Nov. 1, 1966 H. L. LESTER ETAL 3,282,388

TIME CODING MEANS FOR TRANSIT TICKETS

Filed Sept. 18, 1963 2 Sheets-Sheet 1

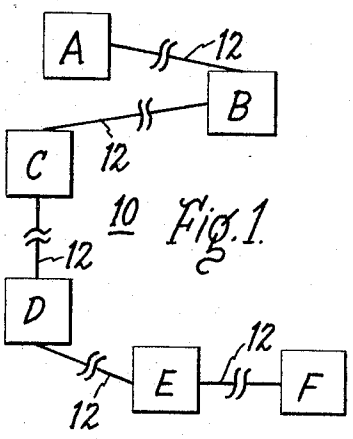


Fig. 1.

Fig. 3.

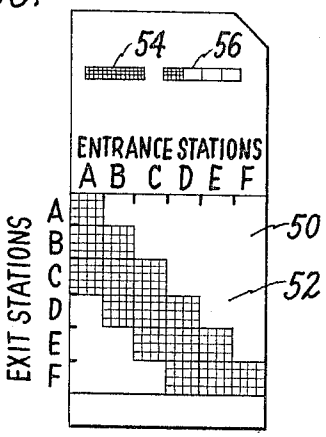
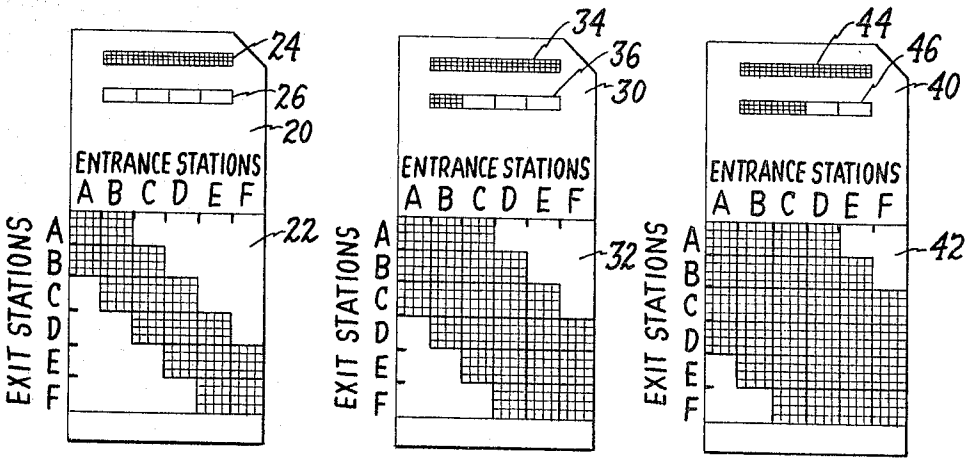


Fig. 2.



Inventors,
Howard L. Lester,
Dallas E. Cain,
by Francis K. Doyle
Their Attorney.

Nov. 1, 1966 H. L. LESTER ET AL 3,282,388

TIME CODING MEANS FOR TRANSIT TICKETS

Filed Sept. 18, 1963 2 Sheets-Sheet 2

Fig. 4.

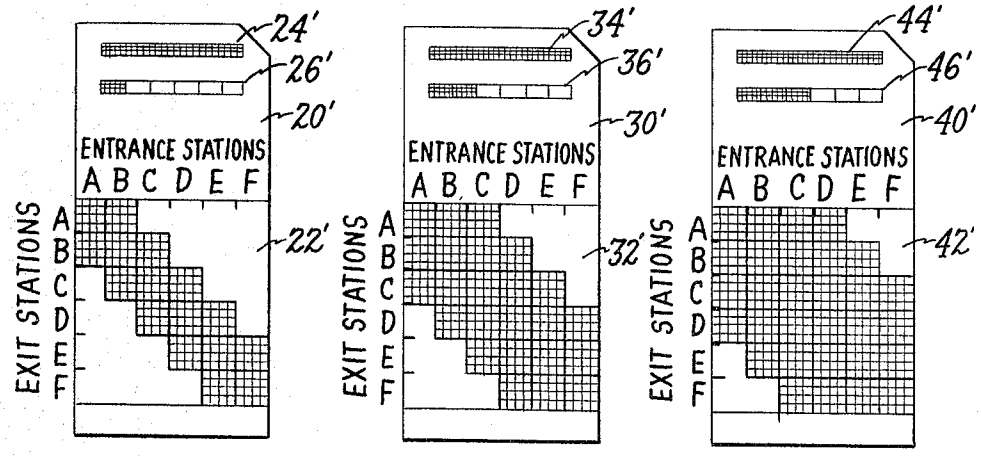
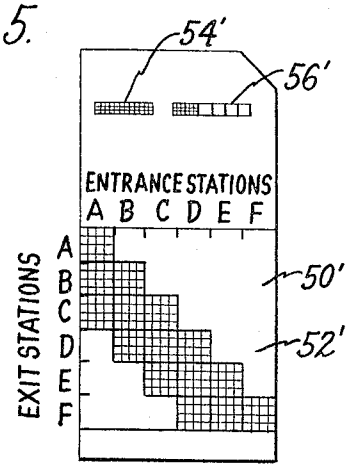


Fig. 5.



Inventors,
Howard L. Lester,
Dallas E. Cain,
by Francis K. Doyle
Their Attorney.

United States Patent Office

3,282,388

Patented Nov. 1, 1966

3,282,388

TIME CODING MEANS FOR TRANSIT TICKETS

Howard L. Lester, Alplaus, and Dallas E. Cain, Scotia, N.Y., assignors to General Electric Company, a corporation of New York

Filed Sept. 18, 1963, Ser. No. 309,730

6 Claims. (Cl. 194—4)

This invention relates to transit tickets for use in automatic fare collection systems and, more particularly, to a time coding means for transit tickets.

Much interest has been expressed in recent years in rapid transit systems for moving a maximum amount of people in a minimum amount of time and space. The interest in these systems is increasing due to the growth of suburban communities surrounding large cities and the necessity of moving people from these communities into and out of such cities, as well as moving the people within the cities. Further, traffic congestion in and around such cities has become an increasing problem, making it necessary to provide for greater use of rapid transit systems.

Most transit systems use either a single fare structure or a zoned fare structure. In a single fare structure the customer may enter the system at any station upon payment of the single fare and may travel to any other station within the system. In a zoned fare structure the customer normally must purchase a special ticket which is generally only usable from the station where purchased to another specified station of the system. Of course, it is understood that many times tickets may be purchased at some central location for use in various stations on the system. The zoned fare structure is more complicated and costly to administer than is the single fare structure because it requires a plurality of tickets, a plurality of offices for issuing such tickets, and transit system personnel, such as conductors, to be certain that a ticket is properly used, that is, that the customer has paid the proper fare for a trip taken.

It has become increasingly evident that there is a need for a zoned fare structure which requires each customer to pay according to his use of the transit system. It is also necessary to provide a zoned fare structure that is easy for the customer to use and which is as automatic as possible. Preferably, it should be similar to a single fare structure in order to reduce the cost of operation as much as possible and to make it as easy as possible for the customer to utilize such transit system.

It has been proposed to provide a transit system using tickets and special types of turnstiles to provide for automatic fare collection of a zoned fare structure. To make the system as simple, reliable and economical as possible, it is proposed to provide a complete fare structure on the tickets thus requiring a minimum amount of logic in the turnstiles of the system. This type of system is described and claimed in Patent application Serial No. 305,101, filed August 28, 1963, now Patent No. 3,212,615, issued October 19, 1965 in the name of Martin W. Hellar for Automatic Fare Collection System for Rapid Transit Systems, and which is assigned to the same assignee as this application. A unique transit ticket, including a complete fare structure code according to the value of the ticket, which may be used in the automatic fare collection system of the Hellar application is disclosed and claimed in patent application Serial No. 305,102, for Transit Ticket Having Fare Coding Means for Automatic Fare Collection Systems, filed August 28, 1963, now abandoned in favor of continuous application Serial No. 516,826, filed November 26, 1965, in the name of Thomas P. Goodman which is assigned to the same assignee as this application. This invention relates to an

improved time coding means which is especially useful in the transit ticket of the Goodman application. As is discussed in the Goodman application, it is desirable to provide a time coding means on transit tickets to provide the necessary system security and to prevent ticket changing and other misuse of tickets in the automatic fare collection system. This application provides a time coding means which may be provided on the transit ticket and which may be readily encoded and decoded by the automatic fare collection system. Further, the time encoding means of this invention provides a simple, economical and reliable time coding means to insure the security of the automatic fare collection system.

The principal object of this invention is to provide a time coding means for a transit ticket.

A further object of this invention is to provide a time coding means for a transit ticket which may be readily encoded and decoded by an automatic fare collection system.

A still further object of this invention is to provide a transit ticket having a time coding means utilizing magnetic material which is simple, reliable and economical to manufacture and use.

Briefly, in one form this invention comprises a transit ticket provided with a time coding means of magnetic material thereon. The time coding means comprises a pair of areas for magnetizable material. One area, which may be a strip or the like, is completely filled with magnetizable material, while the second area contains a number of portions of magnetizable material in accordance with the allowable elapsed time for the permissible trip for which the ticket is issued. The areas of magnetizable material will be readily magnetized for encoding and decoding with time indications by portions of the automatic fare collection system to prevent misuse of the fare collection system.

The invention which is sought to be protected will be particularly pointed out and distinctly claimed in the claims appended hereto. However, it is believed that the invention will be better understood and the manner in which its various objects and advantages are obtained, as well as other objects and advantages thereof, from a consideration of the following description of preferred embodiments thereof, especially when considered in connection with the accompanying drawings, in which:

FIGURE 1 is a diagrammatic showing of a transit system with which the invention finds particular application;

FIGURE 2 is a plan view of one form of ticket showing a preferred form of this invention;

FIGURE 3 is a plan view of a modified ticket showing a modified form of this invention;

FIGURE 4 is a plan view of the form of ticket shown in FIG. 2 showing a further modified form of this invention; and

FIGURE 5 is a plan view of the form of ticket shown in FIG. 3 showing still another form of this invention.

This invention relates to a time coding means for a transit ticket which may be utilized in automatic fare collection on rapid transit systems. The invention will be described with particular reference to a transit system such as shown in FIG. 1 of the drawings, and with reference to a particular type of transit ticket. However, it will be understood that the description is for illustrative purposes only and should not be considered as a limiting feature of the invention.

Considering first FIG. 1, there is shown a diagrammatic view of one form of transit system on which the time coding means of this invention may be used. As shown in FIG. 1, the transit system comprises a plurality of stations indicated as A, B, C, D, E and F which are connected, for example, by a track means 12 which may

be of any length between the various stations. For purposes of description it will be assumed that this system **10** has stations which are so spaced that approximately the same amount of time is required between each of the stations of the system. For example, it will be assumed that under normal circumstances the elapsed time for a normal trip between stations A and B will be approximately ten minutes. Further, for purposes of description it will be assumed that trains run at sufficient frequency such that normally fifteen minutes to twenty minutes elapsed time will be sufficient to go between any two adjacent stations on the system. Thus a normal trip from station A to station B would be completed within a twenty minute period, while a trip from station A to station D would normally be completed in a forty minute period and the trip from station A to station F would normally be completed within sixty minutes.

In considering the system of FIG. 1, and in order to provide for the automatic collection of the required fare between the various stations in the system, an automatic fare collection system such as is set forth in the above-mentioned application Serial No. 305,101 of Martin W. Hellar may be used. Further, the ticket for such fare collection system may be the ticket such as is disclosed in application Serial No. 305,102 now continuation application Serial No. 516,826 of Thomas P. Goodman. The time coding system of this invention will find especial utility with reference to the ticket of the Goodman application when used in the automatic fare collection system of the Hellar application.

FIGURE 2 of this application shows one form of transit ticket utilizing a matrix as set forth in the Goodman application, and being provided with one form of time coding means in accordance with the provisions of this application. The ticket shown in FIG. 2 of the drawings may be used in an automatic fare collection system on a transit system such as that shown in FIG. 1. In FIG. 2 three tickets are shown, each one being identical as far as the outward physical dimensions are concerned. However, each ticket is designated for a different trip on transit system **10** and, therefore, is provided with a different matrix and with a different time coding means. For example, ticket **20** is an example of a minimum fare ticket which may be used between any two adjacent stations on the transit system **10**. Ticket **20** is provided with a fare structure matrix **22** which is specifically coded for the minimum fare ticket. As shown, the matrix **22** comprises a plurality of columns and rows; one column and one row for each station. The matrix as shown is printed with magnetizable ink in the various rows and columns to provide all possible rides on the system **10** for the fare value of the ticket.

The ticket according to the invention will be placed in a slot in an entrance turnstile to gain admission to the transit system **10**. To insure proper orientation of the ticket in the turnstile one edge of the ticket may be cut, in the manner indicated in the drawings. When the ticket is placed in the turnstile slot a magnetic head would be utilized to magnetize all magnetic squares in the column corresponding to the entrance station in the manner set forth in the Goodman application. In using the time encoding means of this invention, when the ticket is placed in the turnstile slot a second magnetizing head will be used to magnetize each of the areas of the time coding means set forth in the invention.

For example, as shown in FIG. 2, on the ticket **20**, the magnetizable areas comprise two strips or rows **24**, **26** which will be used in the time coding means of this invention. The row **24** is indicated as being completely filled with magnetic material, and the row **26** is shown as being divided into four equal portions. According to the invention as shown in FIG. 2, row **24** of magnetizable material will be magnetized by a magnetic head in the automatic turnstile of the automatic collection system. When it is inserted in the slot of the turnstile the magnetizable line **24** will be magnetized with a time code indicating the present time of entry into the transit system plus a specified alapsed time, for example, thirty minutes. Thus the line **24** will be encoded with a time indication which will indicate the present time of entry into the system plus an additional thirty minutes. Thus, if the ticket were presented to the turnstile at 9 A.M. then the line **24** would be coded with an indication of the time 9:30 A.M. For the minimum fare ticket there would be no magnetizable portions in the line **26** inasmuch as for the minimum fare ticket between any two stations on the system the elapsed time set into the line **24** will be sufficient for time between any two stations of the system.

Still considering FIG. 2, there is also shown a ticket indicated at **30** having a matrix **32** which is similarly provided with time code lines **34** and **36**. The ticket **30** as shown is a ticket such as will allow passage on the transit system **10** between any alternate stations in the system, that is, it will allow transit from station A to station C, station B to station D, etc. As shown, the time line **34** is completely filled with magnetic material, while time line **36** is shown as having one of the four portions, such as squares, filled with magnetic material. When the ticket **30** is placed into the entrance turnstile the time line **34** is provided with the present time of entry plus an allowed time of thirty minutes and the one magnetizable square in time line **36** is also magnetized which will indicate a further elapsed time period such as, for example, an additional fifteen minutes. Thus by means of the time line **34** and **36** of ticket **30** the patron will be allowed a total of forty-five minutes to make his trip between any two alternate stations of the system.

In a similar manner the ticket **40** of FIG. 2 being provided with the matrix **42** has time lines **44** and **46**. Again, as previously indicated time line **44** is completely filled with magnetic material while in this instance time line **46** will have two of its squares filled with magnetic material. The ticket **40** is one utilized for a trip between any three stations of the system, that is, between stations A and D, stations B and E, and similar. Thus the time line **44** will provide for an elapsed time of thirty minutes and, additionally, time line **46** will provide two further magnetized squares, each of which indicate an additional elapsed time of fifteen minutes. Thus, the ticket **40** will allow the patron sixty minutes to make his trip between any of the three stations on the system. Clearly, as will be apparent from the above, for trips between stations A to E for example a ticket would be provided in which the second time line had three squares magnetized to allow a total of elapsed time of an hour and fifteen minutes, while for trips from stations A to F the fourth square would be magnetized, allowing a total of elapsed time of an hour and thirty minutes. Thus, as will be apparent from the above by means of the main time line, such as **24**, which provides for the elapsed time between an entrance station and any adjacent exiting station, and the second time line, which is provided with four separate portions which may be provided with magnetizable material, the time lines may provide a simple and reliable indication of the total elapsed time allowed a patron for any given trip within the transit system. Of course, it will be apparent that the time line of the ticket shown in FIG. 2 may be extended as necessary in accordance with the total number of stations in the system. As is shown for example, there are four possible magnetizable squares in the second time line, indicated at **26**, for use in a system having six stations. Obviously, were there ten stations the time line **26** could be provided with a total possibility of eight magnetizable portions, such as squares. Of course, the time element allowed in the main or first time line **24** and the second time line **26** will depend upon the particular distance between the stations of the transit system and the total allowed time believed necessary to allow a patron to comfortably complete any trip for which the fare has been paid.

FIG. 3 of the drawing shows a ticket **50** having a different type of matrix **52** and which is provided with time lines **54** and **56** which are provided in line on the one portion of the ticket rather than being one over the other in the manner disclosed in FIG. 2. Obviously, there will be no difference in the manner of using the time lines **54** and **56**. For example, in FIG. 3 the ticket **50** is indicated as a ticket good between any alternate stations such as, for example, stations A to C. Therefore, as shown, the time line **56** is provided with a single magnetizable square such that when the time line **54** is magnetized with the first elapsed time period and the one magnetic square **56** is magnetized with the additional fifteen minutes then a total elapsed time of forty-five minutes will be provided on the ticket **50** for allowance of a trip between any alternate stations on the system.

Considering now FIG. 4 of the drawings there is shown therein transit tickets utilizing time coding means in accordance with another form of this invention. The tickets shown in FIG. 4 are the same type of ticket as is shown in FIG. 2 and will be provided with the same numbers plus a prime indication. Thus there is shown a ticket **20'** having a matrix **22'** and a pair of time areas, shown as lines **24'** and **26'**. Ticket **20'** is a minimum fare ticket similar to that shown in FIG. 2 and thus only a minimum amount of elapsed time is provided. As earlier indicated, considering that a comfortable trip may be made from stations A to B in any fifteen minute period the time lines **24'** and **26'** are designed to allow a fifteen minute elapsed time for any trip between adjacent stations of the transit system **10**. The time line **24'** which is shown as completely covered with magnetizable material will be provided with a time coded indication of the exact time of entry of the patron into the system. The time line **26'** is provided with six separate squares, each square when filled with magnetizable material and magnetized providing an elapsed time of fifteen minutes for each square. Inasmuch as ticket **20'** is for a trip between adjacent stations which should take no more than fifteen minutes between stations, one square of **26'** is filled with magnetic material. When the ticket **20'** is inserted into the slot of the entrance turnstile time line **24'** will be provided with a time code indication of the actual time of entrance and the single magnetizable square of time line **26** will be magnetized to indicate an allowable time for the trip of fifteen minutes. In a similar manner ticket **30'** provided with the time lines **34'** and **36'** will provide a total elapsed time of thirty minutes since two of the squares of time line **36'** are coated with magnetic material. The ticket **40'** provided with the time lines **44'** and **46'** will allow a total elapsed time of forty-five minutes inasmuch as three of the squares of the time line **46'** are provided with magnetizable material.

FIG. 5 is similar to FIG. 4 in that it utilizes the same type of time coding system. However, as shown here, the ticket is **50'**, inasmuch as it is a similar type ticket to FIG. 3 and is provided with the time lines **54'** and **56'**. As is shown the time line **54'** is the same as the time lines **24'**, **34'** and **44'** and is utilized to indicate the exact time of entry into the system. Time line **56'** is provided with the six magnetizable squares and inasmuch as only two magnetizable squares are filled it will provide a total allowed time of thirty minutes for a trip on the ticket **50'**. Of course, it will be apparent that the time lines **54'** and **56'** are used in the same fashion as the time lines of FIG. 4, the basic difference being that the time lines are placed side-by-side on the card as shown rather than one above the other in the manner of the time lines in FIG. 4.

It will of course be understood that after the ticket has been presented to the entrance turnstile and has been coded with the proper time code, as previously discussed either with reference to FIGS. 2 and 3 or FIGS. 4 and 5, the customer will take his ride between the stations in accordance with the fare that has been paid. At the time of exit the ticket will again be placed into a slot in the exit turnstile and the exit turnstile will compare the time of exit in accordance with the total allowed time for the trip. If the customer has made the trip within the allowed time, and the other requirements of the system have been met, then the patron will be allowed to leave the transit system. The checking of the time can be readily provided by means of comparing the time indicated in the time line **44** or **44'**, for example, against the time of exit. If the times do not compare then the various magnetized squares in the time lines, for example **46** and **46'**, are then added. After the addition of the time indicated by each magnetized square the time then can be compared with the present time and as soon as a coincidence is obtained the comparison will stop. However, should the comparison complete all of the magnetized squares and still not be in coincidence with the present time then it would be apparent that the customer has gone beyond the total elapsed time allowed for the ticket and would not be allowed to exit from the system by means of the main turnstile. As is discussed in the Hellar application, the customer may then be required to go to a special turnstile which would then charge him in accordance with the rules of the automatic fare collection system.

In the previous discussion it has been assumed that the various time areas have been coated with a magnetizable material which will be magnetized by the entrance turnstile. However, it will be apparent to those skilled in this art that a magnetic material could be used that would not require magnetization by the entrance turnstile. For example, considering FIG. 4 and ticket **30'**, it will be apparent that time line **34'** could be of magnetic material which would be properly time coded, such as with the time of entrance, by the entrance turnstile. The time line **36'** could have the indicated portions filled by a magnetic material which would not be affected in any manner by the entrance turnstile. However, the exit turnstile would be able to detect the filled in portions of time line **36'** and add the desired time increments to the time coded in time line **34'**.

While there has been disclosed and described the present preferred embodiments of the time coding means of this invention it will be apparent to those skilled in the art that various changes may be made in the particular embodiments described. For example, the particular areas and portions of the time coding means may be of any shape desired. The time coding may be as to actual hours of the day, or may be of any desired code for indicating elapsed time. Those skilled in this art will readily understand that these and other changes may be made without departing from the scope of the invention, as is set forth in the appended claims.

What is claimed as new and which it is desired to secure by Letters Patent of the United States is:

1. A transit ticket provided with a time coding means comprising: a ticket member; a pair of time areas on said ticket member, one of said time areas being completely coated with magnetizable material, the other of said time areas being divided into parts and each of said parts being coated with magnetizable material according to an allowable time for a trip indicated by the transit ticket.

2. A transit ticket provided with a time coding means comprising: a ticket member; a pair of time areas on said ticket member, one of said time areas being completely coated with magnetizable material, the other of said time areas being divided into parts and each of said parts being coated with magnetic material according to an allowable time for a trip indicated by the ticket, said one area designed to be time coded with a predetermined time with respect to time of use of the ticket and said parts coated with magnetizable material of said other area designed to be time coded with predetermined additional increments of time.

3. A transit ticket having time coding means for use in an automatic fare collectioon system comprising: a ticket member; a pair of time areas on said ticket member, one of said time areas being coated with magnetizable material, the other of said time areas being divided into parts and each of said parts being coated with magnetizable material according to an allowable time for the class of ticket, the magnetizable material being readily encoded and decoded as to time by portions of the automatic fare collection system.

4. A transit ticket having time coding means for use in an automatic fare collectioon system comprising: a ticket member, a pair of time areas on said ticket member, one of said time areas being coated with magnetizable material, the other of said time areas being divided into portions and each of said portions being coated with magnetizable material, according to an allowable time for the class of ticket, said one area designed to be time coded by portions of said automatic fare collection system with a predetermined time with respect to the time of use of said ticket and said portions coated with magnetizable material of said other area designed to be time coded by portions of said automatic fare collection system with predetermined additional increments of time.

5. A transit ticket provided with time coding means comprising: a ticket member; a pair of time areas on said ticket member, one of said time areas being completely coated with magnetic material, the other of said time areas being divided into portions, predetermined ones of said portions being coated with magnetic material according to an allowable time for a trip indicated by the transit ticket.

6. A transit ticket having time coding means for use in an automatic fare collection system comprising: a ticket member; a pair of time areas on said ticket member, one of said time areas being coated with magnetic material, the other of said time areas being divided into portions, predetermined ones of said portions being coated with magnetic material according to an allowable time for the class of ticket, said one area being designed to be time coded by portions of the automatic fare collection system with a time code indicative of the time of use of said ticket and said predetermined ones of said portions of said other area providing an indication of increments of time additional to said time code indicative of the time of use.

References Cited by the Examiner

UNITED STATES PATENTS

2,754,496	7/1956	Embry et al.	
2,794,864	6/1957	Noregaard	194—4
2,906,505	9/1959	Orr et al.	194—4

FOREIGN PATENTS

1,098,165	1/1954	France.

EVON C. BLUNK, *Primary Examiner.*

SAMUEL F. COLEMAN, *Examiner.*

H. C. HORNSBY, *Assistant Examiner.*