United States Patent [19]

McFiggins et al.

[11] **3,792,446**

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[54] **REMOTE POSTAGE METER RESETTING METHOD**

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[73] Assignee: **Pitney-Bowes, Inc.**, Stamford, Conn.

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[52] **U.S. Cl.** **340/172.5**, 444/1

[51] **Int. Cl.** **G06f 9/18**

[58] **Field of Search** 340/172.5, 147 R, 149 A, 152 R; 179/2 A, 2 CA, 2 DP; 444/1

[56] **References Cited**

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Primary Examiner—Raulfe B. Zache

Attorney, Agent, or Firm—William D. Soltow, Jr.; Albert W. Scribner; Martin D. Wittstein

[57] **ABSTRACT**

A data center equipped with a programmed digital computer and a voice answer-back unit processes telephone calls from users of postage meters equipped with combination locks, wherein each lock inhibits recharging of its associated meter with an additional postage increment while locked and its combination changes in random sequence with each actuation to enable meter recharging. The computer operates via the answer-back unit to voice communicate with the caller in requesting the input of data uniquely identifying the caller and the postage meter to be recharged pursuant to issuing the next combination.

10 Claims, 4 Drawing Figures

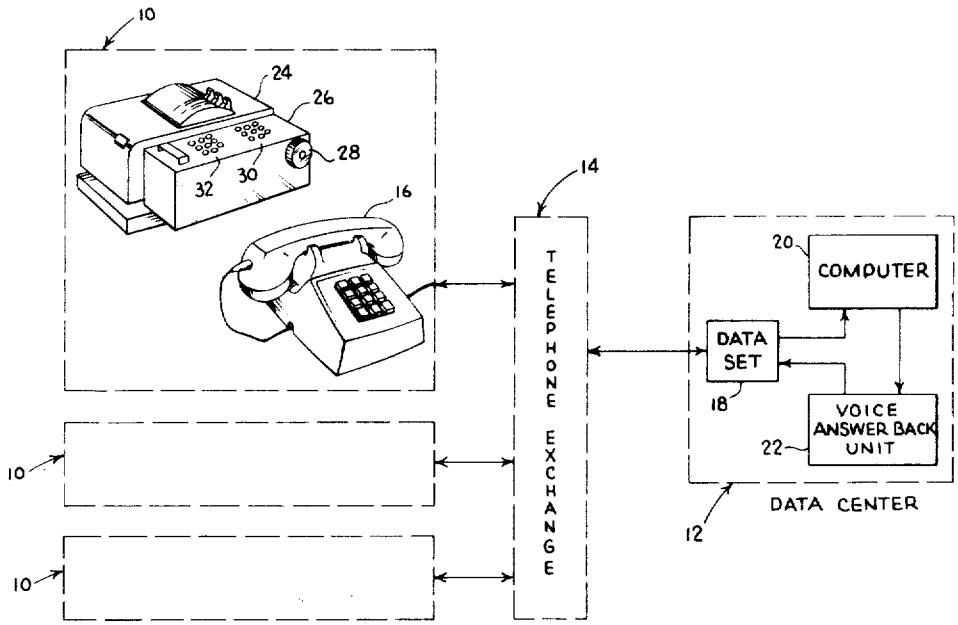


FIG. 1

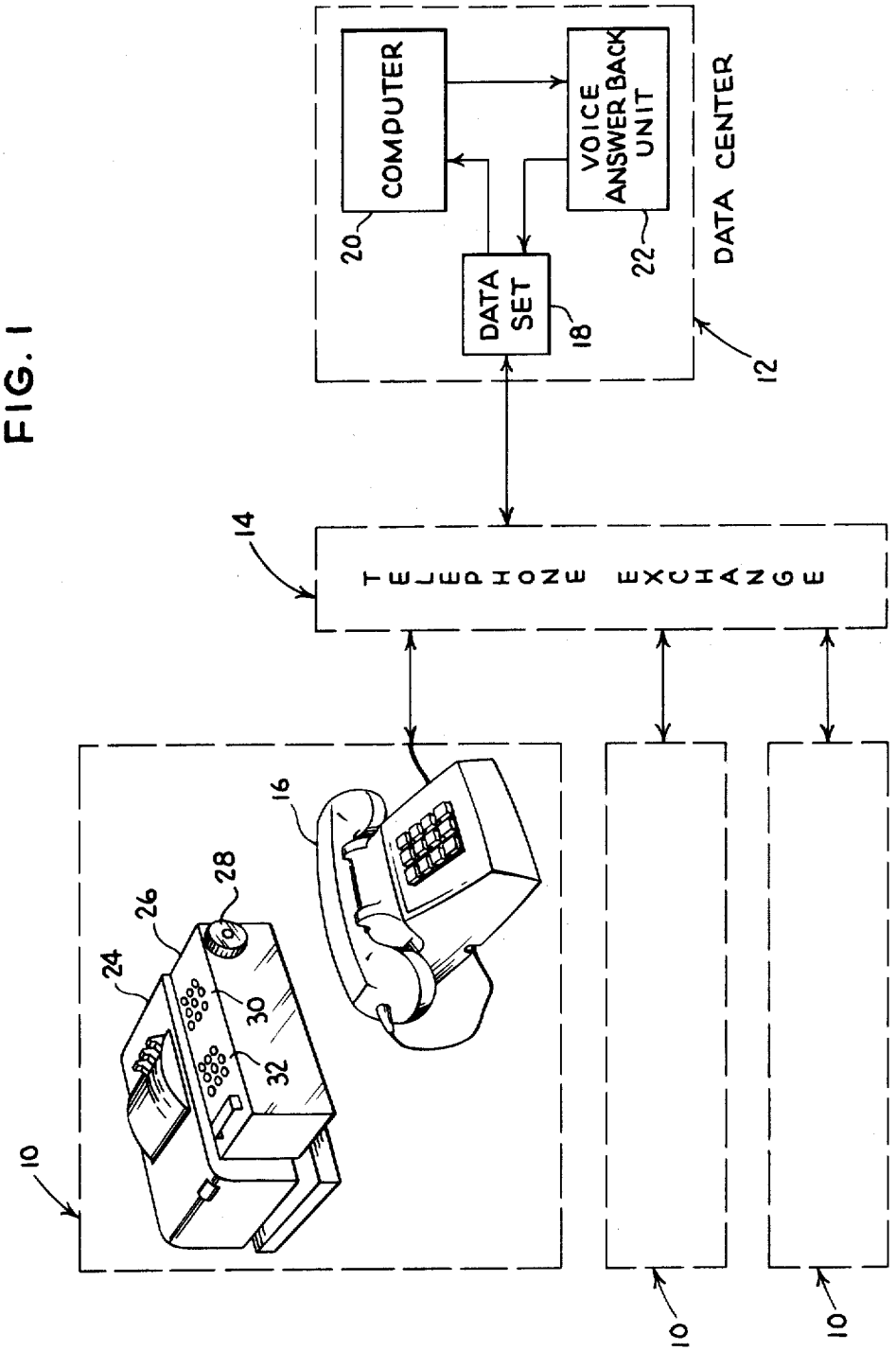
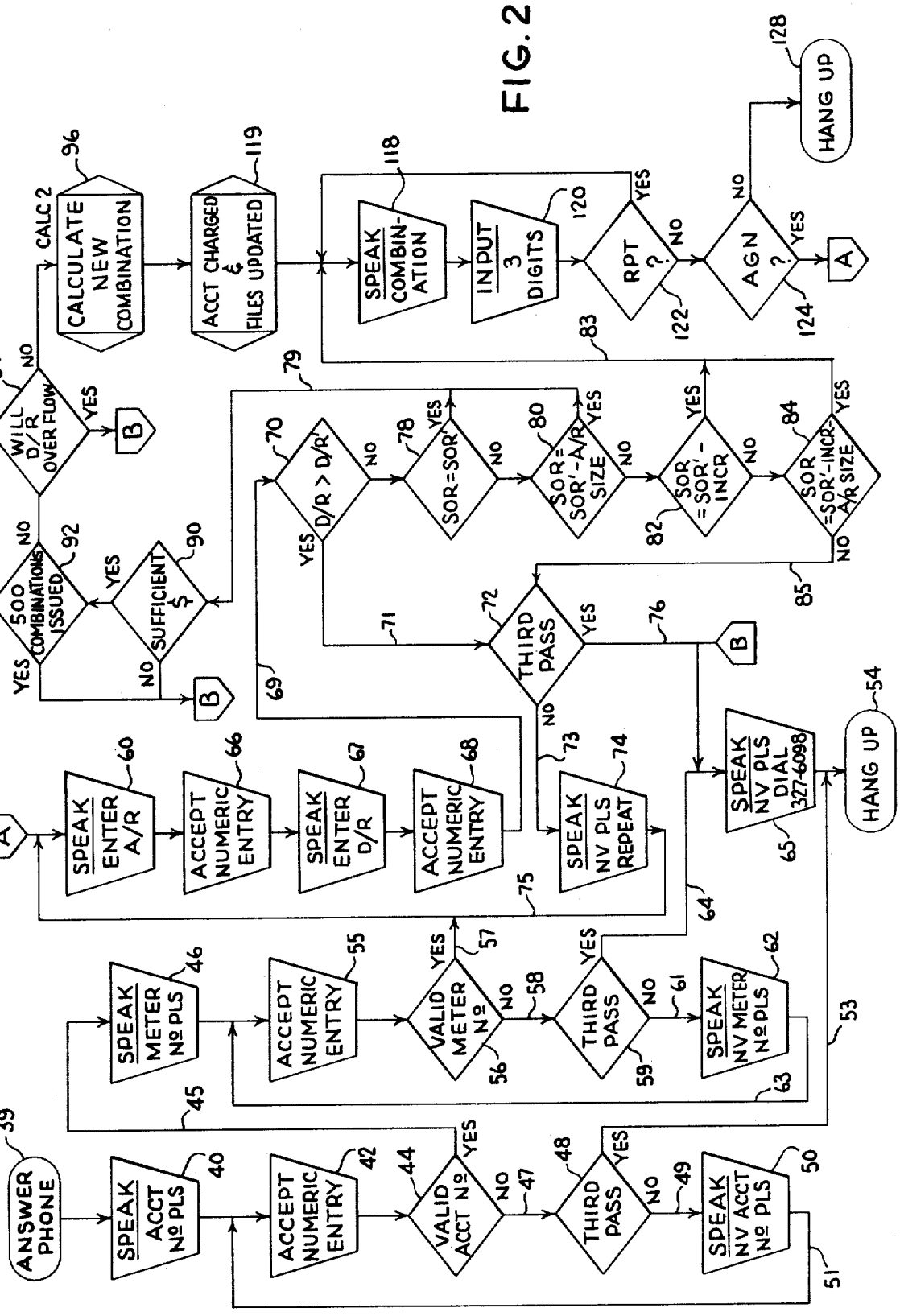

COMPUTER
VOICE ANSWER BACK UNIT
DATA SET
DATA CENTER
20
22
18
12
14
TELEPHONE EXCHANGE
16
28
26
24
30
32
10
10
10

FIG. 2


ANSWER PHONE
39
SPEAK ACCT Nº PLS
40
ACCEPT NUMERIC ENTRY
42
VALID ACCT Nº
44
YES
NO
47
THIRD PASS
48
YES
NO
49
SPEAK NV ACCT Nº PLS
50
51
45
SPEAK METER Nº PLS
46
ACCEPT NUMERIC ENTRY
55
VALID METER Nº
57
YES
NO
58
56
THIRD PASS
YES
NO
61
59
SPEAK NV METER Nº PLS
62
63
53
A
SPEAK ENTER A/R
60
ACCEPT NUMERIC ENTRY
66
SPEAK ENTER D/R
67
ACCEPT NUMERIC ENTRY
68
75
64
SPEAK NV PLS REPEAT
73
74
THIRD PASS
72
YES
NO
76
71
69
B
D/R > D/R'
70
YES
NO
SOR=SOR'
78
YES
NO
SOR=SOR'-A/R SIZE
80
YES
NO
SOR'=SOR'-INCR
82
YES
NO
SOR=SOR'-INCR A/R SIZE
84
YES
NO
85
79
83
SPEAK COMBIN-ATION
118
INPUT 3 DIGITS
120
RPT ?
YES
NO
122
AGN ?
NO
YES
124
A
HANG UP
128
ACCT CHARGED & FILES UPDATED
119
CALCULATE NEW COMBINATION
96
CALC 2
WILL D/R OVER FLOW
94
NO
YES
B
500 COMBINATIONS ISSUED
92
YES
NO
SUFFICIENT $
90
YES
NO
B
SPEAK NV PLS DIAL 327-6098
65
HANG UP
54

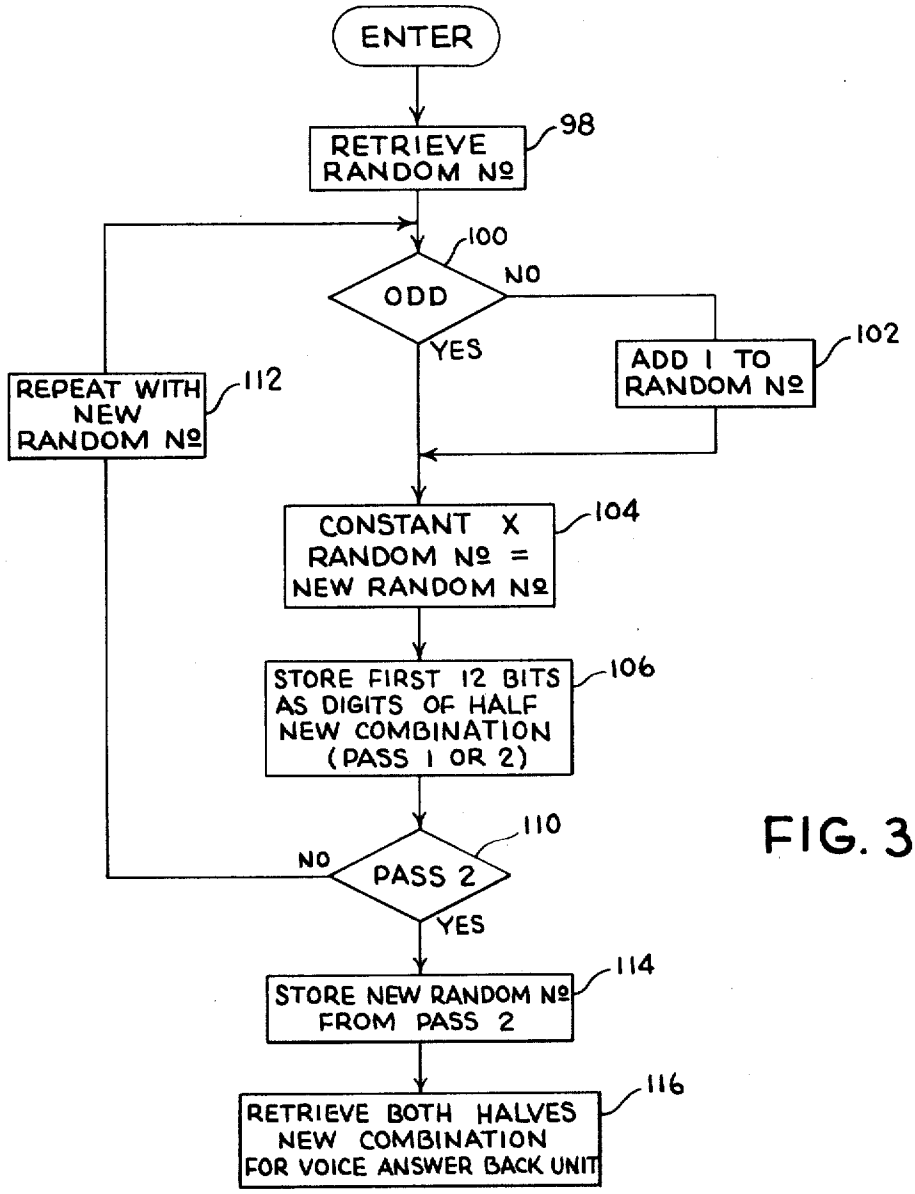

ENTER
RETRIEVE RANDOM Nº
98
100
ODD
NO
YES
ADD 1 TO RANDOM Nº
102
REPEAT WITH NEW RANDOM Nº
112
CONSTANT X RANDOM Nº = NEW RANDOM Nº
104
STORE FIRST 12 BITS AS DIGITS OF HALF NEW COMBINATION (PASS 1 OR 2)
106
110
NO
PASS 2
YES
STORE NEW RANDOM Nº FROM PASS 2
114
RETRIEVE BOTH HALVES NEW COMBINATION FOR VOICE ANSWER BACK UNIT
116

FIG. 3

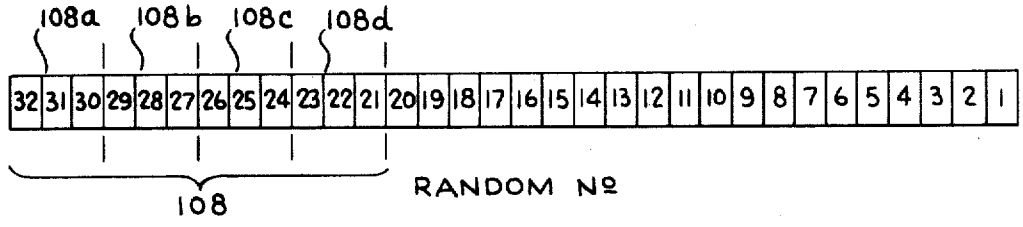

108a
108b
108c
108d
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
108
RANDOM Nº

FIG. 4

REMOTE POSTAGE METER RESETTING METHOD

BACKGROUND OF THE INVENTION

Postage meter resetting or recharging and record keeping operations are now highly dependent on manual routines by both the Postal Service and meter users. Post Office employees have to visually inspect, open, recharge, and reseal the meters, in addition to filling out several different forms for record keeping purposes. These tasks will continue to become more expensive as labor rates rise and as more postage meters come into service. That is, the effort required to administer the metered mail system will rise in direct proportion to the number of postage meters in service.

In addition to the time required to recharge postage meters, there are occasional errors in recharging the meters which are usually not discovered until the user returns with the meter to his office. A return trip to the Post Office is then required to obtain the correct recharging.

Meter recharging is a reasonably complicated process involving large sums of money. Special training for selected Post Office personnel is required to recharge the meters and to maintain the records. This operation must be supervised and special assignments must be made when the trained personnel are on vacation or are out sick.

The present record keeping system for postage meters is completely manually administered. The Postal clerk is required to issue a receipt which contains all of the meter register readings before and after the recharging, along with the amount of the postage increment recharged into the meter. This recharging information is also entered into the customers "Daily Record of Meter Register Readings" book and a complete transaction is entered into the Post Office "Record of Meter Settings" book. Each Post Office is also required to make a quarterly summation of postage sales for all customers.

The users of the metered mail system are inconvenienced by the fact that they must bring their meters to the Post Office for recharging. The problems associated with such a trip involve obtaining a check or cash to pay for the additional postage to be recharged into the meter, actually making the trip, parking and waiting in line at the Post Office. This takes time and thus costs the meter user money.

The foregoing is not to say that the metered mail system does not have significant advantages. Its current wide use is testiment to the fact that it indeed does have tremendous advantages. The most widely used metered mail system is based on a postage meter having the features of double registers (ascending and descending) and credit balance lockout. With this type of meter, the customer has complete control of the postage kept in the meter and cannot use more postage then has been paid for. The Post Office is assured of payment and does not have to operate a collection department or consider suspension of services for nonpayment. The recharging records and procedures provide an excellent record of revenue collection and cannot easily be defrauded, thus minimizing any temptation to collusion between a meter user and a Postal representative to defraud the Government. By virtue of these advantages, there need be no discrimination made by the Postal service against a mailer becoming a metered mail user. Moreover, metered mail does not have to be cancelled, thereby simplifying the handling of mail by the Post Office.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a system for overcoming the above-noted drawbacks to the present metered mail system without sacrificing any of its advantages. This system is based on the use of a double register, credit balance lockout, postage meter, except that the meter is equipped with a combination lock whose combination changes in predetermined random sequence (termed pseudo-random sequence by mathematicians) each time it is actuated. This combination lock operates on the resetting or recharging mechanism of the postage meter such that, when unlocked, the mechanism may be manipulated to recharge the meter with an increment of postage. As the meter is recharged, the combination lock automatically locks itself to prevent subsequent recharging of the meter unless and until the correct new and different combination is entered. Combination locks of this type, suitable for use in the application of the present invention, are disclosed in U.S. Pat. Nos. 3,034,329 and 3,664,231.

The present invention is specifically directed to an automated method for issuing the respective new combinations to a plurality of remotely located postage meter users from a central station over normal touch-tone telephone equipment. The basic operating components of the central station are a programmed digital computer operating in accordance with the present invention and a conventional voice answer-back unit. The computer answers each user's telephone call and automatically, via the answer-back unit, formulates a series of voice instructions requesting the user to input via the phone keys certain encoded data uniquely identifying the caller and the meter to be recharged. The computer processes this input data for authenticity and, when satisfied, automatically issues, via the voice answer-back unit, the new combination capable of actuating the caller's combination lock to permit recharging of the associated meter with an additional increment of postage without having to remove the meter from its normal location. At the time of issuing the new combination to a particular user, the computer automatically updates the user's file or account held in memory, and may if desired initiate the process of billing the user for the increment of postage to which he has been given access.

DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is an overall, generalized block diagram of a system constructed in accordance with the present invention;

FIG. 2 is a flow diagram illustrating the operation of the data center of FIG. 1;

FIG. 3 is a flow diagram of a sub-routine for executing the function of a random number generator for calculating the new combination issued in the flow diagram of FIG. 2; and

FIG. 4 is a diagrammatic illustration of the manner in which the sub-routine of FIG. 3 extracts the new com-

bination from the numbers developed by the random number generator. DETAILED DESCRIPTION

Referring to FIG. 1, the system of the invention comprises a plurality of remote stations 10 capable of communicating with a data center, generally indicated at 12, via telephone exchange equipment, generally indicated at 14. The transmitter-receiver at each remote station 10 is a conventional tone signalling telephone 16 for effecting two-way communication with the data center 12. The data center includes a data set 18 of known construction, such as a Bell System Model 403 data set, for translating frequency encoded data inputs from one of the telephones 16 into a suitable machine language for a programmed or special purpose digital computer 20, for example, a Data General "Nova." The computer, in turn, controls a voice answer-back unit 22 of known construction such as a cognitronics Model 632, to formulate voice responses for transmission via data set 18 and telephone exchange 14 back to the particular telephone 16 in communication with the data center 12. The telephone at each remote station 10 is preferably of the touch-tone type capable of transmitting frequency encoded numeric outputs to data center 12. Alternatively, a dial telephone may be equipped with a touch-tone pad capable of generating frequency encoded digital data in the same manner as a touch-tone phone.

Also located at each remote station 10 is a postage meter 24 of known construction, such as a Model 5300 Pitney Bowes meter, having double register and credit balance lockout features. The two registers comprise an ascending register, which accumulates the dollar amount of postage used over the life of the meter and a descending register, which is incremented with each dollar amount of pre-paid postage reset into the meter and is decremented as this increment of postage is used. When the descending register is decremented to a dollar amount of postage which is less than the maximum dollar amount of postage capable of being issued by the meter in a single cycle, the meter automatically locks out to prevent further usage until recharged. This feature insures that the user will always have a postage credit balance and is incapable of operating his meter in a manner such as to create a deficit situation wherein the Post Office is owed money for postage used.

The postage meter at each remote station 10 is modified to the extent that it is equipped with a combination lock 26 operating on the resetting or recharging mechanism of the postage meter. This combination lock, in accordance with the invention, has the unique characteristic of automatically changing its combination each time it is actuated. When actuated or unlocked, the user is capable of manipulating a knob 28 to increment the descending register of the postage meter 24 by a predetermined dollar amount of a postage increment. This may be accomplished, for example, by a single turn of knob 28, whereupon lock 26 locks up the recharging mechanism so that another increment of postage cannot be set into the meter until the correct new and different combination is entered into the lock 26 by way of clusters of keys 30 and 32, in the illustrated embodiment.

As will be seen from the description to follow, the system of FIG. 1 permits remote postage meter resetting or recharging at the meter site, thus eliminating the necessity of the user having to transport his meter to the Post Office for recharging with an additional increment of postage. This remote recharging is effective using existing communications links, i.e., the telephone exchange network, from a remote central location without the requirement for direct signal control on the postage meter itself, as has been proposed in the past. These prior approaches all involved drastic revisions of existing postage meter designs so as to accept a remotely generated and transmitted initiating or enabling signal for recharging the meter, as well as expensive communications and terminal equipment. In the remote recharging system of the present invention, the postage meter 24 need only be slightly modified so as to accept the adaptation of combination lock 26.

The manner in which the data center handles an incoming call from a user at one of the remote stations 10 seeking to recharge his postage meter 24 is shown in the flow diagram of FIG. 2. When a user determines that his postage meter needs recharging, he keys in the telephone number of the data center on his telephone 16. The data center answers, as indicated at 39, to complete the telephone connection, and the computer 20 controls the voice answer-back unit 22 to compose a voice response, as indicated by output block 40, for transmission back to the caller requesting a numeric input uniquely identifying the caller or the calling remote station 10. This numeric input request may be for an account number, or the like, which is also held in computer memory. Computer 20 then converts to an input mode, illustrated by input block 42, awaiting receipt of a predetermined number of digits, representing, for example, the caller's account number. The user then keys in his account number using the numeric keys on his touch-tone phone 16. The frequency encoded digit inputs are converted by data set 18 at the data center 12 into computer language for the computer 20. The computer then searches its memory to determine if the received account number is stored therein, as represented by decision block 44. If the computer locates a comparable account number in its memory, meaning that the received account number is valid, the program exits decision block 44 on branch 45 to output block 46.

On the other hand, if the computer fails to locate in its memory an account number comparable to the one received from the caller, the program exits decision block 44 on branch 47 to a second decision block 48. Here the computer tests to determine how many chances the caller has been given to input a valid account number. If the caller has had less than three attempts to enter a valid account number, the program exits decision block 48 on branch 49 to output block 50, wherein the computer controls the voice answer-back unit 22 to formulate a voice transmission back to the caller informing him, in effect, that his entry was not valid and to please reenter his account number. The program, as indicated by branch 51, reverts back to the input of block 42 wherein the computer is again conditioned to accept an account number entry. If, on three passes through decision block 44, the caller has failed to enter a valid account number, the decision is made that the call being processed is probably spurious and the program exits decision block 48 on branch 53 pursuant to breaking the telephone connection with the caller, as indicated at 54.

If on one of his allotted three tries, the caller has entered a valid account number, the computer goes into

an output mode, as indicated by output block **46**, wherein the voice answer-back unit **22** is controlled to compose a voice transmission requesting the entry of a second multi-digit number, such as a meter number, uniquely identifying the postage meter to be recharged. as indicated by input block **55**, the computer converts to the input mode awaiting receipt of the numeric entry of the meter number of the caller's postage meter **24**. Upon entry of the meter number, the computer determines, as represented by decision block **56**, whether or not the caller's account file held in memory and file identified by the previously entered account number includes a meter number identical to the one entered by the caller; it being appreciated that the caller may have more than one postage meter. If identity is found, the program exits decision block **56** on branch **57** leading to output block **60**. On the other hand, if identity is not found, the program exits decision block **56** on branch **58** leading to a second decision block **59**, wherein a check is performed to determine how many attempts the user has been afforded to enter a valid meter number after having entered a valid account number. If the user has had less than three such attempts, the program exits decision block **50** on branch **61**, wherein the computer enters an output mode, indicated by output block **62**, to control the voice answer-back unit to compose a voice transmission to the effect that the meter number entry is not valid and to enter it again. The program reverts back, over branch **63** to the input of block **55** as the computer awaits another attempt by the user to enter a valid meter number. If the caller has not done so on three passes through decision block **56**, the program exits decision block **59** on branch **64** to output block **65**, wherein the computer again advises the caller that his meter number entry is not valid and formulates the voice instruction to call a particular telephone number for personal assistance. The computer thereupon breaks the telephone connection with the caller, as represented at **54**. The philosophy in this situation is that since the caller had previously entered a valid account number it is probably not a spurious call. Thus, the caller is requested to call for personal assistance in determining why the caller was unable to enter a valid meter number after three attempts, having previously entered a valid account number.

Assuming the caller has entered a valid account number as well as a valid meter number, the computer, as indicated in output block **60** controls the voice answer-back unit to formulate a voice transmission requesting the caller to enter the reading in the ascending register (A/R) of the identified postage meter to be recharged. The computer then converts to the input mode, as indicated in input block **66**, awaiting entry of the ascending register reading. Upon receipt, the computer reverts to the output mode to control the voice answer-back unit to formulate the voice transmission requesting the user to enter the reading in his descending register (D/R), as indicated by output block **67**. The computer, as indicated in input block **68**, awaits the entry of the user's descending register reading, and, upon receipt, the program proceeds over branch **69** to decision block **70**. Here, the computer checks the descending register reading just entered with the reading of the descending register (D/R') stored in the computer memory under the entered meter number on the occasion of the previous recharging of the user's meter. Since the descending register is decremented by the amount of postage issued with each meter cycle, the current descending register reading cannot be greater than the descending register reading stored in the computer memory. If, however, this is found to be the case, the program exits decision block **70** on branch **71** to a second decision block **72** wherein the computer tests to determine how many times the current descending register reading has been found to exceed the previous descending register reading. If the number of passes through decision block **72** is less than three, the program exits on branch **73** to an output block **74**. The computer then controls the voice answer-back unit to compose a voice response advising the caller, in effect, that his descending register entry is not valid and to repeat the entries of the ascending and descending register readings of his meter. The program exits output block **74** on branch **75** and reenters output block **60** and preceeds through input/output blocks **66, 67** and **68** to decision block **70**. If after the third pass through this portion of the program the current descending register reading is still found to be larger than the stored descending register reading, the program exits decision block **72** on branch **76** to output block **65**, wherein the voice answer-back unit is controlled by the computer to formulate a voice transmission inviting the caller to call for human assistance.

Still referring to FIG. **2**, if the descending register reading entered by the caller is not larger than the previous descending register reading held in memory, the program exits decision block **70** and enters a decision block **78**. The computer sums the ascending and descending register readings (SOR) entered by the caller and compares this total with the sum of the same two register readings (SOR') stored in the memory as the result of the last recharging of the identified meter. If everything is in order, these two totals should be equal. This is seen from the fact that as the postage meter is used subsequent to the last recharging, the amounts of postage by which the descending register is decremented are equal to the postage amounts by which the ascending register is incremented. Consequently, the total of these two register readings should remain constant between rechargings. If the two sums are equal, the program exits decision block **78** on branch **79** where some additional checks are performed pursuant to issuing the next combination for the combination lock **26** associated with the meter to be recharged.

On the other hand, if the sums of the entered register readings and the register readings held in memory are not equal, the computer performs one or more additional checks in an effort to determine if the inequality detected in decision block **78** arose for reasons other than an erroneous digit entry by the caller.

Thus, as seen in FIG. **2**, in the event of inequality the computer exits decision block **78** and enters decision block **80**, wherein the computer checks to see if the ascending register of the identified postage meter overflowed since the last recharging. To perform this check, the computer compares the sum of the register readings entered by the caller with the sum of the register readings held in memory minus the size of the ascending register. That is, if the ascending register has a six digit capacity, for example, capable of registering readings from zero to 999,999, its register size is 1,000,000. It will be seen that if the ascending register is incremented through zero since the last recharging

of the meter, this event can be acccommodated in a sum of registers check by substracting from the sum of the stored register readings the register size, i.e., 1,000,000. This computation compensates for the fact that the ascending register has overflowed and decision block **80** will detect an equality. In such event, the program exits on branch **79** pursuant to issuing the next combination to the caller.

If ascending register overflow was not the reason for the detected inequality in the sum of registers check, the program enters still another decision block **82,** wherein the computer checks to see if the caller failed to actually recharge his meter the last time he called to receive a new combination. That is, the caller having previously called to receive a new combinaton did not enter it into his combination lock **26** and increment his descending register with the amount of allotted additional postage. As will be seen, the computer, at the time of issuing each new combination, increments the descending register reading held in memory with the amount of additional postage to which the caller is given access, and, if he does not recharge his meter, the sum of registers checks performed in decision blocks **78** and **80** will have failed. To determine if this situation exists, the computer compares the sum of the register readings entered by the caller with the sum of the register readings held in memory minus the increment of postage previously allotted to the caller. If an equality is now detected in decision block **82,** the program exits on branch **83,** and the computer proceeds to issue the same combination stored in the memory that was given on the previous call but which had not been entered into the combination lock for some reason. The caller may then recharge his postage meter with the increment of postage he previously had been given access to, and for which he previously had been charged. However, the computer does not update the caller's file. Therefore he is not charged for the same increment of postage again.

If the check illustrated by decision block **82** fails, the computer makes one final check, illustrated by decision block **84,** to determine that the failure of the sum of registers checks illustrated in decision block **78, 80** and **82** was for a reason other than an erroneous digit entry by the caller. This final check involves testing to see if the reason for the sum of registers inequality arose, because the caller's ascending register overflowed and he also neglected to recharge his meter the last time he called and was given the combination permitting him to recharge his meter. This check is carried out by comparing the sum of the registers entered by the caller to the sum of the registers held in computer memory minus the allotted increment of postage minus the ascending register size. If an equality is now detected, the program exits decision block **84** on branch **83** pursuant to issuing the same combination to the caller that he was given the last time he called. On the other hand, if an equality is still not obtained, the program exits decision block **84** on branch **85** to decision block **72,** which checks to see how many passes through decision blocks **70, 78, 80, 82** and **84** the computer has executed for this particular caller. If the number of passes is less than three, the program exits decision block **72** on branch **73** to output block **74,** and the caller is requested to reenter his ascending and descending register readings. If, on the third pass through these decision blocks, a sum of registers inequality is still detected, the program exits decision block **72** on branch **76** to output block **65,** and the caller is invited to call for human assistance.

When the program exits decision blocks **78** or **80** on branch **79,** the computer checks the caller' s account, as represented by decision block **90,** to determine that his account has a sufficient credit balance to pay for the increment of postage with which he is seeking to recharge his meter. If the credit balance is found to be insufficient, the program exits decision block **90** to connector B, which is common to connector B at branch **76** leading to output block **65,** wherein the computer formulates, via the voice answer-back unit, the voice transmission inviting the caller to call for human assistance.

When the computer determines that the caller's account has an adequate credit balance, the program exits decision block **90** and enters decision block **92,** wherein the computer checks to determine whether or not the caller has used up the entire random sequence of combinations accomodated in the meter's combination lock. If the combination lock is of the type disclosed in U.S. Pat. No. 3,664,231, noted above, wherein the random sequence of combinations is established by a series of perforations in a paper tape, the check illustrated by decision block **92** determines when the paper tape is used up and the installation of a replacement tape is required. Assuming, for example, that there is a random sequence of 500 lock combinations punched into the tape, the computer keeps track of the number of combinations issued and, when 500 have been issued, the program exits decision block **92** to connection B, common to the input of output block **65.** The caller is thus invited to call for human assistance.

Assuming that the entire sequence of combinations has not been issued, the program exits decision block **92** to decision block **94,** wherein the computer checks to see that, with the descending register reading entered by the caller, the additional increment of postage which the caller is being given access to will not overflow the descending register. Should the descending register overflow when being recharged, the credit balance lockout feature built into conventional postage meters will prevent the caller from using all of the postage increment if it were recharged into the meter. If the computer determines that descending register overflow will occur, the program exits decision block **94** to connection B and thence to output block **65,** requesting the caller to call for human assistance.

Having cleared all of the above described checks, the computer is now programmed to provide the new combination for the postage meter identified by the meter number entered by the caller. There are of course a number of ways in which this can be done. For example, the computer may store for each remote meter serviced by the data center the same random sequence of combinations as are accommodated in the combination lock adapted thereto. The computer would then atuomatically retrieve the next combination in sequence from its memory for issuance to the caller. This approach has the distinct drawback of taking up inordinate amounts of computer memory. A more practical approach is to utilize a random number generator sub-routine, as generally indicated by sub-routine block **96** in FIG. **2** and as disclosed in greater detail in the flow diagram of FIG. **3.**

As seen in FIG. 3, pursuant to generating the new combination, the computer, as indicated by block **98**, retrieves a random seed number stored in its memory under the meter number of the particular postage meter to be recharged. This random number is checked, as illustrated by decision block **100**, to determine if it is odd or even, and if even, it is incremented by one, as indicated by block **102**. This is done because the particular random number generation method illustrated, a modified power residue method, has a longer repeat period when using odd numbers rather than even numbers. Thus odd seed number, as indicated by block **104**, is multiplied by a constant to develop a new random number. Assuming a 32-bit computer word length, the overflow created by this multiplication is discarded and the 32 least significant bits become the new random seed number. The 12 most significant bits of this random number are stored in binary coded decimal form as the four digits of the first half of the new combination. That is, as indicated in FIG. **4**, the **12** most significant bits, indicated at **108**, of the random number are divided into four groups **108***a* – **108***d* of 3 bits, each representing a decimal digit zero through seven of the first half of the new combination. This first half of the new combination for entry in key cluster **30** is stored, while the computer checks, as indicated by decision block **110** to determine whether this is the first or second pass through the random number generator sub-routine for the identified postage meter. If it is the first pass, the new random number generated by the computation of block **104** is used, as indicated at block **112**, to re-enter the sub-routine of FIG. **3** at decision block **110**. If this new random number is even, it is incremented by one. If it is already odd, this new random number is multiplied by the constant, as indicated by block **104**, to generate still another random number. The overflow bits are discarded, and the 12 most significant bits of the resulting 32-bit random number are retained as the four digits in BCD form of the second half of the new combination for entry in key cluster **32**. The new random number generated on the second pass through this sub-routine is stored as the new seed number as indicated by block **114**, for the random number generator sub-routine when the identified postage meter is to be again recharged. As indicated by block **116** in FIG. **3**, the two halves of the new combination are assembled and used as the basis for controlling the voice answer-back unit to compose the new combination for voice transmission back to the caller, as indicated by output block **118** in FIG. **2**.

It is understood that the random number generation method used in calculating each combination of the random sequence (sub-routine **96**) is also used in preparing the punched paper tape or other form of storage media accommodated in the lock to successively qualify the identical random sequence of combination for opening or actuating the lock. Thus the sub-routine **96** and the particular combination lock for the identified meter to be recharged each progress through the same unique random sequence of combinations in tandem, since the identical seed numbers are used in each case.

It will be appreciated that the combination locks may be equipped with micro-computers using the same random number generation method to calculate the new combinations in concert with sub-routine **96**.

It will be appreciated that the pseudo-random number generation sub-routine **96** illustrated in FIG. **3** is intended as purely illustrative, as there are manifold known random number generation algorithms which may readily be used in the practice of our invention.

Returning to FIG. **2**, prior to the voice tranmission of the new combination to the caller, the computer executes a sub-routine, indicated at **119**, wherein the caller's account and postage meter file, held in memory, are updated. While the computer memory may be organized in a number of ways, preferably each postage meter is allotted a block of memory locations addressed by a unique meter number which is entered by the caller in accordance with input block **55**. Each account is also allotted a block of memory locations addressed by a unique account number, as entered in accordance with input block **42**. In each meter number addressed memory block is stored the account to which that identified postage meter belongs. As represented by decision block **56**, the computer, in effect, determines that the entered meter number is not only stored in the memory, but also cross-checks to determine that the identified meter belongs to the previously entered account number before preceeding to that part of the program calling for entry of the ascending register reading represented by output block **60** in FIG. **2**. Stored in each account number addressed block is the credit balance for that particular account. This credit balance is debited in sub-routine **119** with the increment of postage to which the caller is given access when the function represented by output block **118** is executed. This credit balance is credited by the entry into the computer of payments remitted by the caller. Deficiency of this stored credit balance figure is checked by decision block **90** prior to the calculation of the new combination in sub-routine **96**.

In each meter number memory block is also stored the fixed increment of postage by which that particular meter can be recharged; it being understood that the amount of this postage increment may vary from meter to meter. Also stored in each meter number memory block is the ascending register and descending register sizes for that particular postage meter. This information is used in decision blocks **80**, **84** and **94**. Except for the credit balance figure for each account, the above data remains constant, as stored in memory. The remaining data stored in memory under each meter number is variable data which is updated pursuant to sub-routine **119**. This data includes the updated ascending and descending register readings, as entered by the caller, the new random seen number derived by the random number generator sub-routine of FIG. **3** and stored until such time as the next new combination is to be calculated, the combination calculated by the random number generator sub-routine for issuance to the caller, and the count of the combinations issued as used in decision block **92**.

It is seen from FIG. **2**, when either decision blocks **82** or **84** determine that the caller failed to recharge the postage meter in question with the postage increment to which he was previously given access, sub-routine **96** is bypassed, and the computer retrieves the combination in memory calculated by sub-routine **119** on the previous occasion. This stored combination is then transmitted back to the caller without altering the caller's credit balance and the other variable data for that particular postage meter stored in memory.

Returning to FIG. **2**, once the new combination is transmitted to the caller, the computer is conditioned to accept an entry of three digits, as represented by input block **120**. The computer goes through a time out function awaiting the entry of three digits. If, at the end of the time out function, no three digits have been received, the program hangs up, as indicated at **128**, to break the telephone connection with the caller, if the caller has not already done so. It will be appreciated that the program will execute a similar time out function in anticipation of the receipt of all data entries, (e.g., input blocks **42, 55**, etc.) and will hang up if such entries are not timely. If the caller keys in the letters RPT (778), the abbreviation for "repeat," the program exits decision block **122** on branch **123**, returning to the entry for output block **118**, and the computer controls the voice answer-back to transmit the same new combination back to the caller. If, on the other hand, the caller enters the letters AGN (246), the abbreviation for "again," the computer determines that the caller desires still another increment of postage and the program exits decision block **124** onto connection A which is common to the input block **60**. The computer then requests entry of the ascending register reading and the new descending register reading, i.e., with the new increment of postage to which the caller has just been given access added in. The new, incremented descending register reading must be transmitted to the data center, whether or not it has in fact been incremented, otherwise the caller will be given the same combination when the program reaches decision block **82**. Thus, the end result would be the same as though the caller had entered the letters RPT rather than AGN. However, if the incremented descending register reading is entered, the caller will be given the next combination in sequence, assuming his credit balance is still sufficient (decision block **90**), the sequence of combinations in his combination lock has not been expended (decision block **92**), and the descending register will not overflow (decision block **94**).

It will thus be seen that the objects of the invention made apparent from the foregoing description are efficiently attained, and, since certain changes may be made in carrying out the above method without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. For use at a data center to process telephonic calls from remotely located users of postage meters equipped with combination locks wherein the locks inhibit recharging of their associated meters with increments of postage while locked and their respective combinations change in random sequence with each actuation thereof to permit meter recharging, and wherein the data center is equipped with a programmed digital computer and a voice answer-back unit, the method comprising the steps:

A. answering an incoming telephonic call from a postage meter user to establish two-way communication;

B. formulating via the answer-back unit, a voice response for transmission to the user requesting the input of data uniquely identifying the postage meter to be recharged;

C. processing said identification data, upon receipt, to check the authenticity of the call;

D. determining the next combination capable of actuating the combination lock adapted to the postage meter to be recharged;

E. updating the user's file held in computer memory to reflect the fact that the identified postage meter is to be recharged; and

F. transmitting, via the answer-back unit, said next combination to the user, thereby affording to the user the capability of recharging the identified postage meter.

2. The method defined in claim **1**, wherein the postage meters are each equipped with ascending and descending registers, which further includes the steps of:

A. formulating, via the answer-back unit, a voice transmission to the user requesting the input of the numerical contents of the ascending and descending registers of the identified postage meter;

B. summing the contents of the ascending and descending registers, as entered by the user, and comparing this total with the total of these register contents held in computer memory as the result of the previous recharging of the identified postage meter;

C. upon the detection of the equality therebetween, preceeding with the determination of the next combination; and

D. said updating step including storing in the computer memory the new contents of the ascending and descending registers as entered by the user.

3. The method defined in claim **2**, wherein the computer memory also stores the current credit balance of each user's account and the dollar amount of the increment of postage to which each postage meter may be recharged upon a single actuation of the combination lock adapted thereto, which further includes the step of, prior to proceeding to the determination of the next combination, checking the credit balance of the user's account to determine if sufficient funds are on deposit to cover the increment of postage requested by the user.

4. The method defined in claim **2**, further comprising the steps of developing a random sequence of combinations for each combination lock using a random number generator, and performing new combination determination steps using a random number generation algorithm the same as was used in developing the random sequence of combinations accommodated in each lock.

5. The method defined in claim **4**, which further includes the step of checking to see that the entire random sequence of combinations accommodated in the identified combination lock has not been issued to the user.

6. The method defined in claim **2**, which further includes, in the event inequality is detected between the sum of registers entered by the user and the sum of registers stored in computer memory, checking to determine if the ascending register of the identified postage meter overflowed since its previous recharging by comparing the entered sum of registers total with the sum of the stored register readings minus ascending register size and, if equality is then detected, proceeding to the new combination determining step.

7. The method defined in claim **2**, wherein the combination issued on the previous occasion when the

identified postage meter was sought to be recharged is stored in computer memory, which further includes in the event inequality is detected between the sum of registers entered by the user and the sum of registers stored in computer memory the steps of:

A. checking to determine if the identified postage meter was actually recharged on that previous occasion on the basis of the entered and stored register readings and the postage increment by which the identified postage meter may be recharged, and, if not;

B. retrieving the stored combination from memory for transmission to the user without executing said next combination determining step.

8. The method defined in claim **2,** which further includes the steps of:

A. responding to an input request from the user for a second postage increment for recharging into the identified postage meter by requesting the input of the numerical contents of the ascending register and the descending register with the first postage increment included therein;

B. again summing the register readings entered by the user and comparing this total with the total of the previously entered register readings held in memory;

C. upon the detection of equality therebetween, repeating said next combination determination, updating, and next combination transmitting steps, in sequence.

9. The method defined in claim **8,** which further includes the step of determining that the requested postage increment will not overflow the descending register of the identified postage meter before preceeding to said next combination determining step.

10. The method defined in claim **8,** further comprising the steps of developing a random sequence of combinations for each combination lock using a random number generator, and performing a new combination determination step using a random number generation algorithm the same as was used in developing the random sequence of combinations accommodated in each lock.

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