

April 29, 1952

R. W. BUMSTEAD

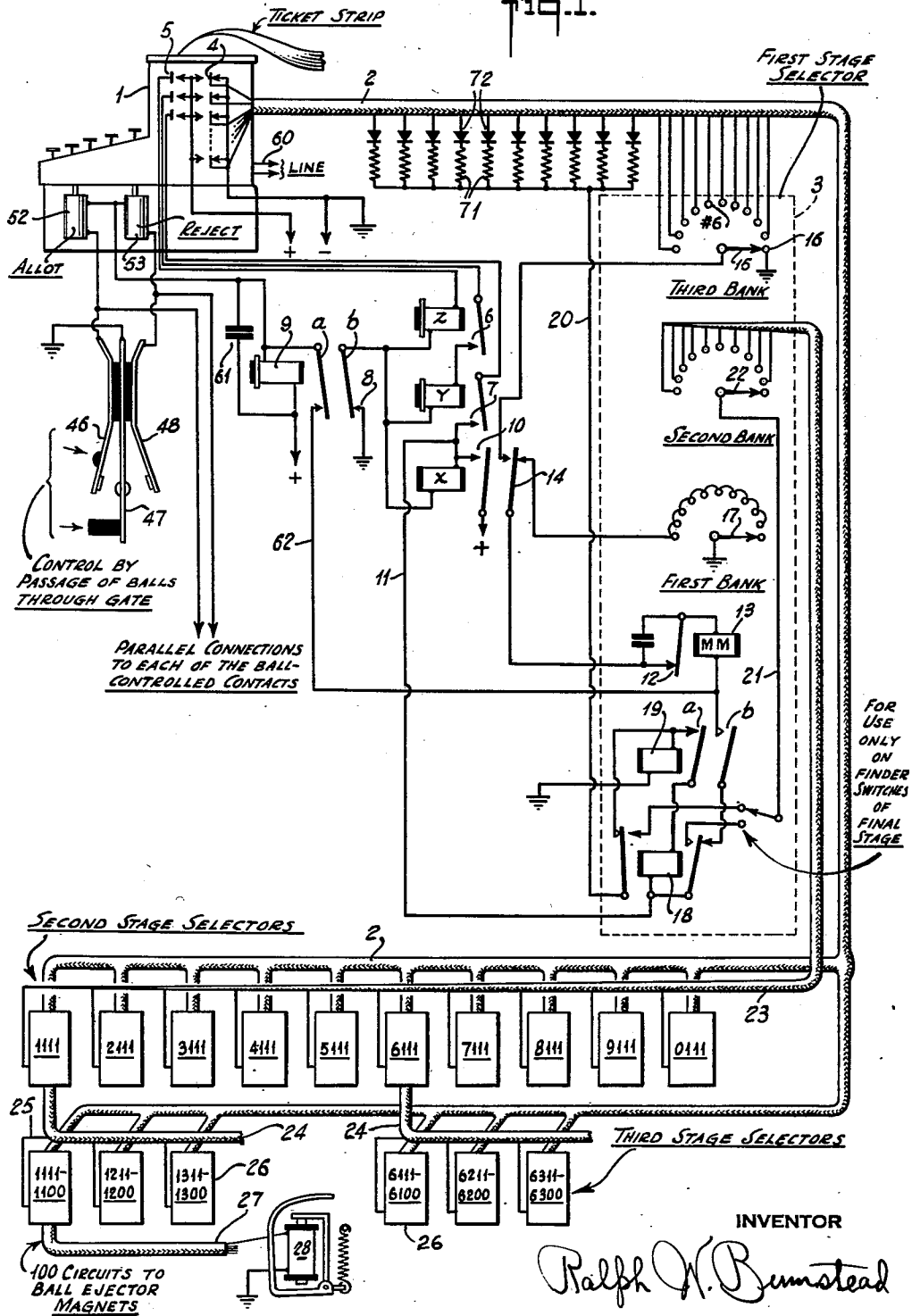
2,594,865

SYSTEM FOR MAKING RESERVATIONS

Filed Jan. 20, 1947

3 Sheets-Sheet 1

Fig. 1.



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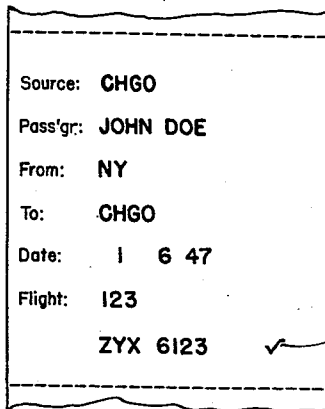
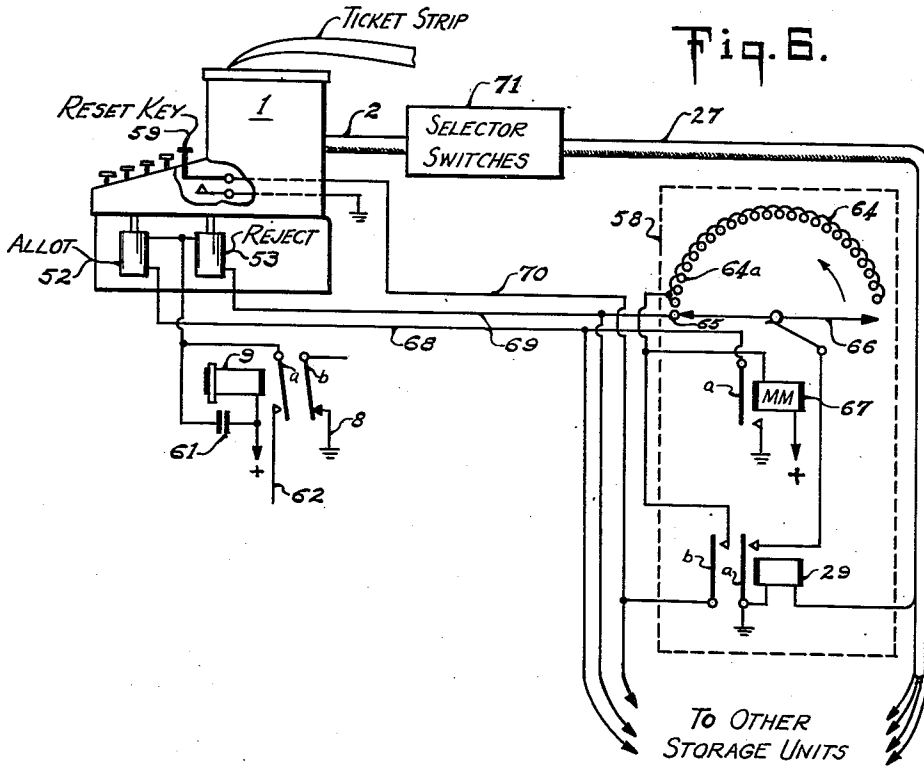


Fig. 7.

✓ Symbol for allotment

⊗ Symbol for rejection

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2,594,865

SYSTEM FOR MAKING RESERVATIONS

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16 Claims. (Cl. 235—61)

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This invention relates to systems for making reservations of space allotments. Examples of use include the booking of travel accommodations, and the allotment of reserved seats in theatres, auditoriums, stadiums, and the like.

The broad object of the invention is to provide improved facilities for handling reservation requests through a communication system and for actuating a statistical device in which reservations are registered. A feature of the statistical device is that it is adjustable in accordance with predetermined quotas of available space allotments. When like reservations have been accumulated up to the limit of a quota, then, obviously, further reservation requests must be denied. The system further provides means for making a response automatically in accordance with the operation of the statistical device so that the person who makes a reservation request will be immediately informed as to whether a space allotment has been made in his favor or whether it must be rejected.

It is an object of my invention to provide facilities of the type indicated above which will be extremely simple in structure and in operation and which will be operable, for example, in association with a conventional teletype communication system.

It is another object of my invention to provide selecting means in combination with, and operable from a teletype printer in such manner as to control the storing of allotments in accordance with successive requests for reservations; the system also including means for automatically recording either an acceptance or a denial of a reservation request.

Other objects and advantages of my invention will be brought out in the more detailed description to follow. This description is accompanied by drawings in which—

Fig. 1 shows diagrammatically and in schematic form a circuit arrangement of a selector to be controlled from a teletype or other telegraph apparatus for testing the receptivity of a storage element corresponding to a group of space units to be reserved, and to report back whether a reservation is then made or the request therefor rejected;

Fig. 2 shows a plan view, partly in section, of a device for storage of tokens corresponding to space units, the hopper 31 being viewed, however, as it would appear in Fig. 4;

Fig. 3 shows a cross section vertically along the line 3—3 of Fig. 2;

Fig. 4 shows a front elevation, partly in sec-

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tion, the plane of projection being indicated at 4—4 in Fig. 3;

Fig. 5 shows a detail of construction which is used for responding to a request for cancellation of a reservation;

Fig. 6 shows diagrammatically a modification of my invention wherein rotary switches may be used as storage units for counting purposes; and

Fig. 7 shows, by way of example, the appearance of a ticket which may have printed on it certain useful data regarding transportation sold to a passenger and symbols representing the effects of an answer back signal produced when a reservation is made.

In order to better comprehend the functions of the different units of apparatus which are combined for carrying out the objects of my invention and for better understanding the mode of operation, the essential features will first be briefly described, after which a fuller explanation of the circuit arrangement and the mechanical structure will be set forth.

In Fig. 1 I show schematically a teletype printer 1 which is preferably of conventional type and may, for example, be in general accord with the disclosure of U. S. Patent 1,567,392 granted to E. L. Kleinschmidt on December 29, 1925, but modified by the addition of an arrangement such that each pull bar has associated with it certain contacts to be closed and/or opened by the operation of the corresponding keyboard key.

The key-operated contacts in the printer are used for certain switching functions which are effective in making a selection of one particular storage unit such as may be assigned to a railway car or train, or an air transport plane, or a section of seats in an auditorium, or any other group of space units which are to be reserved.

The selecting operation is one which may be performed in a manner somewhat similar to that of dialing a telephone number for establishing telephonic communication between a calling subscriber and a called subscriber. In fact, the technique of automatic dial telephone switching is one which is very largely applicable to the requirements of the instant invention. Accordingly, I make use of well known telephone dial switching apparatus to a large extent. However, I prefer to operate that apparatus by the so-called "finder" method because its speed of operation is substantially equal to the speed capabilities of the teletype machine, whereas the operation of the teletype might be unduly retarded if the typing of successive digits of a number

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had to wait upon the transmission of trains of counting pulses.

The use of the step-by-step switches of the "finder" type avoids the necessity for translating character code signals of uniform length into counting pulse trains of variable length. Such a translating method would serve no useful purpose in the present invention.

By the use of an inter-office teletype system a multi-digit number may be typed and at the same time switching operations may be performed at the central office so as to select a specified storage unit out of a very large plurality of such storage units, as required for proper allocation of a requested reservation. The request itself may originate at any station reached by the teletype circuit, that is, wherever the applicant may present himself to obtain a reservation, whether in one city or another. Whatever is typed on one teletype machine of the system will appear at least on the machine at the central office where the statistical apparatus is located. Furthermore, since the teletype system to be utilized is arranged for two-way operation, the answer-back feature is one which enables a record to be made both on the recording tape at the central office and on the tape of the printer at the point of making application for a reservation.

Preferably the recording tape is one which has transverse lines of perforation uniformly spaced so that individual tickets may be torn off, each having a record of the applicant's name, the points of departure and arrival (assuming the reservation is to be made for transportation), the date and identification number of the trip, and eventually the printing of a symbol which indicates that a reservation has been allotted, or, conversely, that it has been rejected because of a "sold out" condition.

As an example of simple means for storing the space allotment information I have shown in Figs. 2, 3 and 4 an arrangement which provides for the storage of metal balls in different pockets, where each pocket represents a transportation unit such as a train, a car, or a plane. These balls are arranged to be ejected from a channel which is common to all of the storage units. When space is available for a new reservation, the ball will drop into a proper pocket in response to circuit controls from the teletype printer. The ball, when ejected through a gate, causes an impulse to be transmitted to the teletype machine for operating a special key thereon which designates that the allotment of space has been made and registered in response to the request. When, however, the allotments have already been fully taken up and no further space is available, the operation of ejecting a ball from the reservoir will cause displacement of another ball already in the pocket, and this displacement will be performed in such manner as to transmit a signal for operating the teletype machine thereby to cause a symbol to be printed which indicates rejection of the application.

After performing the functions as above described, the entire system must be restored to normal and be made ready for operation in response to further requests. The restoring operations will therefore be described in due course.

The storage unit selector system

As previously mentioned, the teletype machine is specially built to control certain circuits which, according to Fig. 1, are bunched in a cable 2. If

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the first selector 3 is one which may select any one of ten different channels for further stages of selection, then the cable 2 will contain ten conductors, each connected to a movable contact 4 in the teletype printer for circuit closure between stationary contacts which on one side are permanently connected to ground and to the negative terminal of a direct current operating source, and which on the other side are connected to a positive potential source feeder. Each of the movable contacts 4 is preferably controlled by an individual pull bar in the teletype machine and normally rests against a grounded contact. Operation of a pull-bar causes its movable contact 4 to engage with a stationary contact having positive potential.

In order to normally isolate the storage selecting system while the teletype machine is used for more or less normal communications service, it is preferable to employ a preliminary conditioning relay system for connecting the selector to the printer. Connection is made only when certain three characters (preferably letters) are printed in succession. This feature is exemplified by the use of the letters Z, Y, X which are to be transmitted in that order as a code signal indicating that a request for space allotment is to follow immediately. Therefore the letter type bars are operated from pull bars which have contacts 5 associated with them for operating three relays which are shown in Fig. 1 as relays Z, Y and X respectively. The Y relay has its winding in circuit with contacts 6 which are closed by the Z relay so that the Y relay cannot operate unless preceded by the operation of the Z relay.

In like manner the X relay has its winding in circuit with contacts 7 of the Y relay and will not operate unless the Y relay has previously operated. The return circuit for each of the relays Z, Y and X is common to them all and leads to ground through normally closed contacts 8 and 9 of a disconnecting relay 9, the operation of which will be described in connection with the general restoring feature.

The Z relay and the Y relay are conventionally shown in the drawing as possessing slow release characteristics. Their time constant is, therefore, suitably chosen for holding their armatures in contact with associated contacts until the X relay has been operated.

The X relay is self-locking since its front contact 10 engages with an armature having positive potential fed to it.

When relay X operates, it applies positive potential to a conductor 11 and also closes a circuit which includes its armature 14 and interrupter contacts 12 associated with a motor magnet 13, this magnet being used for step-by-step operation of a finder switch 3 conventionally shown within a broken line rectangle. This circuit during the pull-up time of relay X is extended to a wiper 15 on the third bank of contacts of the rotary switch 3. The normal position of this wiper is one having a grounded contact 16. When relay X releases, its armature 14 transfers the interrupter contacts 12 to the plurality of interconnected contacts in the first bank of switch 3. The wiper 17 of this bank is grounded. The contact in the normal position has no connection.

Conductor 11 leads to the winding of a relay 18 and thence to contacts a of a relay 19. Relays 18 and 19 are suitably coordinated in their operation so that when relay 19 is first energized by a signal pulse through conductor 20, it will prepare a circuit for the energization of relay 18, and

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before relay 18 is energized, relay 19 will be locked up and freed from further influence by signal pulses.

These signal pulses may be derived from any one of the conductors in the cable 2 according to the application of positive potential to a selected movable contact 4 in the teletype machine. The conductors of cable 2 are branched through parallel-disposed resistors 71 and unidirectional devices 72 to a common pulse circuit 20. Devices 72 allow current to flow only in the desired direction through the winding of relay 19 and without permitting unwanted feed-back into others of the conductors of cable 2. The unidirectional devices 72 may be selenium or copper oxide rectifiers if desired. They are used in many cases where isolation of separate parallel conductors is required along with a common connection to all of them, as herein shown.

Each of the conductors in cable 2 is connected to a separate one of the contact points in the third bank of switch 3. Parallel connections to corresponding terminals in other switch banks for further stages of selection are also made to the individual conductors of cable 2, as will be hereafter explained in more detail.

It should be understood that the selector switch 3 is one which is assigned to the first stage of selection of a storage unit for space reservation allotment and may, for example, represent the thousands digit of a reference number assigned to the storage units generally. If desired, this thousands digit may represent the date of the reservation so that reservations may be made for the same designated trip on different days. Accordingly, it will be recognized that the rotary switch such as 3 may have as many as 25 contacts in its banks so as to comprehend reservations for 25 days in advance. The principle of operation is the same, however, with a rotary switch having only ten steps of selection. Such switches are commonly used having one idle position for homing and ten positions for selection. Each position, therefore, may stand for one of the ten figures of a number. Furthermore, in accordance with ordinary telephone dialing practice, the first step taken by the wiper of a rotary switch brings it to a contact numbered 1 and ten steps would bring it to a contact which is numbered 0, meaning 10, so that the first number which could be selected by a single step movement of the wipers in successive stages would be number 1111. The number which would stand for the greatest movement of all the wipers in successively operated selector switches would be 0000, meaning 10,000.

The second stage of selection is one which, due to a particular setting of the wipers on switch 3, will cause a selected one of ten finder switches to be operated in response to the hundreds digit of a number typed on the teletype machine 1. These second stage finder switches are shown in Fig. 1 on one horizontal line and are numbered 1111, 2111, 3111 and so forth. The details of construction of these switches are exactly the same as shown in the broken line rectangle for switch 3 of the first stage. Similar control relays 18 and 19 are used in the second stage and they are operated by extending the effects of signal pulses from conductor 20 through a conductor 21, and through wiper 22 on the second bank of switch 3 to a selected contact thereof, and thence to a selected one of the second stage finder switches. These individual contacts in the second bank of switch 3 are led through a cable 23 and

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are fanned out individually to the different finder switches of the second stage.

Each of the finder switches of the second stage also has its third bank of contacts connected to individual conductors in cable 2. Each of the finder switches of the second stage has output circuits which are shown in Fig. 1 as cabled, say, with ten conductors in the cable 24. These conductors are again fanned out to individual control circuits 25 which are effectively extensions of conductor 20 and which again serve to control the operation of third stage finder switches 26.

In order to avoid unnecessary duplication of third stage finder switches 26 it is preferable to adopt a type for these switches which has both vertical and horizontal control of its wipers, thereby making it possible to select any one of 100 output circuits for further selection of a desired storage unit. These output circuits are indicated in Fig. 1 as grouped in cable 27.

The finder switches 26 are subject to control by two successive pulses from the teletype machine, these pulses representing the tens and units digits of the identification number of the storage unit to be selected. Each of the storage units is electrically controlled by a magnet such as 28. As will be seen by reference to Figs. 2 and 3, the magnets 28 are utilized for ejecting balls from a common storage channel into selected individual storage pockets representing different groups of space allotments, such as a plane or a trip on any conveyance. Each of the magnets 28 has a return circuit to ground.

The ball storage mechanism

Figs. 2, 3 and 4 are different views of the storage mechanism. The basic principle of statistical storage by means of balls of uniform size is one wherein a supply of balls is always available in a horizontal channel 30, the balls being fed thereto from a hopper 31. Alternate balls are disposed in position to be ejected from the channel into vertically disposed pockets 32, each pocket representing a different space allotment group.

For reasons of structural design alternate balls are positioned for possible ejection while intervening balls are used merely as spacers. With the ejection of any ball from channel 30 into a pocket 32 its space is immediately taken up by one of the spacer balls and the entire line of balls from that point back to the hopper 31 is moved the distance of one ball diameter. Accurate positioning of the balls is obtained by an adjusting screw 33 at the end of channel 30, this screw being locked in its position of adjustment by means of a nut 34.

The ejector magnet 28 has an armature 35 which is pivoted at 36 and is held in its normal position by means of a spring 37 and a back-stop 57.

The armature 35 is extended into a finger 35a which terminates opposite an orifice in the wall of channel 30. Alternate ones of the magnets 28 are disposed in different levels in order to accommodate the diameters of the magnet windings where such diameters are greater than the space between adjacent ball pockets. The heel pieces 38 of the magnets 28 are all mounted on suitable crossbars 39.

The balls 40 are of uniform diameter and are preferably made of hardened steel. They may be guided through channels of circular or rectangular cross section, preferably the latter. The individual pockets 32 which represent different groups of space allotments may be of any suitable

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length to accommodate the storage of balls up to the limit of available space units in any one plane, car, vehicle or other transportation unit. In order to adjust the quota for such a unit, say to its seating capacity or its berths, I have indicated as a simple adjustment device a key 41 which may be placed in any one of a number of holes transversely of each pocket 32 for determining the position of the bottom ball as it drops into such a pocket. An attendant will normally position the keys 41 in each pocket in accordance with the passenger quota of each transportation unit. Two keys such as 41 and 41a may be inserted in adjacent holes through the pocket for purposes of taking care of cancellations. Thus by withdrawing key 41 while key 41a remains in place the balls will drop down the space of one ball diameter. Key 41 may then be reinserted and key 41a removed for releasing one ball which then drops into a trough 54 for carrying it to a cancellation pool. This operation immediately creates a vacant position in pocket 32 for acceptance of the next reservation which is requested.

The act of ejecting a ball 40 from the horizontal channel 30 when magnet 28 is energized is one which drives the ball 40 through a gate 42 and directly into the selected pocket 32. As the ball passes through this gate it lifts one arm of a bell crank 43 which is pivoted at 44. The other arm of this bell crank rests against an insulation button 45 which is carried on a contact spring 46. Two other contact springs 47 and 48 are grouped in a "pile-up" which is individual to each of the storage device units. All of the "pile-ups" may be fastened to a common horizontal bar 49 by means of screws 50. The individual contacts 46, 47 and 48 are separated at their position of anchorage by means of insulating strips 51.

Referring again to Fig. 1, one of the spring combinations may be seen having a spring 46 connected to a solenoid 52 while spring 48 is connected to another solenoid 53. These solenoids have their movable core pieces connected to individual key bars in the teletype machine 1, these bars being specially provided for printing symbols which indicate in one case "allotted" and in the other case "rejected."

The operation of the answer-back feature which is subject to control by the ejection of balls is as follows: when a ball passes through the gate 42, it lifts the horizontal arm of the bell crank 43 and closes contact spring 46 against contact spring 47, provided there is an allotment to be made. In this case the ejected ball either drops downwardly into pocket 32 or it remains on the same level with the gate, assuming that the pocket is otherwise filled with balls. In this case it is the last allotment to be made and further requests for reservations will result in the following operation:

Now an ejected ball in passing through the gate 42 must displace the previously positioned ball on the same level with the gate. The only path for displacement is one which ejects the first ball into a "reject" trough 54. This operation of further ejection is one which actuates a plunger pin 55 slideably mounted in a bushing 56, the pin being retained in its normal position of gate closure by means of the tension of contact spring 47.

If there is no available space to be allotted, it will be seen that the operation of magnet 28 will have the duty of ejecting two balls simultane-

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ously, one from channel 30 into the space overlying a pocket 32 while the other ball is ejected from that space into the reject trough 54. In so doing the insulation rod 55 drives contact spring 47 ahead of contact spring 46 so that these two contacts do not "make," but contacts 47 and 48 "make" so as to send a signal into solenoid 53 for actuating the key bar which prints a symbol indicating "rejected."

Operation of the system

Let it be assumed for purposes of illustration that an individual goes to an air transport reservation office in Chicago and, since he plans to be in New York for a business trip and has already obtained his reservation for going to New York, he now wants a reservation for his return trip on the 6th of the month and on a flight designated number 123. The clerk in the reservation office will immediately establish connection over the leased wire with the reservation office in New York so that the teletype machines in the two cities will be interconnected over a line 60. After typing all of the details of the reservation to be requested, that is—the party's name, the date and the flight number, the points of departure and destination, the code combination Z Y X is typed for placing the selector in operation.

Now the date figure 6 and the flight number 123 are typed immediately following the code Z Y X. The result is that the selector operates as follows: before X relay has been energized and locked up no current will reach the motor magnet 13 because its circuit is open at contact 10 of relay X, even though relay 19 may respond to the typing of figure characters. After relay X pulls up, however, the first selective pulse caused by the printing of the figure "6" sends a positive pulse into contact #6 on the third bank of rotary switch 3 and also through conductor 20 to the lefthand armature of relay 18, thence through its back contact to the winding of relay 19 and thence to ground. Relay 19 pulls up and closes its contacts a and b. At this time however, despite the closure of contacts a, relay 18 remains unenergized because the positive potential derived through conductor 11 is substantially the same as that which is applied to contacts a of relay 19. The removal of positive potential at contacts a when the pulse terminates places the windings of relays 18 and 19 in series. Therefore, relay 18 pulls up and contacts a operate to lock both of the relays 18 and 19 until positive potential is removed from conductor 11 which is at the termination of the final stage of the selecting operation.

Prior to the energization of relay 18 positive potential through conductor 11 is led through contacts b of relay 19, and thence through the winding of the motor magnet 13 to its interrupter contacts 12, and thence through armature 14 of relay X to the wiper 15 on the third bank of rotary switch 3. Each of the conductors which interconnects key contacts 4 of the teletype machine and contacts in the third bank of switch 3 is normally grounded and therefore closes a circuit for the motor magnet 13, with the exception of the operated key where positive potential is applied. Therefore, the motor magnet 13 drives the wiper 15 to such point as will place positive potential on both terminals of the motor magnet 13, whereat the progressive steps taken by the rotary switch are terminated and the switch rests in that selected position to designate the selection of allotment unit magnets 28 in the group for the specified day, the 6th of the month.

The movement of the wipers on the different banks of the switch 3 takes place before relay 18 pulls up. The step-by-step action is very rapid. In accordance with ordinary telephone dial switching practice finder switches can operate at the rate of 40 or 50 steps per second so that the holding time of the key in the teletype machine is normally quite sufficient for setting the switch 3 in any desired position. When the key is released, relay 18 pulls up, as heretofore explained, and the motor magnet 13 is disconnected from the armature of relay 18. Also the lefthand armature of relay 18 transfers connection of conductor 20 to wiper 22 on the second bank of the rotary switch 3. Whatever position this wiper then occupies after the setting movement determines which of the finder switches of the second stage will then be actuated.

In the illustrative example of allotment unit selection the number 123 was given. Therefore, the second-stage finder switch comprehending numbers 6111 to 6000 will be selected in this case. Its operation will be similar to that above described with reference to selector switch 3. The wipers in the first, second and third banks will all be moved to position #1. This will cause selection of a finder switch 26 covering the numbers 6111 to 6100. So for the third stage of selection that particular finder switch will be chosen and further operation of the teletype machine for typing the number 23 will cause first a vertical movement of the wipers on this finder switch, then a horizontal movement thereof so as to seek a selecting point for a conductor leading to the storage unit operating magnet 28 corresponding to the number 6123.

The operation of the storage unit magnet 28 for controlling the ejection of a ball or balls has already been explained in detail. The difference between operations when an allotment is available and when the quota has been filled has also been explained. In the one case there is space at least on the level of the gate 42 for a ball to be ejected from channel 30 without disturbing the normal position of insulation plunger pin 55. In the case of rejection however, the space on the level with the gate 42 is already occupied by a ball and this ball must be ejected into the reject trough 54, thus causing contacts 47 and 48 to be closed.

The operation of the solenoids 52 and 53 selectively as a result of the determination of available or rejected allotment has already been explained. The printing of the ticket strip with suitable symbols for designating the disposition of the reservation request may readily be understood upon reference to Fig. 7. The bottom line of the ticket shows typing of a preparatory signal Z Y X which was explained above as one for initiating the function of the reservation system. This is followed by the number 6123 of which the first digit 6 represents the date, and the number 123 is the flight number. Then follows a symbol for "allotment" which, in this case, has been chosen to be an ordinary check mark (✓). If the reservation request had been rejected another symbol

(N)
(O)

would indicate that, although the ticket had been made out, it could not be validated.

The tickets themselves after being prepared by the teletype machine can be torn apart along prepared perforations in the tape and the

tickets may be distributed to suitable pigeon-holes or hooks on a control board for further reference. In the case of cancellations the information covering a cancellation may be typed on the teletype machine without using the preparatory signals Z Y X and can be taken care of by an attendant who operates the keys 41 and 41a as previously explained.

Now the operation of restoring the system to normal is quite simple. In circuit with the solenoids 52 and 53 is a relay 9, the winding of which has a relatively low ohmic resistance. This relay is of the slow release type and is also arranged for slow operation by virtue of a condenser 61 which is connected in parallel with its winding. When either one of the solenoids 52 or 53 is operated as a result of closure of a contact 46 or a contact 48 against a grounded contact 47, relay 9 pulls up its armature 9a against its front contact, the latter being connected to a conductor 62. Simultaneously it pulls its armature 9b away from the grounded contact 8 and deenergizes relay X, which up to that time had been held locked at contacts 10. When relay X releases, its armature 14 falls back and completes a circuit for step-by-step operation of motor magnet 13 through contacts of the first bank in the rotary switch 3. The motor magnet 13 now derives power for its operation through conductor 62 since relay 9 remains operated for sufficient time for restoring switch 3 to its home position. Other finder switches of the second and third stages are also restored to normal in the same manner. The entire system is then conditioned for further use in responding to requests for reservations.

Alternative components

It will be apparent to those skilled in the art that various types of registering devices may be substituted for the ball storage units if desired. For example, it is well known that counting registers may be operated by magnets such as the magnets 28 herein referred to. If such registers were to be used in the present system, they would first be manually set to indicate the quota for each group of reservation allotments. The magnetic step-by-step operation of such a register may then wind the counting dials backwards until the zero indication is reached, indicating a "sold out" condition. At that setting of the register a swiching operation becomes effective to actuate solenoid 53 for typing the "rejection" symbol on the request ticket. Furthermore, the register may be provided with means for holding the zero registration during receipt of further requests that would require rejection. Prior to full wind-back of the register the solenoid 52 may readily be operated in response to each actuation of the magnet 28 which operates the selected counting register. Such a magnet in this case requires a pair of contacts to be closed by its armature and circuit connections through the zero-position switch of the register to solenoids 52 and 53 respectively. This modification, it seems, is so fully the equivalent of the ball storage type of apparatus as to enable any skilled mechanic to make the substitution without the exercise of invention.

The modification referred to in the foregoing paragraph is illustratively shown in Fig. 6 and may be described in more detail as follows: Any number of storage units 58 may be provided, each having a rotary switch under control of a motor magnet 57. The contact bank has all of

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its segments 64 interconnected except one 65, to which one of the answer back circuits is connected. The wiper 66 may be initially set along the arc of segments 64 at a point representing the maximum storage capacity of seat units for a given plane. The motor magnet 67 steps the wiper 66 counter-clockwise. If the reservations for the flight represented by unit 58 have been completely allotted, then a subsequent request for an allotment will be confronted with the condition where wiper 66 rests on contact 65 so as to cause the transmission of a rejection signal to the solenoid 53. The teleprinter 1 then responds by printing the rejection symbol

$$\begin{pmatrix} N \\ O \end{pmatrix}$$

on the ticket.

Assuming that a reservation request were to be made when an allotment is possible, then the operation of relay 29 causes ground potential to be applied through wiper 66 and one of the segments 64 to motor magnet 67 for operating the same. Its closed contacts a apply ground potential to conductor 68 through which an answer back signal will be transmitted to the solenoid 52, thus causing the symbol for allotment (\surd) to be typed on the ticket.

Components of the system illustrated in Fig. 6, which correspond with those in Fig. 1, are given like reference numbers. In the modification of Fig. 6 the various stages of selection of an individual storage unit are to be performed in the same manner as has been described with reference to Fig. 1. However, the entire selecting mechanism comprising different finder switch stages is shown collectively in the block 71 of Fig. 6.

The output circuits from the final stage of selection switches are referenced 27 in Fig. 1. They are therefore given the same reference numeral 27 in Fig. 6 and show individual conductors to each of the responsive relays 29 in the individual storage units such as 58.

From the foregoing description of the modification shown in Fig. 6 it will be seen that either the signal for "rejection" or the signal for "allotment" is transmitted for selective actuation of one or the other of the solenoids 53, 52, depending upon whether or not the wiper 66 rests on segment 65 when the storage unit selecting relay 29 is operated. The motor magnet 67 does not operate if all available allotments have been exhausted. Therefore the "allot"-solenoid 52 will not operate when it is necessary to transmit the "rejection" signal for operation of solenoid 53, and vice versa. Furthermore, repeated inquiries for allotments after they have been exhausted will all produce the reject signal, since the wiper 66 must remain standing on segment 65 until a reset signal is transmitted, or until a cancellation is to be registered.

When it is desired to reset the rotary switch for any individual storage unit, various well-known means may be employed. For example, a reset key 59 on the teleprinter may be made to close contacts for impressing ground potential on the conductor 70 leading through contacts b of relay 29 and thence to the motor magnet 67. Thus, after response of relay 29 to the usual selecting signals, a single operation of key 59 operates to pulse the motor magnet 67 once for stepping the wiper 66 back onto the first of the interconnected segments 64. Further steps of the wiper 66 may then be taken by repeated operation of relay 29, the same as for making

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allotments, but in this case to obtain a starting registration of the full allotment quota, or for correcting the registration so as to give effect to a cancellation.

In the foregoing description of Fig. 6 it should be understood that I do not claim as my invention any of the individual components of rotary switches or teleprinter apparatus, but have simply described this modification as one wherein such components may be put together in a novel manner for accomplishing the inventive objects of my invention.

The keys 41 and 41a were described above as being useful for adjusting each storage unit to a certain capacity and for releasing balls one by one to take care of cancellations. Cancellations may also be taken care of by remote control and automatically as recorded on the teletype machine. Fig. 5 shows how this may be done.

Two rods 73 and 74 extend through holes in the wall of each storage unit respectively, and in place of the keys 41 and 41a. These rods are pivotally attached to the ends of a toggle lever 75 and are actuated reciprocally by means of a linkage member 79, connected to a lever-arm 78 which is an extension-piece with respect to the armature 77 of a magnet 76. The magnet, when energized by a pulse which may be initiated by key-operation of the teletype machine, operates against the tension of a spring 80. The armature heel rests against a back-stop 81 when not attracted. Each magnet core is mounted on an iron heel-piece 82 and all of the latter are supported along a horizontal elbow-bar 83. When the armature 77 is pulled up, then rod 73 is withdrawn sufficiently to release a ball 40 so as to drop down the space of one ball diameter and is there momentarily arrested by the interjected rod 74. When the magnet 76 releases, then the action of the rods 73 and 74 is reversed. The released ball drops out of the storage unit and the ball next above it (if any) is retained in place by the interjection of rod 73 beneath it.

According to techniques which are well known in the telephone switching art the use of the finder switches as hereinabove described may be extended so that if a special key is actuated on the teletype machine immediately preceding the typing of the final digit of the storage unit identification number, then the selection of a desired one of the magnets 76 would occur in place of selecting a magnet 23 for the same storage unit. Thus, a notice of cancellation may be registered on the teletype machine and taken care of by the storage unit affected, this operation being facilitated automatically just as well as in registering reservations that are to be made.

Other modifications may also be made without departing from the spirit and scope of the invention, as will be appreciated by those skilled in the art.

I claim:

1. In combination, a telegraph typewriter, a plurality of storage devices arranged and adapted to accumulate tokens each of which represents a unit of space to be reserved, each of said devices being appropriate to a specific group of said space units and of limited capacity, selecting means including circuit controlling elements operable by said typewriter concurrently with its own typing operations for subjecting a desired storage unit to control, and means operable upon seizure of that control for causing a token to be stored in said device, pro-

vided there is storage space therefor, and for causing a token to be rejected whenever seizure takes place after filling said storage space to capacity.

2. The combination according to claim 1 and including an answer-back device operable upon seizure of a selected storage device to cause said typewriter to record either acceptance or rejection of a space unit reservation as determined by the storage or rejection of a token respectively.

3. In combination, a telegraph typewriter for printing tickets, a plurality of registers, selective means including circuit controlling elements operable jointly with and under control of said typewriter for selecting one of said registers to be operated and tested, the test being to determine its condition of having or not having registered all of a predetermined number of reservations of space units of a certain group, and means operative in response to said test to cause the typewriter to print one of two notations on a ticket, thereby to show respectively the allotment of a space unit and the rejection of a request therefor.

4. A selector in combination with a telegraphically controlled printing machine, said selector having a plurality of stages of finder switches and a plurality of controlling circuits therefor, each connected to an individual polarity-reversing switch, different character-printing elements of said machine constituting individual means for throwing respective ones of said reversing switches, thereby to control the operation of said finder switches, a plurality of responsive devices individual ones of which are arranged to be selected by said selector, said responsive devices when repeatedly selected having a limited capacity for producing a certain reaction, said devices being also arranged and adapted to produce a different reaction after said capacity is reached, and an answer-back system including two special character-printing elements on said machine, these elements being operable by any selected one of said responsive devices and in accordance with the determination of available or non-available storage capacity of the selected responsive device.

5. A system for making reservations, comprising a plurality of containers individually adjustable to receive a predetermined count of balls for storage therein, a reservoir from which balls are supplied to said containers, magnetic means selectively operable to transfer one ball at a time from said reservoir to a selected container, said means being operable after that container is filled to eject a ball therefrom while a ball is supplied thereto, a device for responding to the passage of a ball into said selected container and a second device for responding to the ejection of a ball from said selected container while disabling the first said device.

6. A system according to claim 5 in combination with a ticket printing apparatus which is provided with a selector operable by the printing apparatus while printing characters on a ticket to control the selection and operation of said magnetic means, said apparatus including character-printing means forming portions of the two said responding devices.

7. A system for moving balls one by one from a reserve channel into a selected one of a plurality of storage holders, each holder having a limited storage capacity and having an outlet for ejection of a ball therefrom whenever a ball is moved into a full holder, said system com-

prising circuit-closing devices operable by the movement of said balls in and out of said holder respectively, and means for preventing a circuit closure by the injected ball operated device when a circuit closure is made by the ejected ball operated device.

8. A system in accordance with claim 7 and including means for changing the capacity of any desired storage holder.

9. A system in accordance with claim 7 and including means for releasing balls one by one from the bottom of each storage holder and for emptying the holder when desired.

10. In a system for issuing tickets corresponding to a predetermined number of space-unit reservations in each of a plurality of space-unit groups, a key-operated printer for typing characters successively on a ticket to be issued, circuits individually controlled by said printer in accordance with the typing of different characters, a plurality of storage elements subject to selection by means utilizing said circuits, said elements constituting means for testing the availability of space-units, each storage element being individual to a different group of space-units, means operative upon the selection and testing of a given storage element to store a token of space-unit reservation and to alter the condition of numerical space-unit representation of said storage element with respect to the remainder of available space-units, a special character-typing mechanism subject to control by said means when its operation is to store a token, and another special character-typing mechanism subject to control by said means when there is no remainder of available space-units, said mechanisms being operative to record on said ticket either that the reservation has been made or that it has been rejected.

11. In a system of the class described, a plurality of space-unit registers each appropriate to a different group of space-units to be reserved, a key-operated machine for typing characters on a strip of tickets to be issued, means including circuit controlling elements operable by said machine during a typing operation for selecting a register corresponding to a group in which a space-unit reservation is requested, as typed on said ticket, means in said register for responding to reservation requests in one of two ways depending upon whether a space-unit is available or not, and special typing mechanism in said machine subject to control by the selected register, when it has responded to a reservation request, for printing on said ticket strip one of two notations which show respectively the allotment of a space-unit and the rejection of a request therefor.

12. In combination, a ticket-issuing typewriter subject to both local and remote control, a plurality of storage elements to be selected, a selector including circuit elements controlled by and in conjunction with the operation of said typewriter during a typing operation for seizing control of a desired storage element in response to a given request for a reservation as typed on a ticket, successive responses being of one character, namely to store a token in the storage element and to test the same for its remainder capacity until a predetermined quota is filled, and subsequent responses being of a different character wherein the number of stored tokens remains unchanged, and means controlled by any seized storage element for causing said typewriter to print one of two appropriate symbols on said

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ticket, thereby to indicate which character of response is made in each case and whether a reservation request is accepted or rejected.

13. A system according to claim 12 in which each of said storage elements includes a pocket for holding a limited number of balls and means for causing a ball from a reserve supply to be injected into said pocket in response to each selection thereof.

14. In combination, a ticket-issuing typewriter subject to both local and remote control, a plurality of storage elements to be selected, said storage elements being constituted as numerical counters which are operable from a predetermined numerical setting subtractively to a zero setting, a selector including circuit elements controlled by and in conjunction with the operation of said typewriter for seizing control of a desired storage element in response to a given request for a reservation as typed on a ticket, successive responses being of one character, namely to drive the counter one step at a time subtractively toward a zero setting until zero is reached, and of a different character, namely to close a "reject" circuit whenever selection of the storage element follows the setting of its counter to zero, and means controlled by any seized storage element for causing said typewriter to print one of two appropriate symbols on said ticket, thereby to indicate which character of response is made in each case and whether a reservation request is accepted or rejected, the last said means including solenoid-operated type keys and actuating circuits therefor, one of said circuits being said "reject" circuit.

15. In combination, a plurality of storage devices, each having a capacity for storing items up to a predetermined numerical limit, a two-way signaling system having terminal equipment at each of two intercommunicating stations, and subject to control by the terminal equipment thereat in response to signals transmitted from the other station, selective means for channeling a signal to any desired one of said devices, said

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signal being intended to effect a plus or minus alteration in the numerical value of the item stored therein, and structure included in each of said devices capable of initiating the proper one of two answer-back signals, one of which signifies that said numerical value has been altered, and the other of which signifies that the item stored in the selected device has reached a numerical limit, the functioning of said structure being automatically initiated upon reception of any one of the first said signals.

16. In a signal transmission and storage system, a station having a plurality of signal storage units for storing the cumulative effects of signals pertaining to different categories of numerical items, means at said station responsive to such signals for selecting and quantitatively controlling a desired storage unit, the effect of each controlling signal being dependent upon the previous quantitative storage condition of the selected storage unit, and means for transmitting a check back signal from said station to another station thereby to report the registration of an increase in the quantity stored in the selected unit in response to said controlling signal, or else to transmit a check back signal to report the failure to produce such a registration due to the prior storage of a quantity in said unit which is of limiting value.

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