heavy system that has to be taken into account for road holding of the bus.

Documents US 2011/316474 and US 6 157 162 are also known in the state of the art, each of which describes an electric coupling device for charging an electric vehicle.

Embodiments of the invention seek to disclose means of improving the state of the art.

A first aspect of the present invention provides an electric coupling device for an electric vehicle charging station comprising a ram/coupler fitted with an extendable arm suitable for being moved between a retracted position and an extended position in which the arm is adapted to provide an electric link with a complementary electric part provided on an electric vehicle, such as a C-shaped cone, and support means for supporting the ram/coupler allowing two degrees of rotational freedom of the ram relative to a support base, about two axes transverse to each other and orthogonal to a direction of extension of the arm, the ram/coupler being capable of angular displacement about a vertical axis and about a horizontal axis perpendicular to the direction of extension of the arm relative to a support base, and the extendable arm is mounted on a means connected to a strand of a belt driven by a geared motor, the device being characterised in that the ram/coupler is placed in a protective housing, the device comprises the support base adapted to be fixed to a support point and an intermediate element installed free to make angular movements about said vertical axis on the support base, the protective housing of the ram/coupler being installed free to make angular movements about said horizontal axis on the intermediate element, the device further comprising stops limiting the angular movement of the intermediate element in regard of the support base about said vertical axis and limiting the angular movement of the protection case in regard of the intermediate element about the horizontal axis, a counterweight being connected to a strand of the belt opposite to the strand on which is mounted the extendable arm so that when the arm is moved into the extended position, the counterweight is moved into the opposite direction and the centre

of gravity of the device always remain close to the intersection point of said vertical axis and said horizontal axis so that the mechanical mass of the system is balanced regardless of the position of the arm, the arm being at least partly flexible so that the double angular movement possible about the vertical axis and the horizontal axis combined with the intrinsic flexibility of the arm allows automatic alignment of the end of the arm with said complementary electric part provided on the electric vehicle when the end of the arm is facing the complementary part provided on the electric vehicle with a single curvature, preventing an "S" type curvature, and in that the protective housing is provided with a door free to move in displacement between a closed position in the retracted position of the extendable arm, and an open position in the extended position of the arm.

An expert in the subject will understand that embodiments of the invention thus disclose a ram system associated with the charging station and that will cooperate with the vehicle that arrives in front of a charging station.

The ram has several degrees of freedom to optimise the connection between the station and the vehicle. The ram also comprises a reliable and safe movement control system to optimise operation and prevent any dysfunction problems.

According to embodiments of the invention:

CLAIMS

1. Electric coupling device for an electric vehicle charging station comprising a ram/coupler fitted with an extendable arm suitable for being moved between a retracted position and an extended position in which the arm is adapted to provide an electric link with a complementary electric part provided on an electric vehicle, such as a C-shaped cone, and support means for supporting the ram/coupler allowing two degrees of rotational freedom of the ram/coupler relative to a support base, about two axes transverse to each other and orthogonal to a direction of extension of the arm, the ram/coupler being capable of angular displacement about a vertical axis and about a horizontal axis perpendicular to the direction of extension of the arm relative to the support base, and the extendable arm is mounted on a means connected to a strand of a belt driven by a geared motor,

   the device being characterised in that the ram/coupler is placed in a protective housing, the device comprises the support base adapted to be fixed to a support point and an intermediate element installed free to make angular movements about said vertical axis on the support base, the protective housing of the ram/coupler being installed free to make angular movements about said horizontal axis on the intermediate element, the device further comprising stops limiting the angular movement of the intermediate element in regard of the support base about said vertical axis and limiting the angular movement of the protection case in regard of the intermediate element about the horizontal axis, a counterweight being connected to a strand of the belt opposite to the strand on which is mounted the extendable arm so that when the arm is moved into the extended position, the counterweight is moved into the opposite direction and the centre of gravity of the device always remain close to the intersection point of said vertical axis and said horizontal axis so that the mechanical mass of the system is balanced regardless of the position of the arm, the arm being at least partly flexible so that the double angular movement possible about the vertical axis and the horizontal axis combined with the intrinsic flexibility of the arm allows

automatic alignment of the end of the arm with said complementary electric part provided on the electric vehicle when the end of the arm is facing the complementary part provided on the electric vehicle with a single curvature, preventing an "S" type curvature, and in that the protective housing is provided with a door free to move in displacement between a closed position in the retracted position of the extendable arm, and an open position in the extended position of the arm.

2. Device according to claim 1, characterised by the fact that the door is held elastically in the closed position by a pin fitted on the counterweight and loaded elastically in the open position to return to its rest position.

3. Device according to one of claims 1 to 2, characterised by the fact that it comprises damping means constraining the angular movement of the support means of the ram/coupler.

4. Device according to one of claims 1 to 3, characterised by the fact that the ram/coupler is mounted on a carriage guided in translation on rails.

5. Device according to one of claims 1 to 4, characterised by the fact that the total travel of the arm between the retracted position and an extended position is of the order of 1100 millimeters.

6. Device according to claim 5, characterised by the fact that said stops are adapted to accept a displacement of the end of the arm of plus or minus 100 millimeters along the vertical axis and the horizontal axis.

7. Electric vehicle charging station, characterised by the fact that it is equipped with an electric coupling device according to one of claims 1 to 6.