# IP Landscape

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# 1 Patent Landscape Analysis

# 2 Project Overview

## 2.1 Project Details

## 2.2 Inspiration

## 2.3 Intended Market

## 2.4 Safety and Ethical Considerations

## 2.5 Market Competition

## 2.6 Design Requirements

# 3 HEVCS Key Constituent Parts

# 4 Patent Research

## 4.1 Under Vehicle Technology

## 4.2 Breakaway Connectors

### 4.2.1 Search Strategies

**Strategy 1**

Using the advanced search functionality of espacenet to filter results based on a search terms inclusion in just the title, the phrase “magnetic” and “break away” was used and returned a single patent. Similar combinations with less strict filters returned more results, with “parallel” AND “cable” AND “magnetic” returning 29 results.

**Strategy 2**

An alternate strategy was attempted, by placing emphasis on the break-away/pull-apart functionality of the connector. This led to the following results:

| Search Term | No. of Results |
|---|---|
| ti = “magnetic” AND (ti any “break away” OR ti any “pull apart”) | 508 |
| ti = “magnetic” AND (ti any “break away” OR ti any “pull apart”) AND ti = “Connector” | 5 |
| ti = “magnetic” AND (ti any “break away” OR ti any “pull apart”) AND ti = “Connector” AND (ctxt = “electrical” OR ctxt = “electronic”) | 2 |

Table 1: Breakaway Connector Search Terms 1

Of the two patents found at the conclusion of this search strategy, only one had relevance to the project. Despite use of logic OR statements to look for synonyms and word variants, this search strategy was overly specialised and too narrow. To remedy this, a third strategy was employed.

**Strategy 3**

| Search Term | No. of Results |
|---|---|
| ti = “magnetic” AND ti = “Connector” AND (ti = “electrical” OR ti = “electronic”) | 149 |
| ti = “magnetic” AND (ti = “Connector” OR ti = “Socket”) AND ti = “parallel” | 2 |
| ti = “magnetic” AND (ti = “Connector” OR ti = “Socket”) AND (ti = “parallel” OR ti = “data”) | 25 |
| (ti = “magnetic” AND (ti = “Connector” OR ti = “Socket”) AND (ti = “parallel” OR ti = “data”)) NOT ctxt = “power” | 22 |
| (ti = “magnetic” AND (ti = “Connector” OR ti = “Socket”) AND (ti = “parallel” OR ti = “data”)) NOT (ctxt = “power” OR ctxt = “USB”) | 16 |

Table 2: Breakaway Connector Search Terms 1

### 4.2.2 Patent 1 - Variable Magnetic Break-away Mounting Mechanism

| | |
|---|---|
| Patent Number | US9221397B1 |
| Applicants | Google Inc [US] |
| Status | Active |
| Application Date/Publish Date | 2014-10-29 / 2014-05-07 |
| Active Jurisdictions | US |

Table 3: Patent information

**Claim 1**

Claim 1 describes a magnetic coupling system that utilises two round connectors with a magnetic element in the centre. One connector is concave, the other is convex, and so the two halves fit together, held in-place by the magnet. Each half can spin independently of the other, as the single magnet provides no rotational locking. Whilst the magnetic break away connector that HEVCS will employ shares the same male/female aspect with a single magnetic locking pin, the HEVCS connector will not share the rotational symmetry that the connector specified in the patent does. Additionally, the patent describes a mechanical coupling device. The HEVCS connector will be connecting the control unit to the mobile platform by way of a 16-pin parallel cable, differing in that it will be a data cable and not a purely mechanical coupling.

**Claim 2**

Claim 18 is identical in content to Claim 1, and so for the reasons outlined above, will not be a factor in infringement.

**Summary**

In summary, the HEVCS design will not infringe this patent, as it does not violate either of the two independent claims. It should be noted, however, that while this patent is valid only in the US, it is active and being upheld by a major US corporation, and so would be a high risk for litigation should infringement occur.

## 4.3 Curb and Step Navigation

### 4.3.1 Patent 1 - Stair traversing device

| | |
|---|---|
| Patent Number | CN108349516A |
| Applicants | QUANTUM ROBOTIC SYSTEMS INC |
| Status | Active |
| Application Date/Publish Date | 2018-07-31 / 2021-05-11 |
| Active Jurisdictions | CN |

Table 4: Stair traversing device patent information

URL - https://worldwide.espacenet.com/patent/search/family/058762787/publication/CN108349516A?q=CN108349516A

| Search Term | No. of Results |
|---|---|
| nftxt = ”carriage” AND nftxt = ”Stairs” | 7038 |
| nftxt = ”carriage” AND nftxt = ”Stairs” AND nftxt = ”assisted” | 290 |
| nftxt = ”carriage” AND nftxt = ”Stairs” AND nftxt = ”assisted” AND nftxt = ”climbing” | 117 |
| ”Stairs” AND nftxt = ”assisted” AND nftxt = ”climbing” AND nftxt = ”remote controlled” | 8 |

Table 5: Step/Curb Navigation Search Terms 1

**Claims**

A device for climbing stairs comprising: A carrier body for transporting a payload,Ladder Frame, A mechanism between the stepped frame and the carrier body, The mechanism is configured to move the stepped frame in relation to the carrier body in a circular path.

The HEVCS does not contain two individual parts that move in relation to each other in a circular motion. This means that this patent is not relevant to the HEVCS platform and there does not impede the patent.

The stair climbing device comprises of a main body portion and an outer hanging portion, forming an L shaped design. The HEVCS is not an L shaped design comprising of two exactly different body portions. Therefore, the HEVCS platform does not encroach on this patent.

### 4.3.2 Patent 2 - Improvements in or relating to first/final mile transportation

| | |
|---|---|
| Patent Number | CN108069182A |
| Applicants | FORD GLOBAL TECH LLC |
| Status | Active |
| Application Date/Publish Date | 2018-05-25 / 2022-03-11 |
| Active Jurisdictions | CN, USA, DN, UK |

Table 6: Improvements in or relating to first/final mile transportation patent information

URL - https://worldwide.espacenet.com/patent/search/family/062016996/publication/CN108069182A?q=CN108069182A

| Search Term | No. of Results |
|---|---|
| nftxt = ”Curb Climbing” | 161 |
| nftxt = ”Curb climbing” AND nftxt = ”assisted” | 20 |
| nftxt = ”Curb climbing” AND nftxt = ”Stairs” AND nftxt = ”assisted” | 11 |
| nftxt = ”Curb climbing” AND nftxt = ”step climbing” AND nftxt = ”Stairs” AND nftxt = ”assisted” AND nftxt = ”climbing” | 3 |

Table 7: Step/Curb Navigation Search Terms 2

**Claims**

A device for transporting payloads over varying terrain, the device comprises: a first round of clustering of three wheels contained in a flat configuration, a second round of clusters of three wheels contained in a planar configuration. The HEVCS will not use a cluster of three wheels to allow the platform to move up and down stairs. Therefore, this does not encroach on this patent. Given that this claim only has one independent claim, outlining the use of three clustered wheels, this patent is not being impeded by the HEVCS platform.

### 4.3.3 Patent 3 - ROBOTIC VEHICLE

| | |
|---|---|
| Patent Number | WO2011152890A2 |
| Applicants | IROBOT CORP |
| Status | Active |
| Application Date/Publish Date | 2010-09-23 / 2013-03-20 |
| Active Jurisdictions | USA, WIPO |

Table 8: ROBOTIC VEHICLE patent information

URL - https://worldwide.espacenet.com/patent/search/family/044675803/publication/WO2011152890A2?q=WO2011152890A2

| Search Term | No. of Results |
|---|---|
| nftxt = "Stair climbing" | 7688 |
| nftxt = "Stair climbing" AND nftxt = "assisted" | 788 |
| nftxt = "Wheeled" AND nftxt = "Stair Climbing" AND nftxt = "assisted" | 107 |
| nftxt = "Stair climbing" AND nftxt = "assisted" AND nftxt = "platform" AND nftxt = "wheeled" AND nftxt = "remote controlled" | 6 |

Table 9: Step/Curb Navigation Search Terms 3

**Claims**

A Robotic Device comprising a chassis having front and rear ends and supported on each right and left driven tracks. The HEVCS platform will not be driven using tracks, therefore is not in breach of the Patent. A deck assembly configured to receiver a removeable payload; and a linkage connecting the deck assembly to the chassis. The HEVCS platform will house the payload within the main chassis and not on a deck connected to a linkage. Therefor this does not impeach on the outlined patent. This means that the HEVCS platform is not into breech of this patent.

#### 4.3.4 Patent 4 - Conveying mechanism for grandstand seat area

| | |
|---|---|
| Patent Number | CN111976576A |
| Applicants | WANG JIANPING |
| Status | Application Withdrawn |
| Application Date/Publish Date | 2020-11-24 / 2022-10-21 |
| Active Jurisdictions | Not Active |

Table 10: ROBOTIC VEHICLE patent information

URL - https://worldwide.espacenet.com/patent/search/family/044675803/publication/WO2011152890A2?q=WO2011152890A2

| Search Term | No. of Results |
|---|---|
| nftxt = ”Stair climbing” | 7688 |
| nftxt = ”Stair climbing” AND nftxt = ”assisted” | 788 |
| nftxt = ”Wheeled” AND nftxt = ”Stair Climbing” AND nftxt = ”assisted” | 107 |
| nftxt = ”Stair climbing” AND nftxt = ”assisted” AND nftxt = ”platform” AND nftxt = ”wheeled” AND nftxt = ”remote controlled” | 6 |

Table 11: Step/Curb Navigation Search Terms 3

**Claims**

A Robotic Device comprising a chassis having front and rear ends and supported on each right and left driven tracks. The HEVCS platform will not be driven using tracks, therefore is not in breach of the Patent. A deck assembly configured to receiver a removeable payload; and a linkage connecting the deck assembly to the chassis. The HEVCS platform will house the payload within the main chassis and not on a deck connected to a linkage. Therefor this does not impeach on the outlined patent. This means that the HEVCS platform is not into breech of this patent.

### 4.3.5 Patent 5 - REMOTE-OPERATED MULTI-DIRECTIONAL TRANSPORT VEHICLE

| | |
|---|---|
| Patent Number | WO0246031A1 |
| Applicants | ALLARD ERIC J |
| Status | Patent Expired |
| Application Date/National Phase | 2002-06-13 / 2004-09-08 |
| Active Jurisdictions | Patent Expired |

Table 12: REMOTE-OPERATED MULTI-DIRECTIONAL TRANSPORT VEHICLE

URL - https://worldwide.espacenet.com/patent/search/family/021742047/publication/WO0246031A1?q=WO0246031A1

| Search Term | No. of Results |
|---|---|
| nftxt = ”Stair climbing” OR nftxt = ”Curb Climbing” | 7826 |
| (nftxt = ”Stair climbing” OR nftxt = ”Curb Climbing”) AND (nftxt = ”assisted” OR nftxt = ”assisting”) | 1331 |
| (nftxt = ”Stair climbing” OR nftxt = ”Curb Climbing”) AND (nftxt = ”assisted” OR nftxt = ”assisting”) AND (nftxt = ”platform” OR nftxt = ”carriage”) | 396 |
| (nftxt = ”Stair climbing” OR nftxt = ”Curb Climbing”) AND (nftxt = ”assisted” OR nftxt = ”assisting”) AND (nftxt = ”platform” OR nftxt = ”carriage”) AND nftxt = ”wheeled” AND nftxt = ”remote controlled” | 7 |

Table 13: Step/Curb Navigation Search Terms 5

**Claims**

A chassis containing a pair of laterally opposed front axles, a pair of lateral opposed rear axles and a pair of longitudinal intermediate axels between the front and rear axles. Given the HEVCS will not have longitudinally mounted axels and will drive by one motor on each of the wheels, the patent is not impeded by the platform. This patent is also expired meaning that even if the HEVCS platform did infringe on the patent it would not be affeced.

## 4.4 EV Charging

[1]

### 4.4.1 Search Strategy 1

# References

[1] M. Moran. (Aug 2020) A third of uk homeowners don't have a driveway or garage to install a home chargepoint. [Online]. Available: https://www.transportxtra.com/publications/parking-review/news/66621/a-third-of-uk-homeowners-don-t-have-a-driveway-or-garage-to-install-a-home-chargepoint/

# A Appendix 1