

## Key Patents

*Our VacTrain® Technology is protected by patents in all relevant countries of the World. They cover the larger part of the Global Market by GDP and by Population (USA, EU, Switzerland, China, India, Russia, Australia, Japan, Korea, Brazil, etc.). They protect the components critical for the safe and efficient operation of the VacTrain® and all other vacuum-trains.*

*The official patent papers were published by the World Intellectual Property Organisation (WIPO), the European Patent Office (EPO), the Swiss Patent Office (IPI), and other national patent offices. They can be accessed with the links provided below and on the Websites of the WIPO, EPO, IPI, Google Patents, Patent Guru, and with similar data banks on the internet.*

**The VacTrain® Switch facilitates Networks spanning whole Countries and Continents.** It is analogue the railway switch. It allows a so-called “Drive-through Operation” and very high average travel speeds. Some alternative “solutions” demand a so-called “Stop and Go Operation”. The Trip is interrupted with a Stop and/or actions at the Switch/Station. The average travel speed falls figuratively to sub-zero levels (slower than by Rail and Road).

**The VacTrain® Airlocks allow quick and safe boarding at Stations despite the Vacuum.** The VacTrain® and all other vacuum-trains require a so-called vacuum-gap between the vehicle and the wall of the tunnels or pipes in which they travel. This space is “filled” with a vacuum. The air in it is evacuated by vacuum pumps. VacTrain® Airlocks allow passengers to cross this vacuum gap to enter and exit the vehicle at stations quickly and safely. They are as comfortable as walking through an open sliding door in a building. The opening and closing take around 22 Seconds. In contrast, the “solutions” of some competitors demand that the vehicle wait a very long time at the station to re-establish the vacuum in the tunnels or pipes before departure.

**VacTrain® cross-section Seals are a safety feature.** They are used in VacTrain® networks to seal off select lengths of tunnels so that they can be flooded with ambient air to avert danger in relevant emergencies and for maintenance. They are positioned before and after switches and stations. They are also positioned at strategic locations on long tracks so that a short length of track designed as an emergency station can be isolated and re-pressurised with air in emergencies. The objective here is to minimise the time required for a vehicle to reach such a station and evacuate the passengers safely in emergencies (earthquakes, pressure loss, terrorism, etc.). The seals can be pierced by a vehicle without causing harm to passengers.

**VacTrain® Tunnels are vacuum compatible.** They have an internal lining consisting of vacuum compatible bi-metal sheets and can hold the vacuum pressure for an infinite length of time. The sheets are anchored into the concrete wall of the tunnel (tubbings) to prevent delamination. They function as a so-called “lost mould” for the tubbings during construction. Concrete is porous and the vapour in the tunnel walls will thus exert a pressure of around 1.0 Bar on the bi-metal sheets. The anchoring in the concrete prevents them from peeling off.

**1. Point Switch and Railway Network comprising at least one Point Switch of said type.**

International Patent registered Feb. 20<sup>th</sup>, 2017. Publication WO 2017/143463.

<https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2017143463>

<b>Country / Region</b>	<b>Patent Number</b>	<b>Status</b>
European Patent	No. EP 3 384 089 B1	Granted
United States Patent	No. US 10,947,676 B2	Granted
Chinese Patent	No. CN 108699778 B	Granted
Russian Patent	No. RU 2 722 347 C2	Granted
Japanese Patent	No. JP 6974327	Granted
Brazilian Patent	No. BR 112018014428-2	Granted
Australian Patent	No. AU 2017222718 B2	Granted
Canadian Patent	No. CA 3010525 B1	Pending
Indian Patent	No. IN 201817024360	Pending
Korean Patent	No. KR 20180113507	Pending

**2. Door System for a Vacuum Train.**

International Patent registered Sept. 15<sup>th</sup>, 2017. Publication WO 2019/052656

<https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2019052656>

<b>Country / Region</b>	<b>Patent Number</b>	<b>Status</b>
European Patent	No. EP 3 672 857 B1	Granted
United States Patent	No. US 11,492,018 B 2	Granted
Chinese Patent	No. CN 111051176 A	Granted
Australian Patent	No. AU 2017431376 A1	Pending
Canadian Patent	No. CA3075551 A1	Pending

**3. “Rohrleitung für ein im Vakuum verkehrendes Verkehrsmittel”**

Swiss Patent registered June 7<sup>th</sup> 2016

<https://www.swissreg.ch/srclient/en/pat/CH712559>

<https://www.swissreg.ch/srclient/loadPatDocPdf/462E606E756AD0A6C9D3344CC64221BAE81A01AC>

<b>Country / Region</b>	<b>Patent Number</b>	<b>Status</b>
Swiss Patent	No. CH 712559 B1	Granted

**4. “Verfahren zur temporären Unterteilung eines als Verkehrsweg dienenden Tunnels oder Rohrs in voneinander getrennte Abschnitte.”**

Swiss Patent registered May 15<sup>th</sup> 2017

<https://www.swissreg.ch/srclient/en/pat/CH713770>

<https://www.swissreg.ch/srclient/loadPatDocPdf/1D38C7776DF06C7554219458A14443752B3C29DE>

<b>Country / Region</b>	<b>Patent Number</b>	<b>Status</b>
Swiss Patent	No. CH 713770 B1	Granted

The Trademark “**VacTrain®**” was successfully registered in all relevant Countries of the World.

<https://branddb.wipo.int/en/brand/WO500000001367149>