



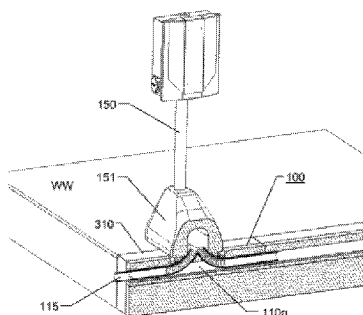
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(57) Abstract:

A cast curbstone (100) has a longitudinal cable duct (110a) passing between first and second short sides of the curbstone (100). The longitudinal cable duct (110a) is configured to carry at least one electric cable (115). The curbstone (100) also has at least one upward opening configured to provide access for a charging post (150) to the at least one cable (115) in the longitudinal cable duct (110a). A first flat long side (L1) extending over the entire length of the curbstone (100) renders the curbstone (100) configured to be arranged between a level separated walkway (WW) and roadway (RW) with the first flat long side (L1) facing towards the walkway (WW). Thus, the curbstone (100) may for example be arranged in parallel with and in contact with a flat outer wall of an existing curbstone (310). The invention also pertains to a charging post (150) for the proposed curbstone (100).



Abstract

A cast curbstone (100) has a longitudinal cable duct (110a) passing between first and second short sides of the curbstone (100). The longitudinal cable duct (110a) is configured to carry at least one electric cable (115). The curbstone (100) also has at least one upward opening configured to provide access for a charging post (150) to the at least one cable (115) in the longitudinal cable duct (110a). A first flat long side (L1) extending over the entire length of the curbstone (100) renders the curbstone (100) configured to be arranged between a level separated walkway (WW) and roadway (RW) with the first flat long side (L1) facing towards the walkway (WW). Thus, the curbstone (100) may for example be arranged in parallel with and in contact with a flat outer wall of an existing curbstone (310). The invention also pertains to a charging post (150) for the proposed curbstone (100).

Cast Curbstone and Charging Post

TECHNICAL FIELD

The present invention relates generally to the provision of electric energy to land based vehicles. Especially, the invention relates to a cast curbstone according to the preamble of claim 1 and a charging post according to the preamble of claim 10.

BACKGROUND

The use of electrically powered vehicles has increased tremendously during the last decade. This places a very high pressure on the infrastructure for distributing electric current to these vehicles. Inter alia, there is a massive demand for charging poles being available to the public at convenient locations. One way to achieve rapid and cost-efficient expansion of the charging capacity is to integrate electric equipment into roadside arrangements, e.g. sidewalks.

For example, GB 2 591 830 shows a modular curb for charging electric vehicles and telecommunication infrastructure. The curb contains a base unit adapted to receive an electricity supply and connect the supply to an interchangeable head, which is operable to connect to an electric vehicle or other electrical load. The interchangeable head is preferably received inside or proximate the base unit, preferably within a slot or opening formed in a generally uppermost and/or sloping wall of the base unit. The interchangeable head may include an induction coil, either retained entirely within the head or deployable as a retractable planar roll or sheet, configured to create an electromagnetic field to supply energy to an electric vehicle. The head may have a lockable access cover containing a plug-in charging cable. The head may include other articles including sensors, lighting, telecommunications apparatus, batteries and gas filters.

WO 2021/250427 discloses an electrical vehicle curbside charging device, which has: an electrical connector configured to receive an external electrical connector; a flap configured to cover the electrical connector; an exit passage opening a second face
5 of the charging device, configured to facilitate access for an electric cable; and an interior channel extending from the exit passage to the electrical connector, configured to accommodate the electric cable. The flap is further configured to alternate between an open configuration and a closed configuration. The charging device
10 is configured to fit contiguously with a curb. The curbside charging device may be seamlessly integrated with existing curbs, thereby providing charging outlets for electric vehicles in areas that do not have off road parking.

EP 2 463 439 describes a curbstone that has a continuous channel formed in a part of a curbstone for accommodating an electric
15 cable, where the part of the curbstone is arranged at ground level. The complete channel runs through the curbstone and avoids constriction along passage direction. The channel contains a plug-in sleeve at one end, a compatible enlargement at another
20 end and a side branch at the ends, where the side branch is closed. A mounting platform for an electric-tank station is arranged at the side branch.

Although the above known solutions may offer relatively convenient installation of vehicle charging equipment, each design
25 requires that least one of the walkway and the roadway is dug up, or by other means must be disrupted mechanically.

SUMMARY

The object of the present invention is to mitigate the above problems and offer a solution for expanding the infrastructure for
30 providing electric current to vehicles that requires less intervening measures.

According to one aspect of the invention, the object is achieved

by a curbstone that is cast, for instance in concrete or metal. The curbstone has a longitudinal cable duct and at least one upward opening. The longitudinal cable duct passes between first and second short sides of the cast curbstone, and the longitudinal cable duct is configured to carry at least one electric cable. The at least one upward opening is configured to provide access for a charging post to the at least one cable in the longitudinal cable duct, for example such that two neighboring charging posts are interconnected electrically. The cast curbstone also has a first flat long side extending along an entire length of the cast curbstone, which first flat long side is configured to be arranged between a level separated walkway and roadway with the first flat long side facing towards the walkway.

The above cast curbstone is advantageous because the unbroken first flat long side facing towards the walkway enables the curbstone and cabling therein to be installed in a street environment while causing minimum disturbance to that environment.

According to one embodiment of this aspect of the invention, the at least one upward opening is located in a second flat long side orthogonal to the first flat long side, which second flat long side preferably is configured to be arranged in level with a walking surface of the walkway. Thereby, it is straightforward to connect a charging post to cabling inside the curbstone by placing a base of the charging post on top of the curbstone.

According to another embodiment of this aspect of the invention, the first flat long side has a surface of a general rectangular shape, which surface has such an extension in a dimension orthogonal to the second flat long side that the curbstone is configured to be arranged in parallel with and in contact with a flat outer wall of an existing curbstone separating the walkway from the roadway. As a result, a street environment may be supplemented with a vehicle-charging installation essentially without any disturbance at all to the street environment.

According to yet another embodiment of this aspect of the invention, the cast curbstone further has a third flat long side that is orthogonal to the first flat long side, which third flat long side is configured to be placed on and fastened to a road surface of the roadway. Hence, the proposed curbstone may simply be placed on the road surface next to an existing curb.

Preferably, the third flat long side contains at least one fastening pin that extends from the third flat long side and is configured to penetrate into the road surface of the roadway so as to fasten the cast curbstone to the roadway. This namely reduces the risk that the proposed curbstone is dislocated unintentionally, for example by a vehicle on the road.

According to still another embodiment of this aspect of the invention, the first flat long side has a surface of a general rectangular shape which surface has such an extension in a dimension orthogonal to the second flat long side that the cast curbstone is configured be positioned countersunk relative to a road surface of the roadway. Thus, the proposed curbstone can be installed in place of a conventional curbstone. This is beneficial because thereby the width of the roadway need not be reduced.

According to yet another embodiment of this aspect of the invention, the second flat long side contains at least one recess configured to receive at least one downward extending element of a base of the charging post when said base is placed on the walking surface of the walkway so as to secure the charging post to the cast curbstone. This allows for highly convenient and robust electrical and mechanical connection between the curbstone and the charging post.

According to another aspect of the invention, the object is achieved by a charging post for providing electric energy to vehicles. The charging post contains a base, which, in turn, has at least one downward extending element configured to be fitted into the at least one recess of the proposed cast curbstone. Consequent-

ly, when said base is placed on the walking surface of the walkway with the at least one downward extending element fitted into the at least one recess, the charging post is secured to the cast curbstone. This charging post is advantageous because together
 5 with proposed curbstone it offers a convenient and cost-efficient overall solution for installing charging facilities for vehicles in a street environment.

Further advantages, beneficial features and applications of the present invention will be apparent from the following description
 10 and the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is now to be explained more closely by means of preferred embodiments, which are disclosed as examples, and with reference to the attached drawings.

- 15 Figure 1 shows a perspective sectional view of a charging post connected to a curbstone according to a first embodiment of the invention;
- Figures 2a-b illustrate details of the curbstone according to the first embodiment of the invention;
- 20 Figure 3 shows another perspective view of the charging post according to the first embodiment of the invention;
- Figures 4a-b show side views of a base of a charging post according to one embodiment of the invention;
- 25 Figure 5 shows a perspective sectional view of a charging post connected to a curbstone according to a second embodiment of the invention;
- Figures 6a-b illustrate details of the curbstone according to the second embodiment of the invention; and
- 30 Figure 7 shows another perspective view of the charging post according to the second embodiment of the in-

vention.

DETAILED DESCRIPTION

In Figure 1, we see a perspective sectional view of a charging post 150 connected to a curbstone 100 according to a first embodiment of the invention. Figures 2a and 2b illustrate details of the curbstone 100 according to the first embodiment of the invention. Figure 3 shows another perspective view of the charging post 150 according to the first embodiment of the invention.

For durability and mechanical resistance, the curbstone 100 is cast, for example in concrete or metal, such as iron. The curbstone 100 contains a longitudinal cable duct 110a that passes between first and second short sides 111 and 112 respectively of the cast curbstone 100. The longitudinal cable duct 110a is configured to carry at least one electric cable, here schematically represented by a flexible duct 115. The curbstone 100 contains at least one upward opening, here exemplified by 221 and 222 respectively configured to provide access for the charging post 150 to the at least one cable 115 in the longitudinal cable duct 110a. Preferably, the charging post 150 is installed via a serial connection, such that an incoming electrical cable is received from a neighboring upstream charging post via a first one 121 of the upward openings and an outgoing electrical cable is fed to a neighboring downstream charging post via a second one 122 of the upward openings. The curbstone 100 further contains a first flat long side L1, which extends along an entire length of the cast curbstone 100. The first flat long side L1 thus renders the curbstone 100 configured to be arranged between a level separated walkway WW and roadway RW with the first flat long side L1 facing towards the walkway WW.

Preferably, the upward openings 121 and 122 are located in a second flat long side L2 that is orthogonal to the first flat long side L1. Namely, this facilitates arranging a base 151 of the charging post 150 on top of the curbstone 100. Of course, as is apparent

in Figure 2, the fact that the second flat long side L2 is orthogonal to the first flat long side L1 does not preclude that the second flat long side L2 transitions to a side opposing the first flat long side L1 via one or more inclined flat surfaces, or a curved surface. In fact, such profiles are beneficial because they make it easier for vehicles to drive up on the curbstone 100. A rounded outer profile also reduces the risk of rim damages.

For further convenience, the second flat long side L2 has such measures that the curbstone 100 is configured to be arranged in level with a walking surface WS of the walkway WW.

Moreover, the first flat long side L1 has a surface of a general rectangular shape, and the surface has such an extension in a dimension L1y orthogonal to the second flat long side L2 that the curbstone 100 is configured to be arranged in parallel with and in contact with a flat outer wall of an existing curbstone 310 separating the walkway WW from the roadway RW. In practice, this means that a height of the curbstone 100 measured along the dimension L1y is equal to a typical elevation of a conventional curbstone over a road surface RS of the roadway RW. In an opposing dimension L1x of the first flat long side L1 the curbstone 100 may or may not extend equal to the length of a typical curbstone.

Additionally, the curbstone 100 may contain a third flat long side L3 being orthogonal to the first flat long side L1, which third flat long side L3 is configured to be placed on and fastened to a road surface RS of the roadway RW. To facilitate unfailing fastening of the curbstone 100 to the roadway RW, the third flat long side L3 may contain at least one fastening pin 320 extending from the third flat long side L3. The at least one fastening pin 320, which preferably is pointed and may be made of metal, e.g. iron, is configured to penetrate into the road surface RS of the roadway RW. Alternatively, of course, the third flat long side L3 may contain at least one cavity configured to receive at least one fastening pin inserted into the road surface RS of the roadway RW.

Figures 4a and 4b show side views of the base 151 of the charging post 150 according to one embodiment of the invention. The base 151 here contains downward extending elements exemplified by 403 and 404, which are configured to be fitted into recesses 223 and 224 respectively in the second flat long side L2 of the cast curbstone 100. As a result, when the base 151 is placed on the walking surface WS of the walkway WW with the downward extending elements 403 and 404 fitted into a respective one of the recesses 223 and 224 the charging post 150 is secured to the cast curbstone 100. Thus, preferably, the base 151 is positioned such that it rests partially on the walking surface WS of the walkway WW and partially on the second flat long side L2 of the curbstone 100.

Figure 5 shows a perspective sectional view of the charging post 150 connected to a curbstone 100 according to a second embodiment of the invention. Figures 6a and 6b illustrate details of the curbstone 100 according to the second embodiment of the invention. Figure 7 shows another perspective view of the charging post 100 according to the second embodiment of the invention. In Figures 5, 6a, 6b and 7, reference signs that also occur in one or more of Figures 1, 2a, 2b, 3 and 4 designate the same objects/features as described above with reference to Figures 1, 2a, 2b, 3 and/or 4.

In the second embodiment of the invention, similar to the first embodiment, the first flat long side L1 has a surface of a general rectangular shape. In contrast to the first embodiment, however, the first flat long side L1 of the second embodiment has such an extension in the dimension L1y orthogonal to the second flat long side L2 that the cast curbstone 100 is configured be positioned countersank relative to a road surface RS of the roadway RW. For example, the first flat long side L1 may have an extension along the dimension L1y equivalent to a height of a conventional curbstone configured be positioned countersank relative to the road surface RS of the roadway RW.

In the second embodiment of the invention, due to the larger overall height of the curbstone 100, a longitudinal cable duct 110b passing between the first and second short sides 111 and 112 of the curbstone 100 may be arranged at a larger distance from the
5 second flat long side L2. Consequently, the incoming and outgoing electric cables 115 connected to the charging post 150 may be less angled. This, in turn, may allow for a single upward opening 610 in the second flat long side L2 to the longitudinal cable duct 110b.

10 The term “comprises/comprising” when used in this specification is taken to specify the presence of stated features, integers, steps or components. The term does not preclude the presence or addition of one or more additional elements, features, integers, steps or components or groups thereof. The indefinite article “a”
15 or “an” does not exclude a plurality. In the claims, the word “or” is not to be interpreted as an exclusive or (sometimes referred to as “XOR”). On the contrary, expressions such as “A or B” covers all the cases “A and not B”, “B and not A” and “A and B”, unless otherwise indicated. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that
20 a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

It is also to be noted that features from the various embodiments
25 described herein may freely be combined, unless it is explicitly stated that such a combination would be unsuitable.

Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the ap-
30 pended claims.

The invention is not restricted to the described embodiments in the figures, but may be varied freely within the scope of the claims.

Claims

1. A cast curbstone (100) comprising:
 - a longitudinal cable duct (110a, 110b) passing between first and second short sides (111, 112) of the cast curbstone (100),
 - 5 which longitudinal cable duct (110a, 110b) is configured to carry at least one electric cable (115), and
 - at least one upward opening (221, 222; 610) configured to provide access for a charging post (150) to the at least one cable (115) in the longitudinal cable duct (110a, 110b),
 - 10 **characterized in that** the cast curbstone (100) comprises:
 - a first flat long side (L1) extending along an entire length of the cast curbstone (100), which first flat long side (L1) is configured to be arranged between a level separated walkway (WW) and roadway (RW) with the first flat long side (L1) facing towards the
 - 15 walkway (WW).
2. The cast curbstone (100) according to claim 1, wherein the at least one upward opening (121, 122; 610) is located in a second flat long side (L2) orthogonal to the first flat long side (L1).
3. The cast curbstone (100) according to claim 2, wherein the
 - 20 second flat long side (L2) is configured to be arranged in level with a walking surface (WS) of the walkway (WW).
4. The cast curbstone (100) according to any one of the claims 2 or 3, wherein the first flat long side (L1) has a surface of a general rectangular shape which surface has such an extension
 - 25 in a dimension (L1y) orthogonal to the second flat long side (L2) that the curbstone (100) is configured to be arranged in parallel with and in contact with a flat outer wall of an existing curbstone (310) separating the walkway (WW) from the roadway (RW).
5. The cast curbstone (100) according to claim 4, comprising
 - 30 a third flat long side (L3) orthogonal to the first flat long side (L1), which third flat long side (L3) is configured to be placed on and fastened to a road surface (RS) of the roadway (RW).

6. The cast curbstone (100) according claim 5, wherein the third flat long side (L3) comprises at least one fastening pin (320) extending from the third flat long side (L3), and which at least one fastening pin (320) is configured to penetrate into the road surface (RS) of the roadway (RW) so as to fasten the cast curbstone (100) to the roadway (RW).
7. The cast curbstone (100) according to any one of the claims 2 or 3, wherein the first flat long side (L1) has a surface of a general rectangular shape which surface has such an extension in a dimension (L1y) orthogonal to the second flat long side (L2) that the cast curbstone (100) is configured be positioned counter-sank relative to a road surface (RS) of the roadway (RW).
8. The cast curbstone (100) according to any one of the claims 3 to 7, wherein the second flat long side (L2) comprises at least one recess (223, 224) configured to receive at least one downward extending element (403, 404) of a base (151) of the charging post (150) when said base (151) is placed on the walking surface (WS) of the walkway (WW) so as to secure the charging post (150) to the cast curbstone (100).
9. The cast curbstone (100) according to any one of the claims, wherein the curbstone (100) is cast in concrete.
10. A charging post (150) for providing electric energy to vehicles, which charging post (150) comprises a base (151), **characterized in that** the base (151) comprises at least one downward extending element (403, 404) configured to be fitted into the at least one recess (223, 224) of the cast curbstone (100) according to any one of the claims 3 to 7 and 8 such that when said base (151) is placed on the walking surface (WS) of the walkway (WW) with the at least one downward extending element (403, 404) fitted into the at least one recess (223, 224) the charging post (150) is secured to the cast curbstone (100).

I följande bilaga finns en översättning av patentkraven till svenska. Observera att det är patentkravens lydelse på engelska som gäller.

A Swedish translation of the patent claims is enclosed. Please note that only the English claims have legal effect.

Titel: Gjuten kantsten och laddstolpe**PATENTKRAV**

- 5 1. En gjuten kantsten (100) innefattande:
 en längsgående kabelkanal (110a, 110b) vilken passerar mellan
 en första och en andra kortsida (111, 112) av den gjutna kantstenen
 (100), vilken längsgående kabelkanal (110a, 110b) är konfigurerad att
 bära åtminstone en elektrisk kabel (115), och
 10 åtminstone en uppåtriktad öppning (221, 222; 610) konfigurerad
 att ge åtkomst för en laddstolpe (150) till den åtminstone en kabeln
 (115) i den längsgående kabelkanalen (110a, 110b),
kännetecknad av att den gjutna kantstenen (100) innefattar:
 en första plan långsida (L1) vilken sträcker sig längs hela läng-
 15 den av den gjutna kantstenen (100), vilken första plana långsida (L1)
 är konfigurerad att vara anordnad mellan en planseparerad gångbana
 (WW) och vägbana (RW) med den första plana långsidan (L1) vänd
 mot gångbanan (WW).
2. Den gjutna kantstenen (100) enligt krav 1, varvid den åtminstone
 20 en uppåtriktade öppningen (121, 122; 610) är belägen i en andra plan
 långsida (L2) vinkelrät mot den första plana långsidan (L1).
3. Den gjutna kantstenen (100) enligt krav 2, varvid den andra pla-
 na långsidan (L2) är utformad att anordnas i nivå med en gångyta
 (WS) hos gångbanan (WW).
- 25 4. Den gjutna kantstenen (100) enligt något av kraven 2 eller 3,
 varvid den första plana långsidan (L1) har en yta av generell rektan-
 gulär form, vilken yta har en sådan utsträckning i en dimension (L1y).
 vinkelrät mot den andra plana långsidan (L2) att kantstenen (100) är
 konfigurerad att vara anordnad parallell med och i kontakt med en
 30 plan yttervägg av en befintlig kantsten (310) vilken skiljer gångbanan
 (WW) från vägbanan (RW).
5. Den gjutna kantstenen (100) enligt krav 4, innefattande en tredje
 plan långsida (L3) vinkelrät mot den första plana långsidan (L1), vil-

ken tredje plana långsida (L3) är konfigurerad att placeras på och fästas vid en vägyta (RS) på vägbanan (RW).

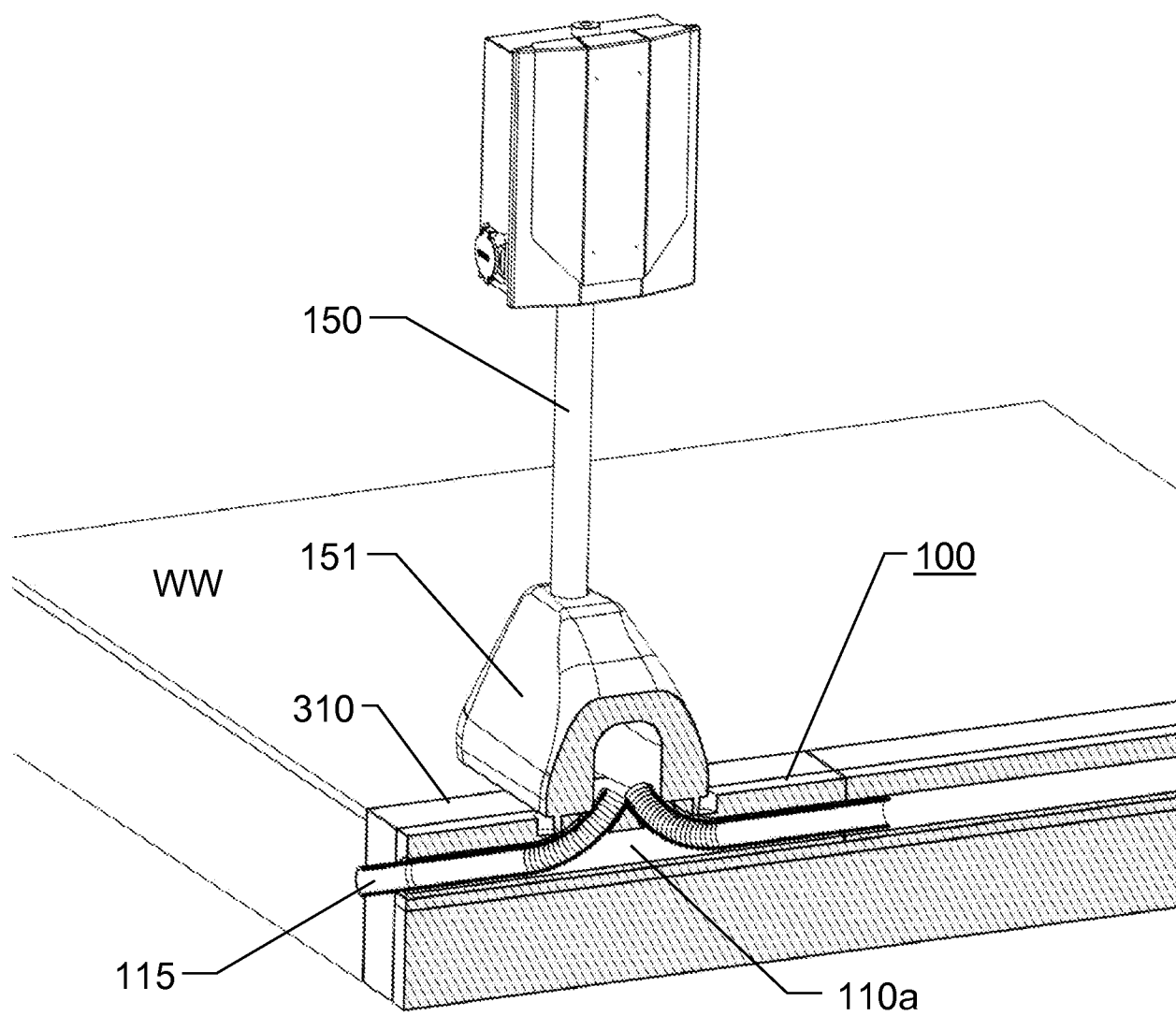
5 6. Den gjutna kantstenen (100) enligt krav 5, varvid den tredje plana långsidan (L3) innefattar åtminstone en fästtapp (320) vilken sträcker sig från den tredje plana långsidan (L3), och vilken åtminstone en fästtapp (320) är konfigurerad att tränga in i vägytan (RS) på vägbanan (RW) för att fästa den gjutna kantstenen (100) vid vägbanan (RW).

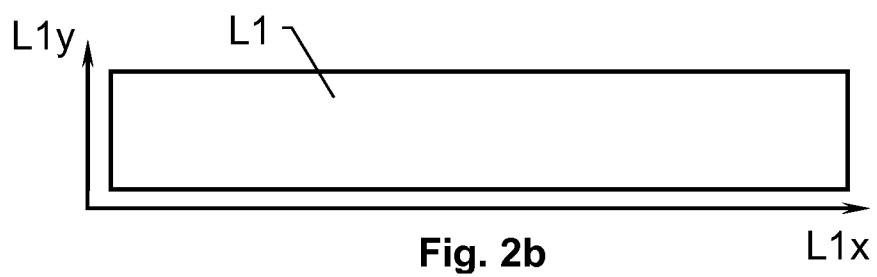
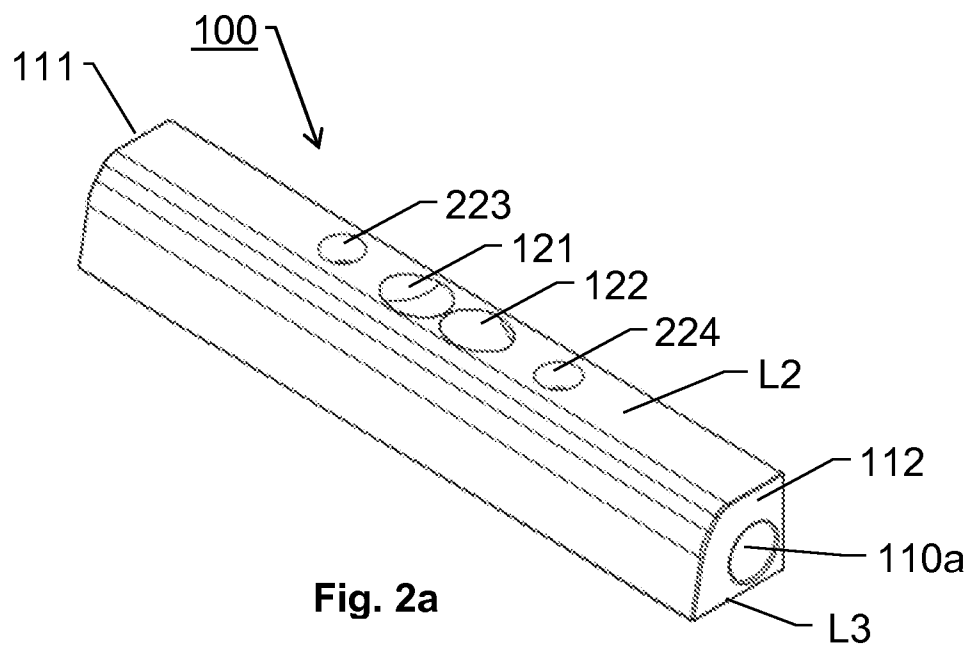
10 7. Den gjutna kantstenen (100) enligt något av kraven 2 eller 3, varvid den första plana långsidan (L1) har en yta av generell rektangulär form vilken yta har en sådan utsträckning i en dimension (L1y) vinkelrätt mot den andra plana långsidan (L2) att den gjutna kantstenen (100) är konfigurerad för att försänkas relativt en vägyta (RS) på vägbanan (RW).

15 8. Den gjutna kantstenen (100) enligt något av kraven 3 till 7, varvid den andra plana långsidan (L2) innefattar åtminstone ett urtag (223, 224) konfigurerat för att ta emot åtminstone ett nedåtgående element (403, 404) av en bas (151) på laddstolpen (150) då nämnda bas (151) är placerad på gångytan (WS) hos gångbanan (WW) för att
20 förankra laddstolpen (150) till den gjutna kantstenen (100).

9. Den gjutna kantstenen (100) enligt något av kraven, varvid kantstenen (100) är gjuten i betong.

25 10. En laddstolpe (150) för att tillhandahålla elektrisk energi till fordon, vilken laddstolpe (150) innefattar en bas (151), kännetecknad av att basen (151) innefattar åtminstone ett nedåtriktat element (403, 404) konfigurerat att passa in i det åtminstone ena urtaget (223, 224) i den gjutna kantstenen (100) enligt något av kraven 3 till 7 och 8 så att då nämnda bas (151) är placerad på gångytan (WS) hos gångbanan (WW) med det åtminstone ett nedåtgående elementet (403, 404) in-
30 passat i det åtminstone ena urtaget (223, 224) är laddstolpen (150) fastsatt till den gjutna kantstenen (100).

**Fig. 1**



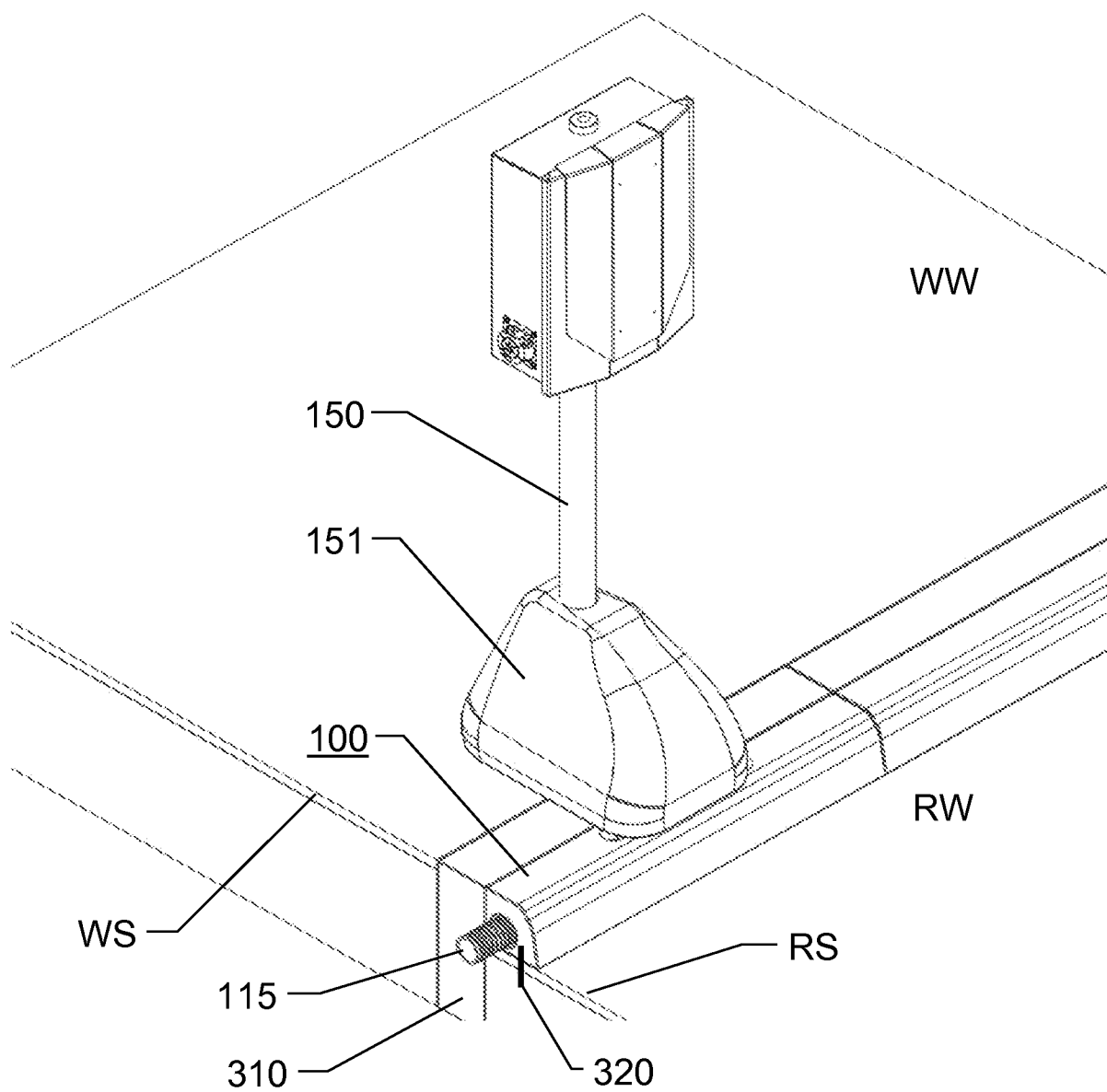


Fig. 3

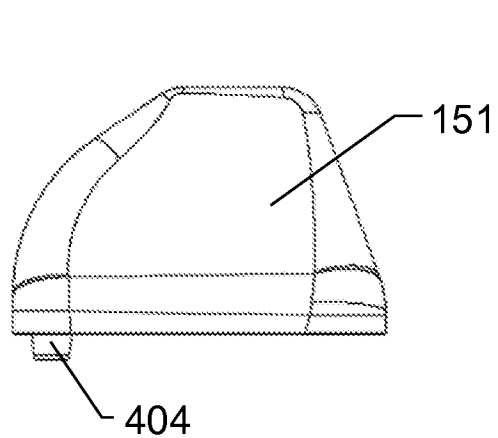


Fig. 4a

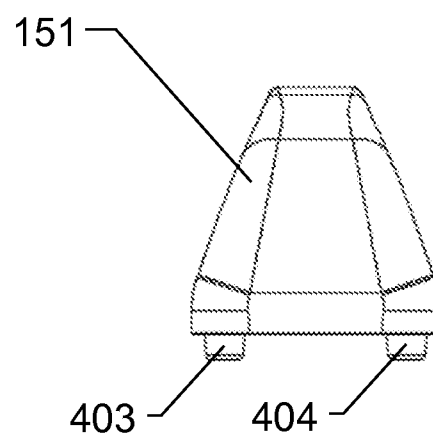


Fig. 4b

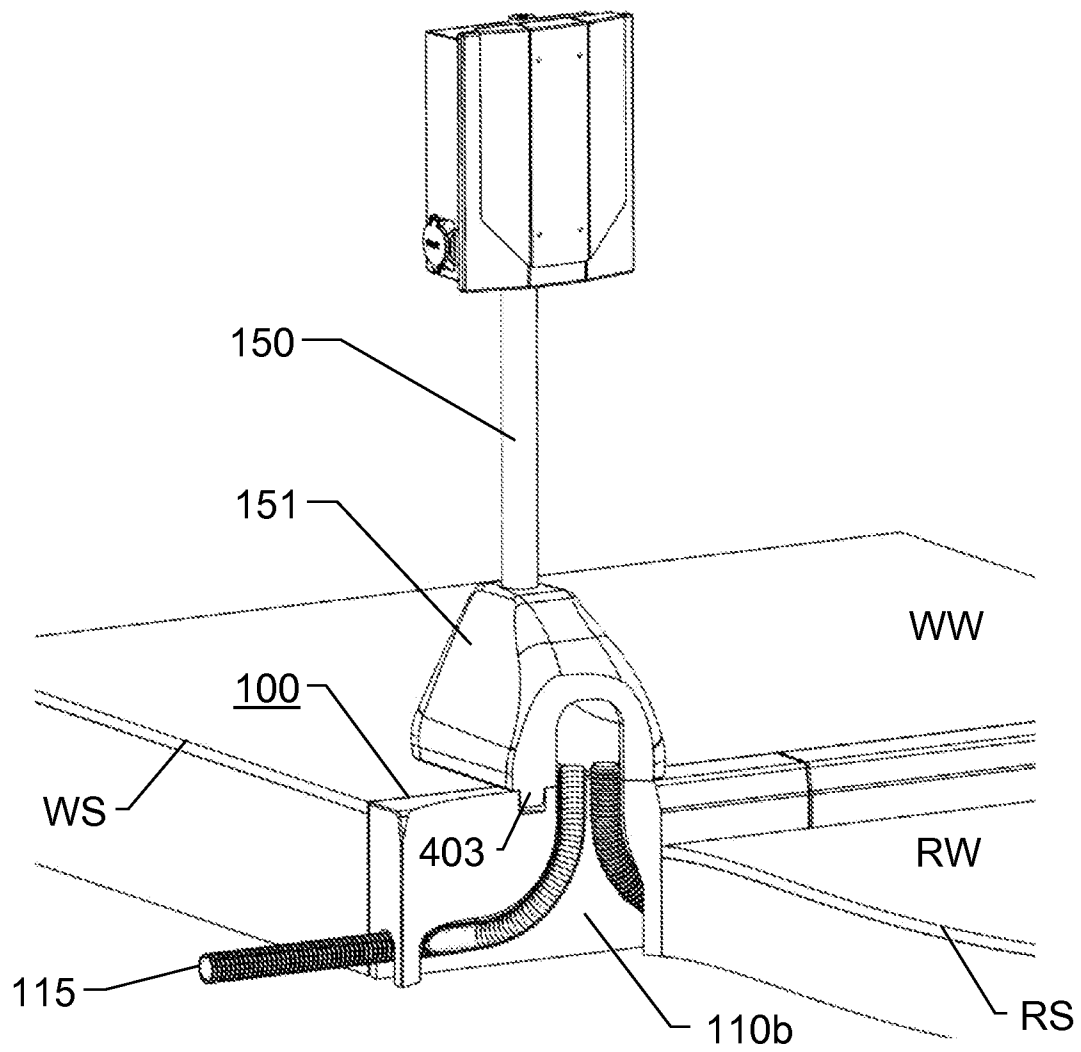


Fig. 5

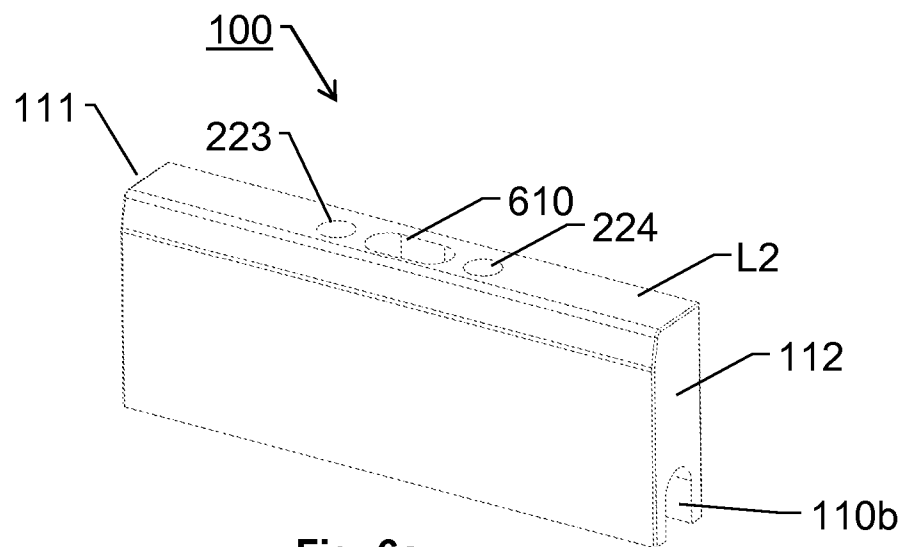


Fig. 6a

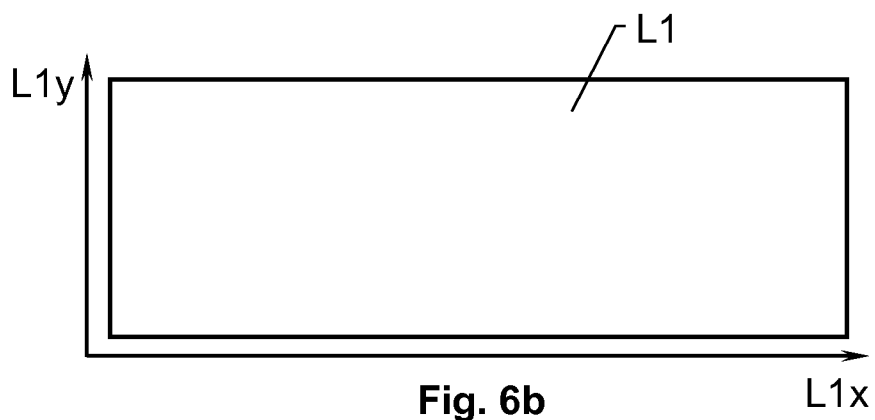


Fig. 6b

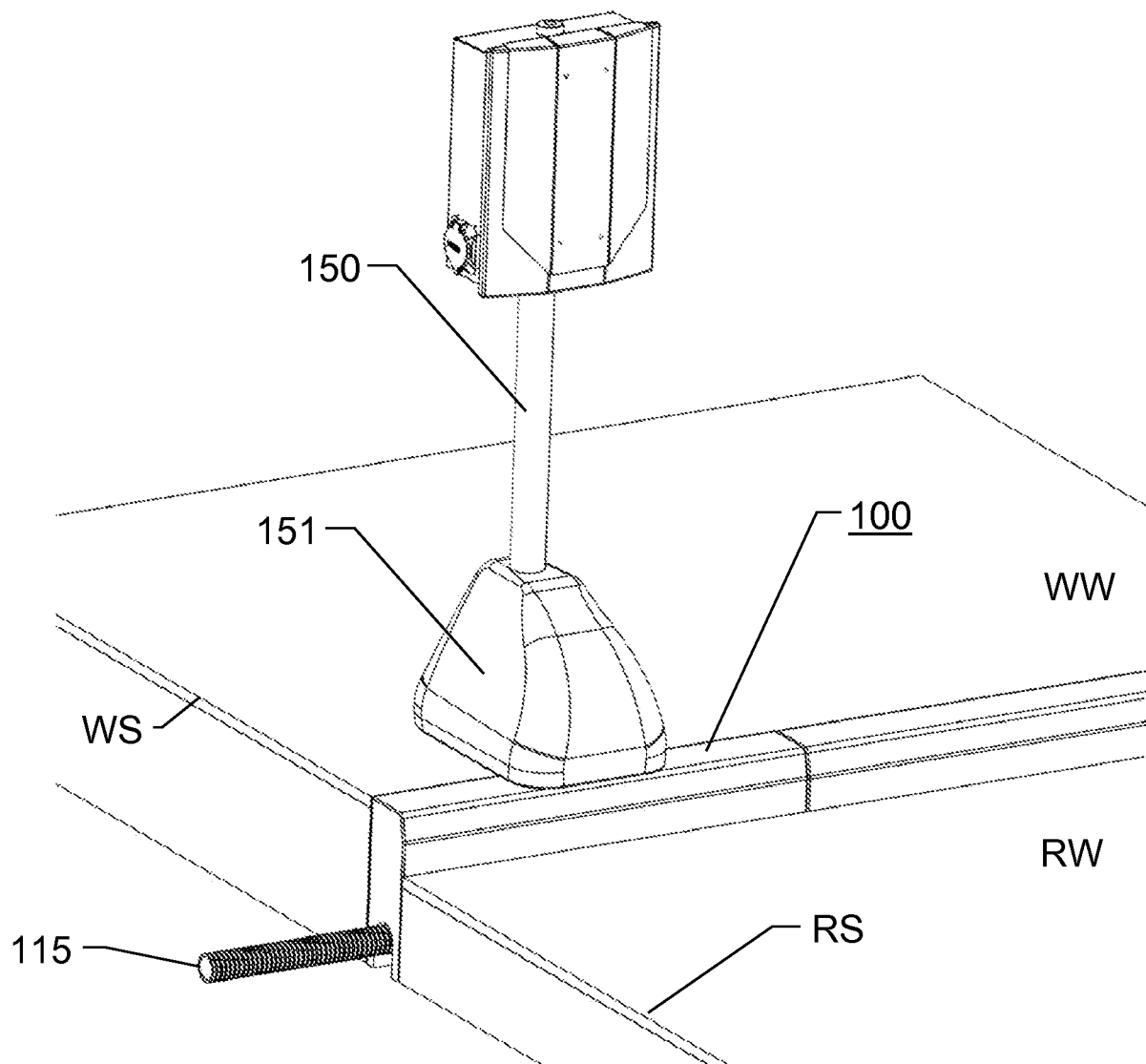


Fig. 7