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B7L LMB L24 L62

(56) Documents Cited:
GB 1372255 A **AU 000690378 B**
JP 200164660 A **US 4184792 A**
US 4023500 A **US 3999487 A**
US 1813625 A

(58) Field of Search:
UK CL (Edition X) **B7L**
INT CL **B61B**
Other: **ONLINE WPI EPODOC**

(54) Abstract Title: **Tube railway**

(57) Passenger/freight vehicles 1 are driven through a large diameter tube 2, enclosing the complete vehicles, by means of an air drive system, supplied by ground based, large volume flow air fans 3, causing a negative pressure in front and a positive pressure behind the vehicles thus inducing a thrust to impel the vehicles in the direction of the negative pressure. Seals of low friction compressible material, between the vehicles and the tube ensure a minimum loss of air pressure.

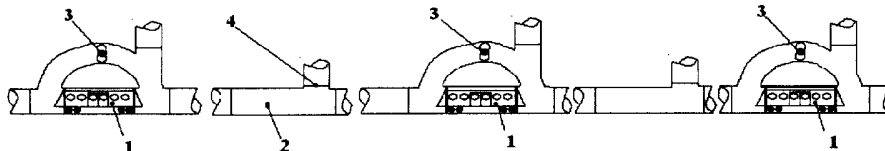


Fig.3

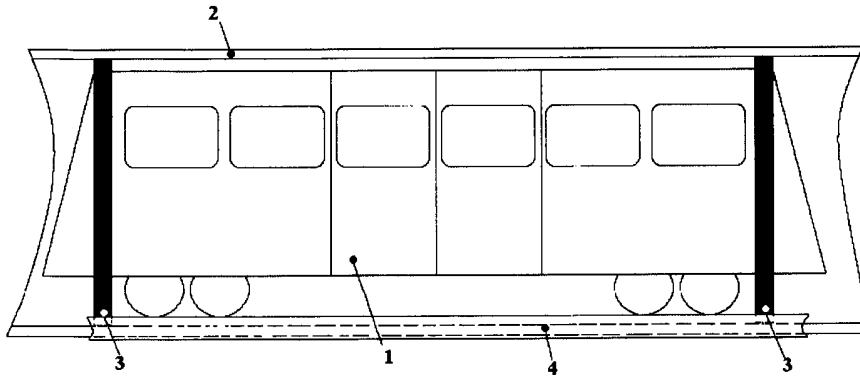


Fig.1.

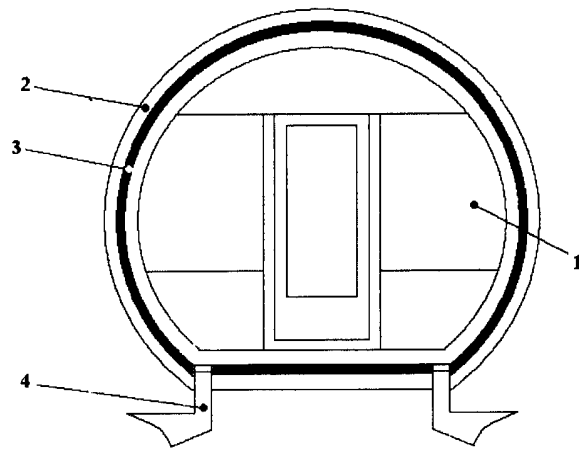


Fig.2.

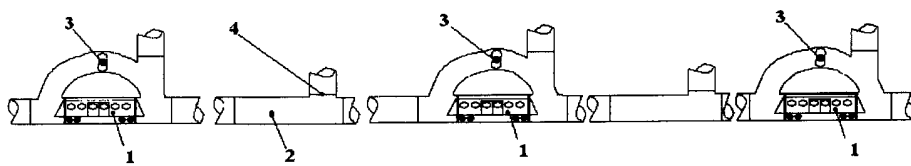


Fig.3

Application for grant of a patent.**Pneumatic thrust system****(01)**

This invention relates to a pneumatic thrust system to propel a passenger/freight-carrying vehicle through a large diameter tube enclosing the complete vehicle.

(02)

The principle of this invention was suggested in the early part of the 19thC and several trials were conducted in the UK and USA. A commercial system was successfully operated, as an elevated railway (EL), in New York (NY), but suffered the fate of all NY ELS. The trial and EL systems were popular with the travelling public.

A related system, entitled "The atmospheric railway", regarding which, Robert Stephenson coined the phrase "A rope of air", was conceived contemporaneously, employing a piston, moved by a partial vacuum/atmospheric pressure, connected to a carriage by an arm, attached to the piston, via a slot in the top of a tube beneath the carriage. The slot was sealed by a leather seal reinforced with metal plates, called the "Longitudinal valve". It was vulnerable to extremes of weather (rain, snow & ice) and to gravel and debris. This gave one of the numerous problems causing breakdowns leading to the closure of the major lines then operating. Robert Stephenson referred to it as "the prominent imperfection".

The fully enclosed system, because it was enclosed, did not, it seems, have the same sort of problems, at least none have been mentioned in the literature studied. At least two of the trial vehicles did not have seals but were simply a close fit in the tube.

(03)

The invention described here provides a means of driving a passenger/freight vehicle through a large diameter tube, enclosing the complete vehicle, by means of an air drive system, supplied by ground based, large volume flow air fans, causing a negative pressure in front and a positive pressure behind the vehicle, thus inducing a thrust to impel the vehicle in the direction of the negative pressure. The positive pressure may be derived from the ambient atmosphere by appropriate positioning of gate valves. Seals, of low friction compressible material, between the vehicle and the tube ensure a minimum loss of air pressure.

A number of electric motor driven fans, housed in the support system, or adjacent buildings would be utilised to provide redundancy so as to allow replacement and maintenance without interruption of service. This facility and the fact that there is no on board power plant, except those required for braking and lighting, subject to the shock loads and vibration of vehicle motion, increases the reliability of the system.

Application for grant of a patent.Continued

Pneumatic thrust system

(4)

Operational control is effected by varying the rotational speed and direction of rotation of the electric motors driving the fans and positioning of gate valves which control the flow of air within the tube and to and from the atmosphere. Fine positioning at passenger stops would be by auxiliary fans or an electro-mechanical device coupled temporarily to the vehicle.

The system may be operated in a similar fashion to that of a bus service within a town or City or as a commuter service directly into the town or City or to a railway station. In the latter case lines could radiate from there by changing to another tube by means of a flexible tube or an electro-mechanical device as described.

The system can be operated as an overhead, over pavements, railways or road ways, under ground, either deep tunnel or cut and cover, or at ground level. It can also operate under water.

As an overhead system, it can be arranged so as to pass close to or, since it is quiet and non-polluting, through commercial premises at an upper level, to allow passenger movement and in operating above other traffic it is safe, uninterrupted and relieves traffic congestion. The supports can be of gantry or single column cantilever arrangements using support from buildings where possible.

Standard vehicle configurations, such as that of the London Transport (LT) Underground tube carriages or single decker LT buses, may be used or something similar of lighter, perhaps a cylindrical shape, of aircraft construction. The bogies may have standard metal wheels or solid rubber or standard pneumatic tyred wheels running on standard rail or track above or beneath the vehicle.

The tube may conform to the shape of the vehicle or also be of a cylindrical shape and lightweight construction. Stresses due to the air pressure in the tube would be low, since the air pressure is low; a maximum during acceleration of $7,200\text{N/m}^2$ above atmospheric.

The configuration is not limited to these arrangements and the invention may be satisfied by any other type of vehicle and tube arrangement having the same principle of operation.

(05)

Wheel brakes would be operated pneumatically or hydraulically from compressors or hydraulic pumps driven by the wheels. Alternators or generators would be driven in the same way.

Application for grant of a patent.Continued

Pneumatic thrust system

(6)

The principles of the invention are embodied in the accompanying drawings in which:

Figure 1 shows a side view of the vehicle in the tube(sectioned).

Figure 2 shows an end view of the vehicle in the tube.

Figure 3 shows a schematic of the system.

Referring to Figure 1, the vehicle 1 is shown in the tube 2 with seals 3 between the tube and the vehicle. The tube meets the sides of the rails 4 and continues between the rails Figure 2 as does the seal 3 Figure 2.

The vehicle 1 Figure 2 incorporates an end door for passenger evacuation in emergency.

Figure 3 shows three vehicles 1 positioned in the tube 2 at points where there are fans 3, approximately three kilometres apart. Assuming that the direction of motion is to the left of the page, then to move the vehicles in that direction, the gate valves 4 to the left of the vehicles are opened and the fans 3 are operated so that air flows in a clockwise direction in the curved duct into the space at the rear (right hand end) of the vehicles thus moving them to the left. By sequential opening and closing of the gate valves,so that air is exhausted to and inhaled from the atmosphere, the vehicles are propelled along the tube and stopped at the fan stations and intermediate passenger stops.

Alternatively, in the case where vehicles are occupying every other pumping station, the alternate gate valves, adjacent to the fans, may be opened to the atmosphere, the adjacent fan left idle, the tube gate valves down stream of the vehicle opened and the downstream fan operated applying a suction at the front of the vehicle thus acting as an “atmospheric system”.

Application for grant of a patent.Continued

Pneumatic thrust system

Claims

1 a means of driving a passenger/freight vehicle through a large diameter tube, enclosing the complete vehicle, by means of an air drive system, supplied by ground based, large volume flow air fans, causing a negative pressure in front and a positive pressure behind the vehicle, thus inducing a thrust to impel the vehicle in the direction of the negative pressure. The positive pressure may be derived from the ambient atmosphere by appropriate positioning of gate valves. Seals, of low friction compressible material, between the vehicle and the tube ensure a minimum loss of air pressure.

2 A means of driving a passenger/freight vehicle through a large diameter tube as claimed in Claim 1 wherein a number of electric motor driven fans, housed in the support system, or adjacent buildings would be utilised to provide redundancy so as to allow replacement and maintenance without interruption of service. This facility and the fact that there is no on board power plant, except those required for braking and lighting, subject to the shock loads and vibration of vehicle motion, increases the reliability of the system.

3 A means of driving a passenger/freight vehicle through a large diameter tube as claimed in Claim 1 or claim 2, wherein operational control is effected by varying the rotational speed and direction of rotation of the electric motors driving the fans and positioning of gate valves which control the flow of air within the tube and to and from the atmosphere. Fine positioning at passenger stops would be by auxiliary fans or an electro-mechanical device coupled temporarily to the vehicle.

4 A means of driving a passenger/freight vehicle through a large diameter tube as claimed in Claim 1 or claims 2 &3, wherein the system may be operated in a similar fashion to that of a bus service within a town or City or as a commuter service directly into the town or City or to a railway station. In the latter case lines could radiate from there by changing to another tube by means of a flexible tube or an electro-mechanical device as described.

The system can be operated as an overhead, over pavements, railways or road ways, under ground, either deep tunnel or cut and cover, or at ground level. It can also operate under water.

As an overhead system, it can be arranged so as to pass close to or, since it is quiet and non-polluting, through commercial premises at an upper level, to allow passenger movement and in operating above other traffic it is safe, uninterrupted and relieves traffic congestion. The supports can be of gantry or single column cantilever arrangements using support from buildings where possible.

Application No: GB0424409.1

Examiner: Roger Binding

Claims searched: 1-4

Date of search: 20 February 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-4	AU 690378 B (HUTTER), see whole document.
X	1-4	GB 1372255 A (GEORGIA TECH), see whole document.
&	1-4	JP 20164660 A (SHIMADA), see abstract and drawings.
X	1-4	US 4184792 A (TURNBO), see whole document.
X	1-4	US 4023500 A (DIGGS), see whole document.
X	1-4	US 3999487 A (VALVERDE), see whole document.
X	1-4	US 1813625 A (KNOX), see whole document.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

B7L

Worldwide search of patent documents classified in the following areas of the IPC

B61B

The following online and other databases have been used in the preparation of this search report



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Online WPI EPODOC