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(54) **SYSTEM FOR URBAN TRANSPORT, IN PARTICULAR BY UNDERGROUND RAILWAY**

SYSTEM FÜR DEN ÖFFENTLICHEN NAHVERKEHR, INSBESONDERE U-BAHN

SYSTEME POUR TRANSPORT URBAIN, NOTAMMENT PAR METROPOLITAIN

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Description

[0001] The invention relates to a system for urban transport which is capable of serving an area of urban settlement of relatively limited extent. Such a system is known from US-A-3,722,427.

[0002] One aim of the invention is the creation of a system which is easy and economical to create and easy and economical to run, even without the need for operating personnel in the carriages and with a limited need for supervision on the ground. The hourly flow of passengers can be high and the journey times for the passengers relatively limited. These and other aims and advantages will become clear from the following text.

[0003] To this purpose, the system for urban transport according to the invention comprises all the features of Claim 1.

[0004] The annular circuits can be excavated at great depth and preferably all at the same level; the stations will be equipped with lifts to reach the outside surface in addition to service and emergency stairs.

[0005] The shape of the annular circuits, the number of trains circulating in each circuit, the times and the speeds of the journeys in the various annular circuits will be arranged so as to make coincide the stops of the trains in the stations with tracks side by side, for rapid transfer on the part of the travellers. Even the trains will be proportioned for frequency and for capacity according to the traffic load in the respective annular circuit.

[0006] The trains circulating in operation can be automated without the presence of driving personnel.

[0007] In relation to the journey frequency and to the brevity of the stay in each circuit, the annular circuits can be arranged in tunnels of limited diametral dimensions, of the order of 4 metres.

[0008] The invention will be better understood following the description and the attached drawing which shows a non-limiting exemplary embodiment of the invention itself. In the drawing:

Fig. 1 shows a diagram of four annular circuits;
Fig. 2 shows in cross-section a comparative diagram of the dimensions of tunnels for underground railways;
Figs 3 and 4 show a plan view of a station with tracks side by side and a local section along IV-IV in Fig. 3.

[0009] In Fig. 1, a sequence of polygons A, B, C and D is illustrated, each of which represents the single track of an annular circuit, at the vertices of which stopping stations generally indicated by S are symbolized. At least one of the stations of each circuit is common to a station of an adjacent circuit and is a double station indicated by SD.

[0010] The distances between adjacent stations S is equal to the sum of the radii of circles CE, each of which represents a surface which can be reached by a convenient limited journey on foot from the station S or SD which is located at the centre of the circle; the various circles can be tangential. Considering circuit B which comprises six stations, two of which are double SD, in practice a wide area surrounding the annular route B is covered by the limited journey on foot and; by an extended limited journey it is possible to reach the intermediate area inside the polygon B also.

[0011] In each of the routes A, B, C, D, one or more trains circulate always in the same direction and with suitable frequency; the various trains will have a number of carriages and in any case a capacity which is proportioned to the traffic requirements of the area served by the annular track in question. The traffic in the various annular circuits such as A, B, C, D is synchronized in such a manner that a train of each of the two annular circuits having a station SD in common stops simultaneously in the station SD in question. Considering Fig. 3 which can for example be the station SD in which the circuits B and C are tangential, the stopping of the trains such as those 10 and 11 takes place on the two sides of a common platform 13 which can be transited by passengers who are leaving a train, who are boarding a train, who are passing from one train to the other (that is to say from the train 10 to the train 11 or vice versa), who are arriving at the station, and who are leaving the station making use of lifts such as those indicated by 15 and 17. The lifts serve for movement between the outside and the platform 13. Service and emergency stairs such as 19 will also be provided.

[0012] The frequency of the journeys in each annular route will be relatively high and in each period of the day proportioned to the requirements of the areas served by each route. In each case, the frequency can also be very high while the dimensions of the individual vehicles can be relatively limited.

[0013] In Fig. 4, a station is shown in section such as that of which the platform is indicated by 13, which extends to the track 20, on which the outline of a carriage 22 is shown in Fig. 4.

[0014] The tunnel 24 can have a circular section of a relatively very limited diameter, for example even of the order of 4 metres. Each carriage 22 can have a profile in section which is in part circular and generally contained in a circular segment with a base 22A (according to the mathematical definition), the base being orientated vertically and the segment also including the centre. The vertical base 22A can easily form wide openings for the entry and exit of the travellers; in front of the wall 22A, a row of seats 25 can be arranged, which does not constitute an obstacle to the movements of the passengers on foot on the floor 22B of the carriage. The movements on entry and exit are very easy as a result of the breadth which can be imparted to the openings formed in the wall 22A and which will be equipped with automatically operable doors.

[0015] The size in section of a tunnel such as 24 can be very much smaller in relation to the dimensions of tunnels which are currently provided, such as a conven-

tional underground railway tunnel which is indicated for comparison by 26 and of a diameter of the order of 9 metres, and also an underground railway tunnel of new design indicated by 28 which is also double track and of a diameter of the order of 6.5 metres. The saving in cost and the ease of making a tunnel such as that indicated by 24 allow extremely rapid and economical design and implementation of the works.

Claims

1. A system for urban transport, in particular by underground railway, including a plurality of circuits (A, B, C, D) with respective tracks (20), and a plurality of stations (SD, S) arranged along the route of each circuit, wherein:

   - each circuit is tangential to at least one adjacent circuit and does not cross the other circuits of the system,
   - said circuits (A, B, C, D) are independent of one another,
   - in correspondence of the point where two circuits are tangent to one another a common station (SD) is provided,

   characterized in that:

   - said circuits are one way annular circuits,
   - at least one train (10, 11) is provided for each of said circuits, each train circulating always in the same direction and along its respective circuit,
   - in said common station the tracks (20) of the two mutually tangent circuits are arranged side by side, an intermediate platform being provided between said tracks,
   - and a plurality of further stations are arranged along each circuit in addition to said common station(s).

2. System for urban transport according to Claim 1, in which the annular circuits (A, B, C, D) are excavated at great depth and the stations (S, SD) are equipped with lifts (15, 17) to reach the outside surface.

3. System according to Claim 1 or 2, in which the shape of the annular circuits (A, B, C, D), the number of trains (10) circulating in each circuit, the times and the speeds of the journeys in the various annular circuits are arranged so as to make coincide the stops of the trains in the common stations (SD) with tracks side by side, for rapid transfer on the part of the travelers.

4. System according to Claim 1 or 2 or 3, in which the trains (10) are proportioned for frequency and for capacity according to the traffic load in the respective annular circuit.

5. System according to at least one of the preceding claims, in which the annular circuits (A, B, C, D) are arranged in tunnels (24) of diametral dimensions of the order of 4 metres.

Patentansprüche

1. System für städtischen Transport, insbesondere durch Untergrundbahn, das eine Mehrzahl von Reisestrecken (A, B, C, D) mit entsprechenden Schienen (20) und eine Mehrzahl von Stationen (SD, S) einschließt, die entlang der Strecke jeder Reisestrecke angeordnet sind, wobei:

   - jede Reisestrecke tangential zu wenigstens einer benachbarten Reisestrecke ist und die anderen Reisestrecken des Systems nicht kreuzt,
   - die Reisestrecken (A, B, C, D) voneinander unabhängig sind,
   - entsprechend dem Punkt, wo zwei Reisestrekken tangential miteinander sind, eine gemeinsame Station (SD) vorgesehen ist,

   dadurch gekennzeichnet, dass:

   - die Reisestrecken ringförmige Einbahnreisestrecken sind,
   - wenigstens ein Zug (10, 11) für jede der Reisestrecken vorgesehen ist, wobei jeder Zug immer in derselben Richtung und entlang seiner entsprechenden Reisestrecke zirkuliert,
   - in der gemeinsamen Station die Schienen (20) der beiden zueinander tangentialen Reisestrecken Seite an Seite angeordnet sind, wobei eine Zwischenplattform zwischen den Schienen vorgesehen ist,
   - und eine Mehrzahl von weiteren Stationen entlang jeder Reisestrecke zusätzlich zu der gemeinsamen Station oder den gemeinsamen Stationen angeordnet ist.

2. System für städtischen Transport nach Anspruch 1, bei dem die ringförmigen Reisestrecken (A, B, C, D) in großer Tiefe ausgeschachtet sind und die Stationen (S, SD) mit Aufzügen (15, 17) ausgerüstet sind, um die Oberfläche außen zu erreichen.

3. System nach Anspruch 1 oder 2, in dem die Form der ringförmigen Reisestrecken (A, B, C, D), die An-

zahl von Zügen (10), die in jeder Reisestrecke zirkulieren, die Reisezeiten und Reisegeschwindigkeiten in den verschiedenen ringförmigen Reisestrecken so ausgebildet sind, dass die Stops der Züge in den gemeinsamen Stationen (SD) mit nebeneinander angeordneten Schienen für schnelles Umsteigen auf Seiten der Reisenden zusammenfallen.

4. System nach Anspruch 1 oder 2 oder 3, bei dem die Züge (10) für Frequenz und Kapazität entsprechend der Verkehrslast in der entsprechenden ringförmigen Reisestrecke bemessen sind.

5. System nach wenigstens einem der vorangehenden Ansprüche, bei dem die ringförmigen Reisestrecken (A, B, C, D) in Tunneln (24) mit Durchmesserabmessungen der Größenordnung von 4 Metern angeordnet sind.

Revendications

1. Système de transport urbain, en particulier par réseau ferroviaire souterrain, comprenant une pluralité de circuits (A, B, C, D) ayant des voies respectives (20) et une pluralité de stations (SD, S) agencées le long du trajet de chaque circuit, dans lequel :

- chaque circuit est tangent à au moins un circuit adjacent et ne croise pas les autres circuits du système ;
- lesdits circuits (A, B, C, D) sont indépendants l'un de l'autre ;
- une station commune (SD) est prévue à un endroit correspondant au point auquel deux circuits sont tangents l'un à l'autre ;

caractérisé en ce que :

- lesdits circuits sont des circuits annulaires à sens unique ;
- au moins un train (10, 11) est prévu pour chacun desdits circuits, chaque train circulant toujours dans la même direction et le long de son circuit respectif ;
- dans ladite station commune, les voies (20) de deux circuits mutuellement tangents sont agencées côte à côte, une plate-forme intermédiaire étant prévue entre lesdites voies ;
- et une pluralité de stations complémentaires sont agencées le long de chaque circuit en complément à ladite ou auxdites stations communes.

2. Système de transport urbain selon la revendication 1, dans lequel les circuits annulaires (A, B, C, D) sont creusés à une grande profondeur et les stations (S, SD) sont équipées d'ascenseurs (15, 17) pour atteindre la surface extérieure.

3. Système selon l'une quelconque des revendications 1 ou 2, dans lequel la forme des circuits annulaires (A, B, C, D), le nombre de trains (10) circulant dans chaque circuit, les délais et les vitesses des déplacements dans les différents circuits annulaires seront déterminés de façon à faire coïncider les arrêts des trains dans les stations communes (SD) ayant des voies côte à côte, aux fins d'un transfert rapide de la part des voyageurs.

4. Système selon l'une quelconque des revendications 1, 2 ou 3, dans lequel les trains (10) sont proportionnés en termes de fréquence et de capacité en fonction de la charge de trafic dans le circuit annulaire respectif.

5. Système selon l'une quelconque des revendications précédentes, dans lequel les circuits annulaires (A, B, C, D) sont agencés dans des tunnels (24) de dimensions de diamètre de l'ordre de 4 mètres.

Fig. 1

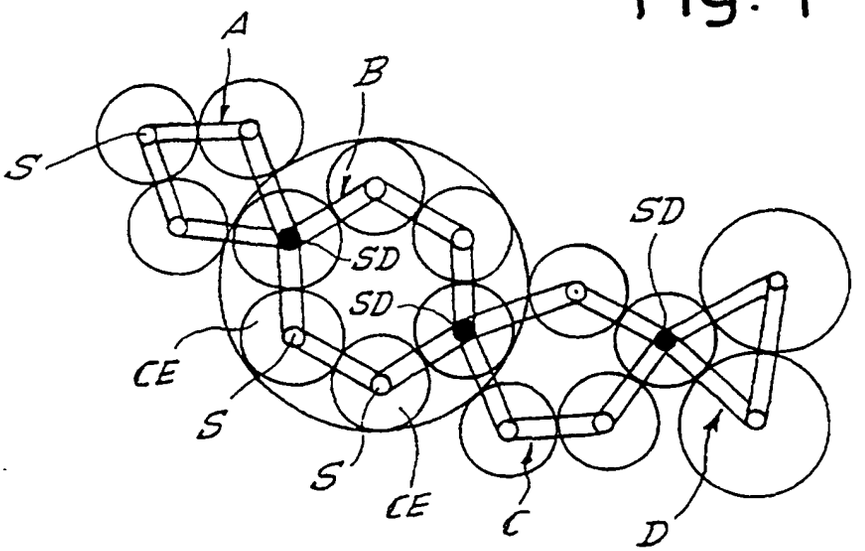


Fig.2

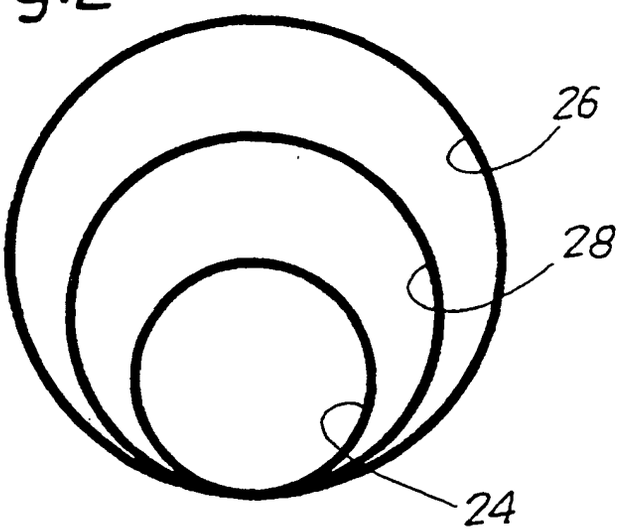


Fig.3

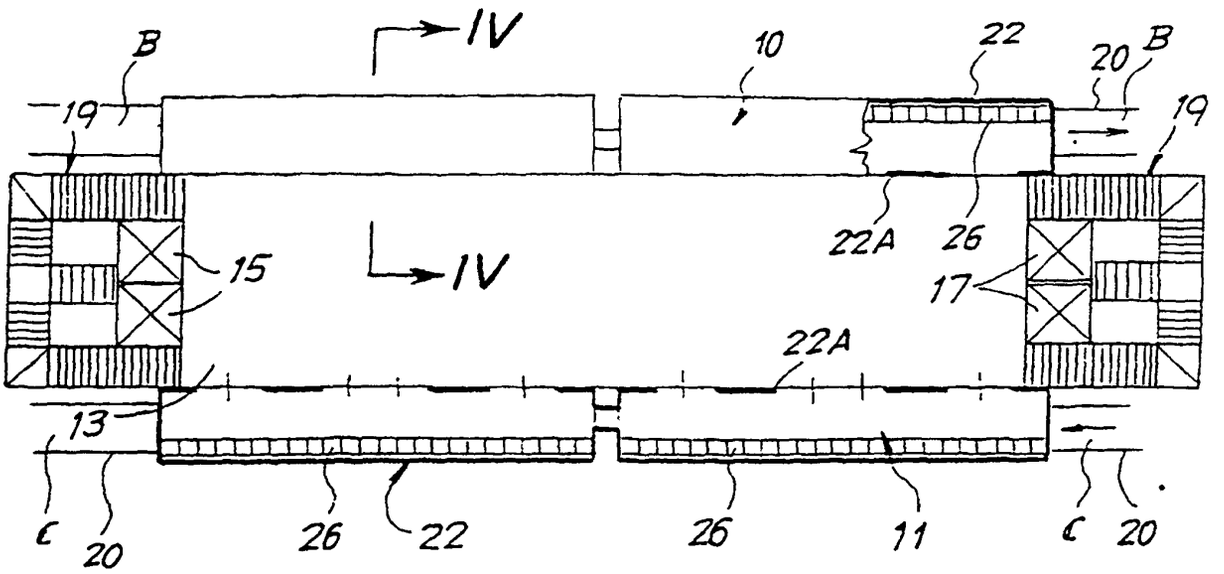
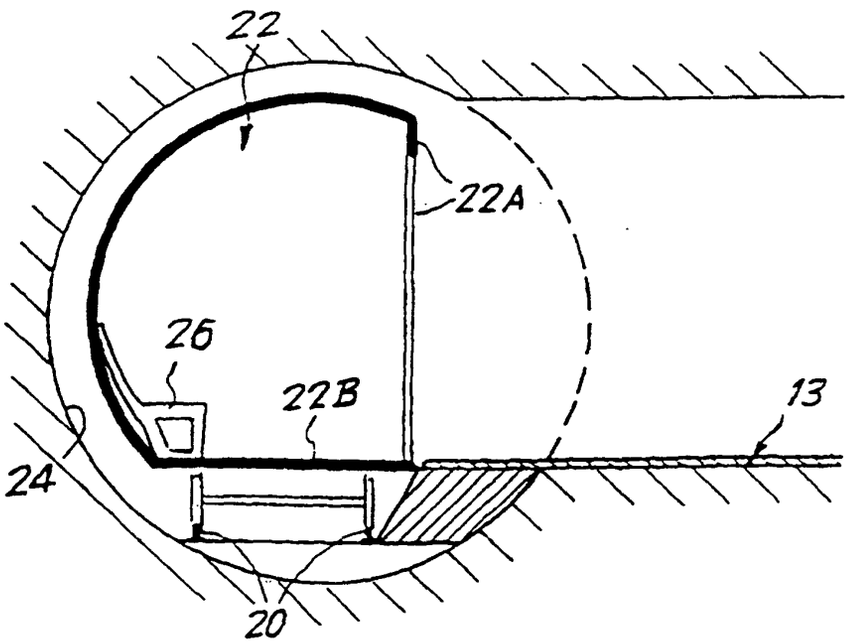

B
IV
10
22
20
B
19
19
15
IV
22A
26
17
22A
13
C
20
26
22
26
11
C
20

Fig.4


22
22A
26
22B
13
24
20