UNIT

13 FIRST SEQUENCE GENERATION STARTING POSITION CONTROLLING UNIT

14 FIRST SEQUENCE GENERATION ENDING POSITION CONTROLLING UNIT

15 SECOND SEQUENCE GENERATION STARTING POSITION CONTROLLING UNIT

16 SECOND SEQUENCE GENERATION ENDING POSITION CONTROLLING UNIT

17 FIRST COINCIDENCE DETECTING UNIT

18 THIRD COINCIDENCE DETECTING UNIT

19 SECOND COINCIDENCE DETECTING UNIT

20 FOURTH COINCIDENCE DETECTING UNIT

21 FIRST OUTPUT CONTROLLING UNIT

22 SECOND OUTPUT CONTROLLING UNIT

23 THIRD OUTPUT CONTROLLING UNIT

24 FOURTH OUTPUT CONTROLLING UNIT

25 FIRST LOGIC OPERATION CIRCUIT

26 SECOND LOGIC OPERATION CIRCUIT

27 SIGNAL A

28 SIGNAL B

29 SIGNAL C

30 SIGNAL D

REPLACEMENT SHEET

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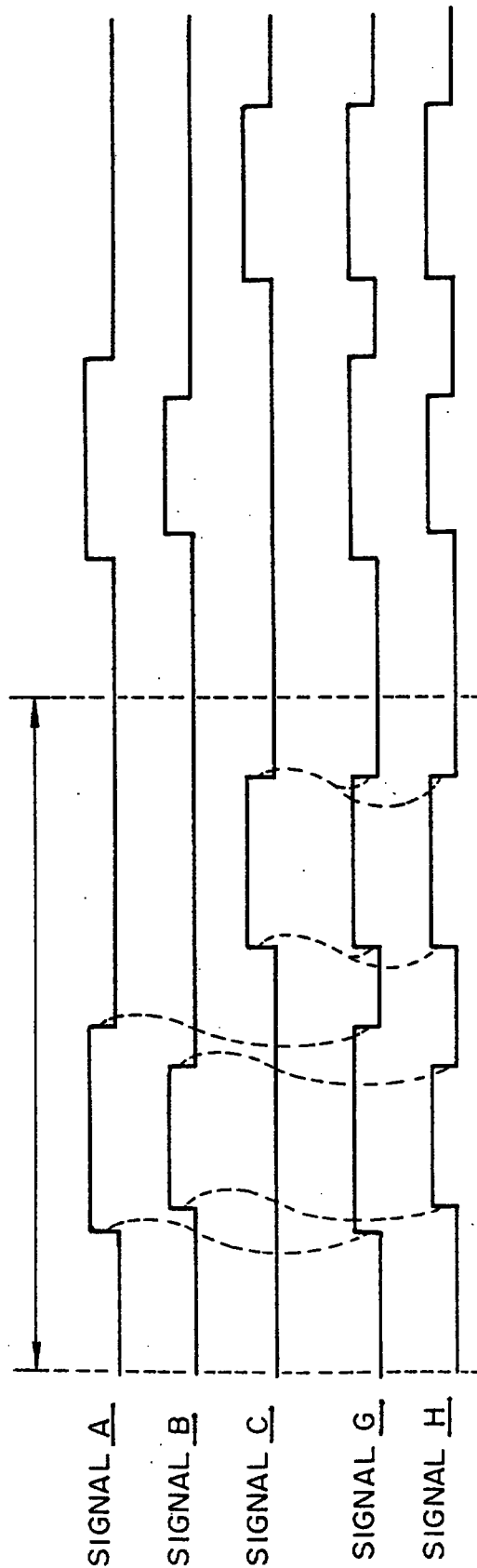
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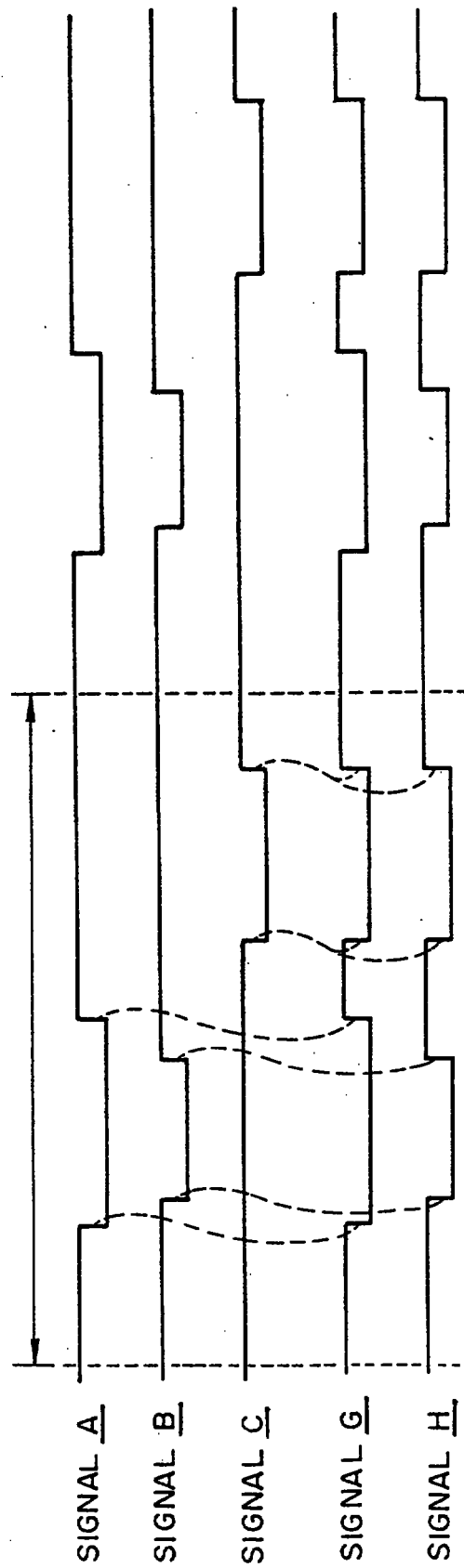
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FIG.15



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FIG. 16

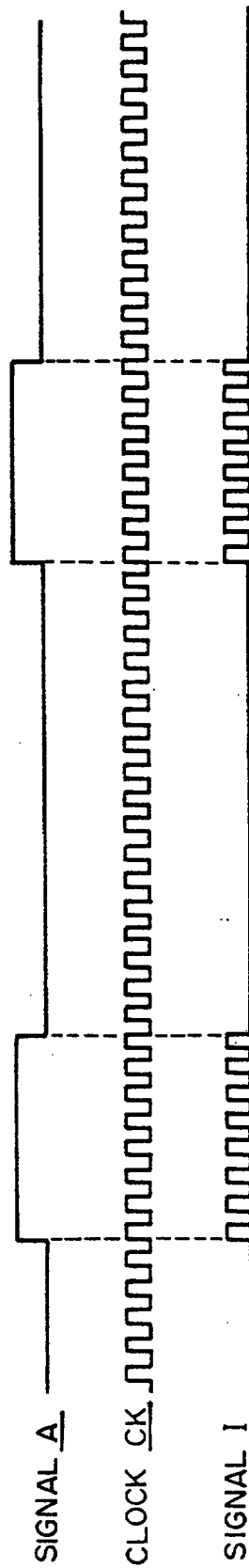


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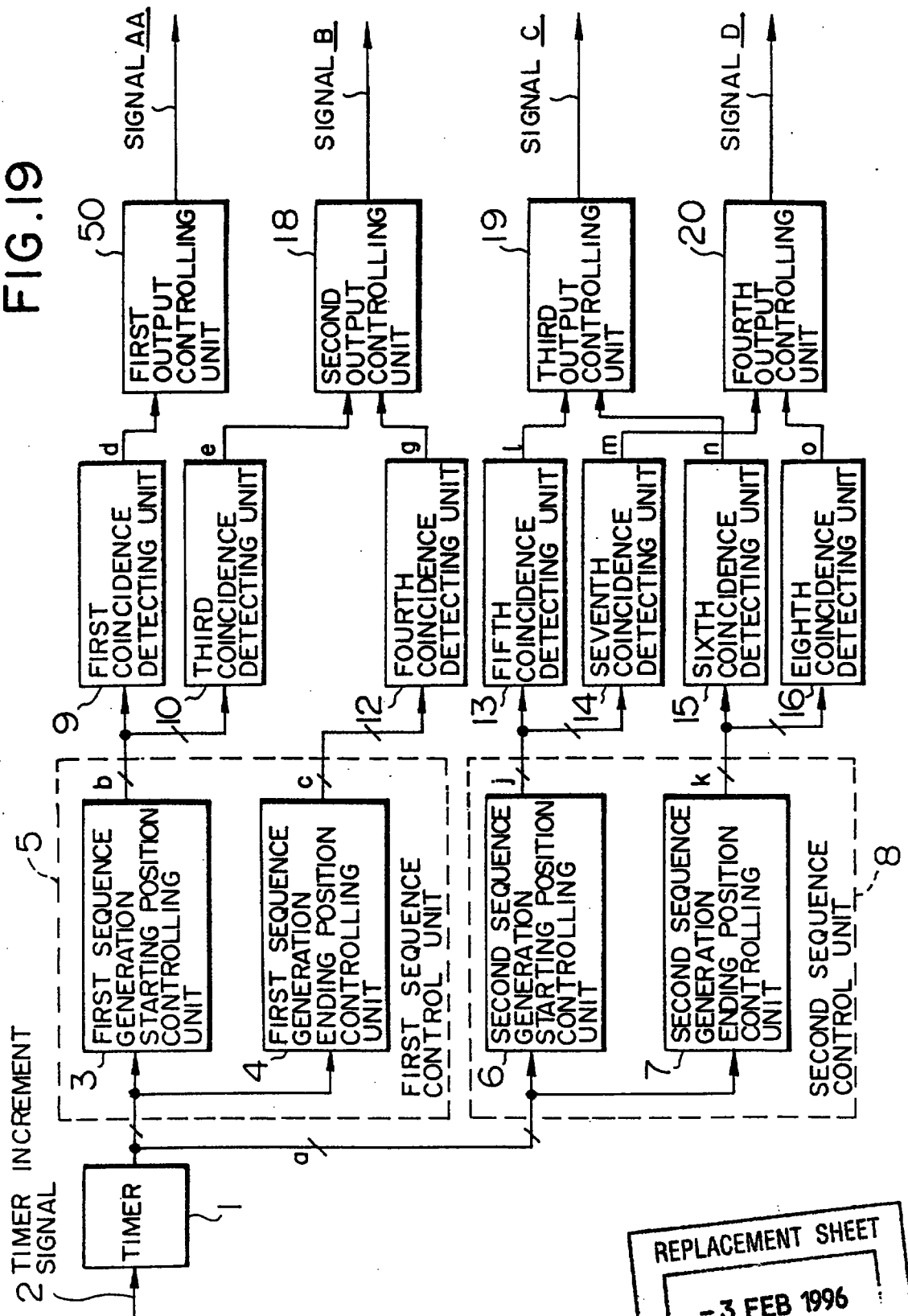
FIG. 18



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FIG. 19



REPLACEMENT SHEET

- 3 FEB 1996

FIG. 20

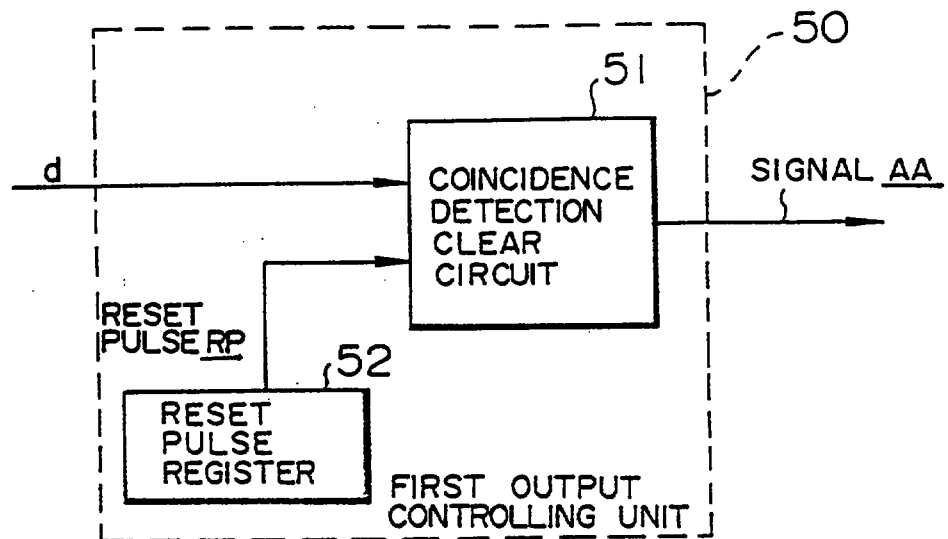


FIG. 21

REPLACEMENT SHEET

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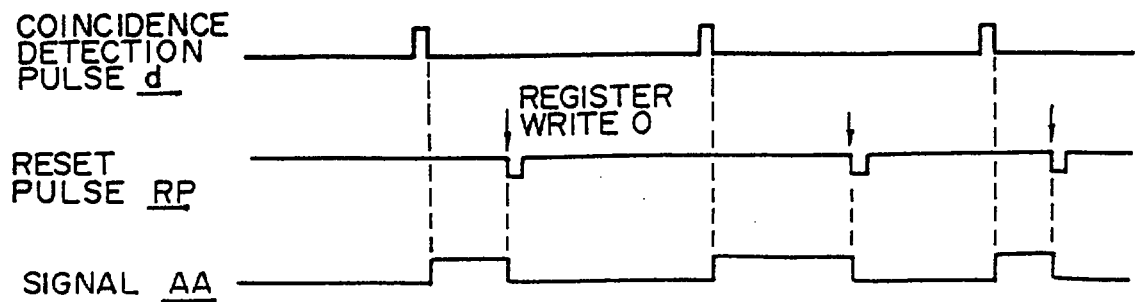
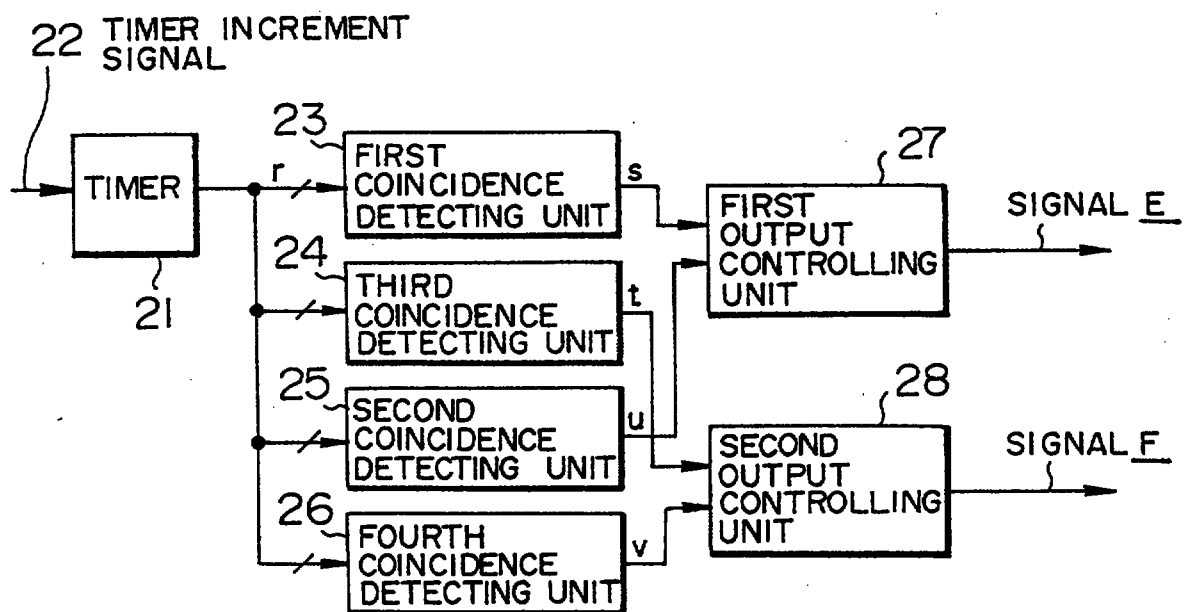
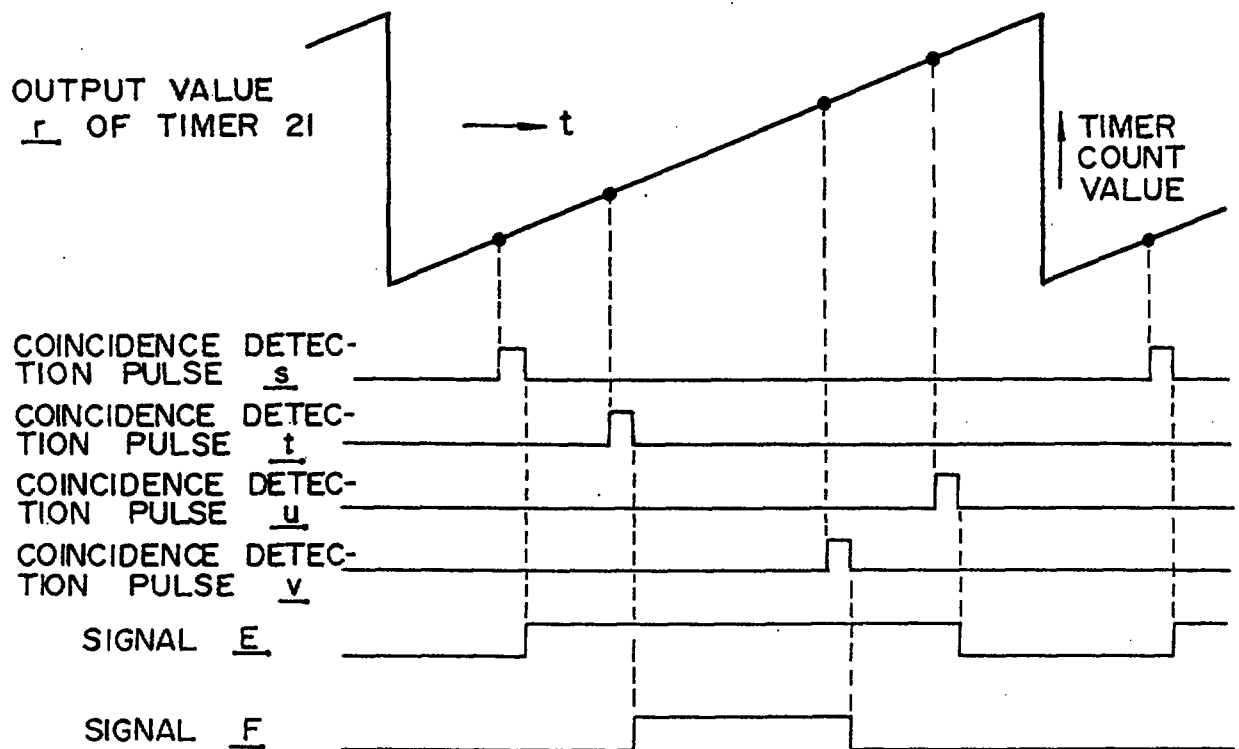


FIG. 22
PRIOR ART

REPLACEMENT SHEET

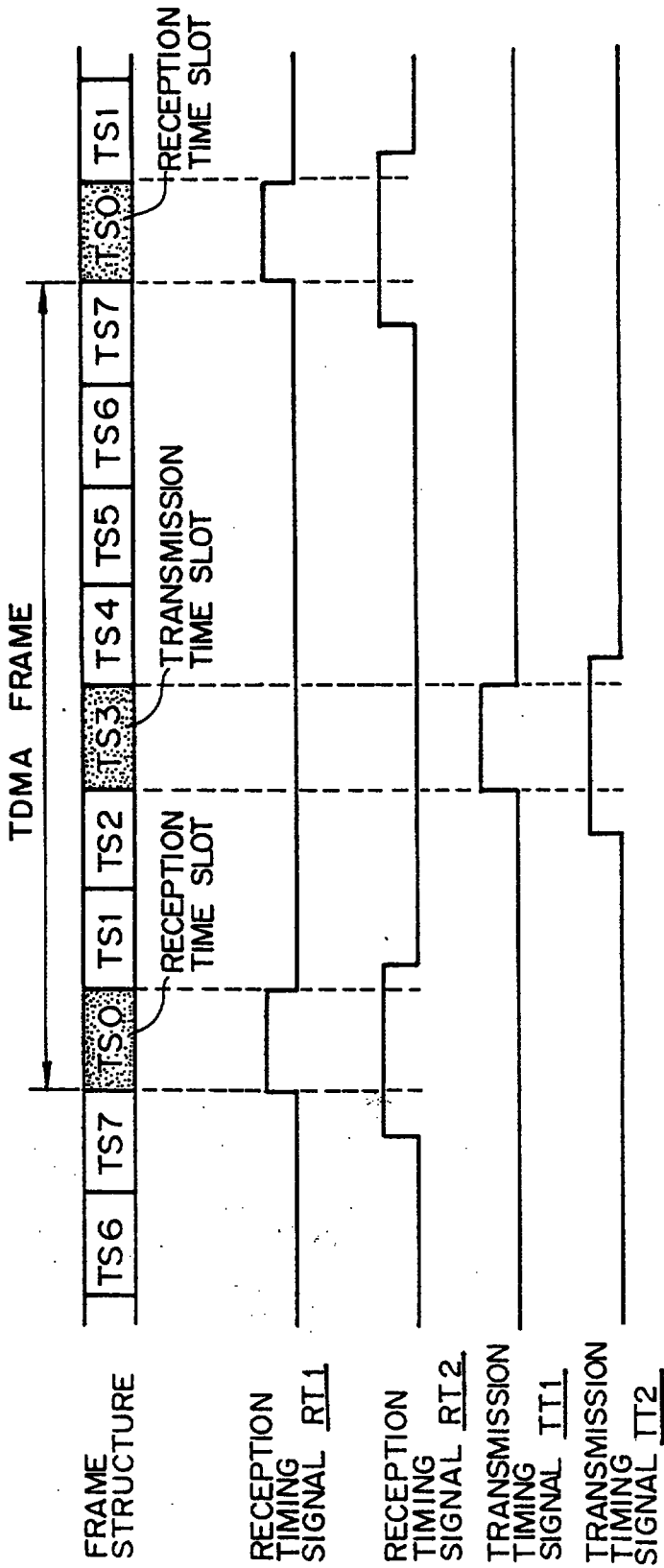
-3 FEB 1996

FIG. 23
PRIOR ART

REPLACEMENT SHEET

- 3 FEB 1996

FIG. 25



REPLACEMENT SHEET
- 3 FEB 1996

ABSTRACT OF THE DISCLOSURE

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TITLE OF INVENTION: SIGNAL GENERATOR AND WIRELESS MOBILE SYSTEM INCLUDING THE SAME

A signal generating apparatus generates four signals whose rising and falling timing are controlled. A timer increments a count value in response to a timer increment signal to produce a timer output value. A first sequence controlling unit produces two correction values obtained by correcting the timer output value. A first coincidence detecting unit outputs a coincidence detection pulse when one of the correction values is coincident with an internally set set-value. A second coincidence detecting unit outputs another coincidence detection pulse when the other correction value is coincident with another internally set set-value. A first output controlling unit controls the rising timing of one signal of the four signals in response to the coincidence detection pulse, and also controls the falling timing of the one signal in response to the another coincidence detection pulse.

Fig. 1 to accompany abstract when published.

