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(54) Hose guider

(57) There is provided a device for handling a hose, more particularly a hose guider (10) comprising a main body (12) comprising a first side (16a) and a second side (16b), and a main element (14) arranged between the first side (16a) and the second side (16b). The main element (14) is arranged to guide a hose around a first axis (18), and the hose guider is arranged to be pivotable around a second axis (22). There is also provided a system and a fuel dispensing unit thereof.

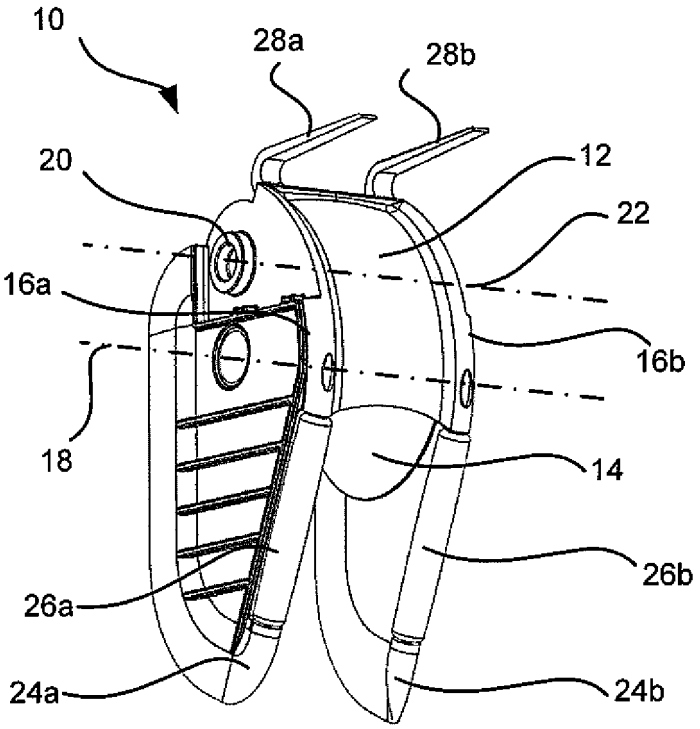


Fig. 2(a)

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Description

Technical Field of the Invention

[0001] The present invention generally relates to a device for handling a hose, more particularly to a hose guider, a system and a fuel dispensing unit thereof.

Background of the Invention

[0002] A fuel dispensing unit, such as a petrol pump, typically comprises a pump part standing on the ground, a display part showing the chosen type of petrol, cash readout, volume readout etc., and a column to which one or more hoses are connected.

[0003] In order to make the filling-up process more efficient and user friendly hoses may be made longer. Thus, in order to protect the hoses and make the fuel dispensing unit more compact the it may be arranged to hold the hoses in an idle mode (i.e. when not used). Inside the fuel dispensing unit different arrangements are provided in order to make the hoses easy to pull out of the fuel dispensing unit and in order to enable the hoses to be retracted efficiently into the fuel dispensing unit when the hoses are placed in their boots.

[0004] Further, in order to make it easier to use the fuel dispensing unit, it is an advantage if the hoses can be pulled out efficiently and in a user friendly manner. This means, in order to make a user friendly but yet cost efficient fuel dispensing unit, the hose handling within the fuel dispensing unit as well as at the interface of the fuel dispensing unit is crucial.

[0005] Thus, there is a demand for fuel dispensing units having efficient hose handling such that the hoses are easy to pull out from the fuel dispensing unit, such that they retract into the fuel dispensing unit when they are not in use, and such that a large portion of the hose can be pulled out from the fuel dispensing unit.

Summary of the Invention

[0006] A difficulty that may arise in connection with filling-up is that the hose does not reach to the vehicle if parked a distance from the petrol pump. The reason why the vehicle has not been parked sufficiently close to the pump may be difficulty in manoeuvring owing to a limited space round the petrol pump. This issue may be solved by providing a fuel dispensing unit having a hose of such length that a driver may be able to fill up the tank although the vehicle is not parked such that the fuel cap immediately in front of the fuel pump.

[0007] To be able to handle a hose of sufficient length it is important that the fuel dispensing unit is provided with a returning mechanism for the hose as well as proper guiding of said hose when it is pulled from an idle position within the fuel dispensing unit to an operating position outside of the fuel dispensing unit. Also, the construction of the fuel dispensing unit must be robust if several hoses along with the means for controlling them are to be incorporated in the fuel dispensing unit.

[0008] Further, when pulling out a hose from the fuel dispensing unit through an opening, particularly when the hose is not pulled straight out from the opening, the hose may be torn against a side of the opening sides of the opening in the fuel dispensing unit. As a result this may shorten the lifespan of the hose. In general, this problem may be a function of the extendable length of the hose.

[0009] In view of the above, an objective of the invention is to solve or at least reduce the problems discussed above.

[0010] It is thus an object of the present invention to provide improved means for handling a hose. It is a further object of the present invention to provide improved means for reducing the wear and tear of a hose. It is a further object of the present invention to provide improved means for extracting a hose from, and retracting a hose into, a fuel dispensing unit. It is a further object of the present invention to provide improved means for enabling simpler handling of a fuel dispensing hose for a user.

[0011] Generally, the above objectives are achieved by the attached independent patent claims.

[0012] According to a first aspect, the present invention is realized by a hose guider.

[0013] There is thus disclosed a hose guider comprising a main body comprising a first side and a second side, and a main element arranged between said first side and said second side, wherein said main element is arranged to guide a hose around a first axis defined as an axis parallel with the normal of said first side and said second side of said main body, and wherein said hose guider is arranged to be pivotable around a second axis, said second axis being substantially parallel with said first axis.

[0014] The disclosed hose guider may thus enable protection of the hose. An advantage is that the hose guider provides improved means for handling a hose.

[0015] One advantage is that the hose guider reduces wear and tear of a hose.

[0016] One advantage is that the hose guider provides improved means for extracting a hose from, and retracting a hose into, a fuel dispensing unit.

[0017] One advantage is that the hose guider may act as an arm of a lever, thereby enabling extracting a hose from, and retracting a hose into, a fuel dispensing unit with a reduced applied exterior force.

[0018] One advantage is that the hose guider enables a user simpler handling of a fuel dispensing hose.

[0019] At least a first portion of the first side and a second portion of the second side of the main body may be substantially parallel. The main element may be rotatably arranged between the first portion and the second portion.

[0020] The main body and the main element may be formed as a unit.

[0021] The first side and the second side of the main body may each have a front edge. The hose guider may further comprise at least one side roller. The at least one side roller may be arranged on the front edge of at least one of the first side and the second side of the main body.

[0022] The main body may further comprise spring means. The spring means may enabling a spring effect around the second axis.

[0023] The main body may further comprise at least one spring leg. The at least one spring leg may comprise the spring means.

[0024] The hose guider may be made of a conductive plastic material.

[0025] The main body may comprise gripping means rotatably engagable with complementary gripping means, thereby guiding said hose guider around said second axis.

[0026] The gripping means may be arranged on at least one of said first side and said second side of said main body.

[0027] According to a second aspect, the present invention is realized by system comprising a hose guider and a nozzle boot. There is thus disclosed a system comprising a hose guider as disclosed above and a nozzle boot comprising the complementary gripping means.

[0028] According to a third aspect, the present invention is realized by a fuel dispensing unit comprising a hose guider. There is thus disclosed a fuel dispensing unit comprising a hose guider as disclosed above.

[0029] The fuel dispensing unit may further comprise a nozzle boot. The hose guider may be attachable to the nozzle boot.

[0030] The nozzle boot may be made of a non-conductive plastic material.

[0031] The spring means may be arranged to be in contact with a bar made of an electric conductive material. The bar may be part of the fuel dispensing unit. The bar may be part of a vertical support means of the fuel dispensing unit. The spring means may be arranged to be in contact with the nozzle boot. Thereby the hose guider may be joined to ground.

[0032] The second and third aspects may generally have the same features and advantages as the first aspect.

[0033] Other objectives, features and advantages of the present invention will appear from the following detailed disclosure, from the attached dependent claims as well as from the drawings.

[0034] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc]" are to be interpreted openly as referring to at least one instance of the element, device, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

Brief Description of the Drawings

[0035] Embodiments of the present invention will now be described in more detail, reference being made to the enclosed drawings, in which:

Fig. 1 is a front view of a fuel dispensing unit;
Fig. 2(a) is a perspective view of a hose guider;
Fig. 2(b) is a side view of a hose guider;
Fig. 2(c) is an exploded side view of a hose guider;
Fig. 2(d) is a front view of a hose guider;
Fig. 2(e) is a front view of a hose guider;
Fig. 2(f) is a front view of a hose guider;
Fig. 2(g) is a front view of a hose guider;
Fig. 2(h) is a front view of a hose guider;
Fig. 3(a) is a perspective view of an arrangement of a hose guider and a nozzle boot;
Fig. 3(b) is a side view of an arrangement of a hose guider and a nozzle boot;
Fig. 4(a) is a perspective view of a portion of a fuel dispensing unit;
Fig. 4(b) is a perspective view of a portion of a fuel dispensing unit;
Fig. 4(c) is a side view of a portion of a fuel dispensing unit; and
Fig. 4(d) is a side view of a portion of a fuel dispensing unit.

Detailed Description of Preferred Embodiments

[0036] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which certain embodiments are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

[0037] Fig. 1 shows a fuel dispensing unit 1, having a number of hose storage spaces 2, an electrical cabinet 3 comprising electronics for the fuel dispensing unit 1, a hydraulic cabinet 4 containing fuel dispensing means (not shown), e.g. fuel metering means, valves, vapour recovery system etc, and a column 5 extending vertically between and separating the electrical cabinet 3 and the hydraulic cabinet 4 from the hose storage spaces 2. The fuel dispensing unit 1 is connected to an underground fuel container (not shown). When filling up the tank of a vehicle, the fuel is pumped from the underground container by means of a pump (not shown) which is located in the hydraulic cabinet 4, and from there to the column 5 and out to a nozzle 6 via a hose. When filling-up does not take place, the hose is accommodated in a hose storage place 2 and the nozzle 6 is inserted in a nozzle boot. The hose can be handled by a hose handling device, which is arranged in the hose storage space 2. The elec-

tronics located in the electrical cabinet 3, such as means for choosing the desired type of fuel and display means for showing the chosen type of fuel, the volume of dispensed fuel etc, are securely isolated in order to encapsulate electronic components from possible presence of flammable gases. The electronics can also include a payment terminal.

[0038] Fig. 2(a) is a perspective view of a hose guider 10. Fig. 2(b) is a side view of the same. The hose guider 10 may be made of a conductive plastic material. The hose guider 10 comprises a main body 12 and a main element 14. The main body 12 comprises a first side 16a, a second side 16b and may also comprise a top side (not explicitly shown). The main element 14 is arranged between the first side 16a and the second side 16b, respectively, of the main body 12. The main element is arranged to guide a hose (not shown) around a first axis 18 defined as an axis parallel with the normal of the first side 16a and the second side 16b of the main body 12. The hose guider 10 may be pivotable around a second axis 22. According to a preferred embodiment the second axis 22 is substantially parallel with the first axis 18.

[0039] The main body 12 may furthermore comprise gripping means 20. The gripping means 20 may be engagable with complementary gripping means (not shown). The gripping means 20 may enable the hose guider 10 to be pivotable around the second axis 22.

[0040] The gripping means 20 may be arranged on at least one of the first side 16a and the second side 16b of the main body 12. Alternatively the gripping means 20 may be arranged on the top side of the main body (not shown).

[0041] The first side 16a and the second side 16b of the main body 12 may each have a front edge 24a, 24b.The hose guider 10 may further comprise at least one side roller 26a, 26b arranged on the front edge 24a, 24b of at least one of the first side 16a and the second side 16b of the main body 12. The side rollers 26a, 26b may enable a hose to be smoothly operated although the hose is not extracted or retracted in a direction perpendicular to the first axis 18.

[0042] The main body 12 may further comprise spring means 28a, 28b enabling a spring effect around the second axis 22. The spring means 28a, 28b may be at least one spring leg. The spring means 28a, 28b may be made of a metal, such as steel. Spring means made of a metal may enable reliable grounding capacity. Spring means made of a metal may be more durable than spring means made of a non-metallic material. The spring effect of spring means made of a metal may be more durable than the spring effect of spring means made of a non-metallic material. Having separate spring means 28a, 28b may enable simple manufacture of the hose guider 10.

[0043] Fig. 2(c) is an exploded side view of a hose guider, such as the hose guider 10 of Fig. 1(a). The main element 14 of the hose guider 10 of Fig. 2(c) is a hose guider wheel. Thus the main element 14 may be rotatably arranged between a first portion of the first side 16a and a second portion of the second side 16b of the main body 12. Also shown in Fig. 2(c) is part of a hose 30. The main element 14 is arranged to guide the hose 30 through the hose guider 10 around the first axis 18 from a first position behind the hose guider 10 to a second position in front of the hose guider 10.

[0044] Fig. 2(d) is a front view of a hose guider, such as the hose guider 10 of Fig. 1(a). According to a preferred embodiment the first side 16a and the second side 16b of the main body 12 are substantially parallel. Substantially parallel first 16a and second 16b sides may enable the main element 14 to rotate freely around the first axis. Substantially parallel first 16a and second 16b sides may allow the hose 30 to freely move from a first position wherein the hose 30 is in contact with the main element 14 to a second position wherein the hose 30 is not in contact with the main element 14.

[0045] In general, at least a first portion of the first side 16a and a second portion of the second side 16b of the main body 12 may be substantially parallel. The main element 14 may be rotatably arranged between the first portion and the second portion.

[0046] The main body 12 and the main element 14 may also be formed as a unit. The unit may be an integral unit. That is, the main body 12 and the main element 14 may form one and the same element.

[0047] Fig. 2(e) is a front view of a hose guider 10b according to an embodiment. The hose guider 10b is similar to the hose guider 10 of Figs.2(a)-(d). Fig. 2(e) shows a first portion 32a of the first side 16a and a second portion 32b of the second side 16b of the main body 12. Thus according to the embodiment of Fig. 2(e) the main element 14 (not explicitly shown) is placed between the first portion 32a of the first side 16a and the second portion 32b of the second side 16b of the main body 12, wherein the first portion 32a of the first side 16a and the second portion 32b of the second side 16b of the main body 12 are substantially parallel. Thereby the main element 14 may be rotatably arranged between the first portion 32a of the first side 16a and the second portion 32b of the second side 16b of the main body 12.

[0048] The first side 16a furthermore comprises a first extended portion 34a and the second side 16b comprises a second extended portion 34b, wherein the first extended portion 34a and the second extended portion 34b are arranged to diverge from each other in a direction along an extension axis extending from the hose guider 10b, wherein the extension axis is perpendicular to the first axis 18 and extends in a direction from the second axis 22 towards and beyond the first axis 18.

[0049] Such an arrangement may allow for a hose 30b having a diameter being larger than the diameter of the hose 30 of Fig. 2(c)-(d) to be guided by the hose guider 10b.

[0050] Fig. 2(f) is a front view of a hose guider 10c according to an embodiment. The hose guider 10c is similar to the hose guider 10 of Figs.2(a)-(d) and the hose guider 10b of Fig. 2(e). In comparison to the hose guider

10b of Fig. 2(e) the hose guider 10d may allow hoses 30c having diameters being as large or even larger than the diameter of the hose 30b of Fig. 2(e) to be guided by the hose guider 10c.

[0051] Fig. 2(g) is a front view of a hose guider 10d according to an embodiment. The hose guider 10d is similar to the hose guider 10 of Figs.2(a)-(d), the hose guider 10b of Fig. 2(e) and the hose guider 10c of Fig. 2 (f). Similarly to the hose guider 10b of Fig. 2(e) the first side 16a of the hose guider 10d comprises a first extended portion 36a and the second side 16b of the hose guider 10d comprises a second extended portion 36b. The first extended portion 36a and the second extended portion 36b are arranged to converge with each other in a direction along an extension axis extending from the hose guider 10d, wherein the extension axis is perpendicular to the first axis 18 and extends in a direction from the second axis 22 towards and beyond the first axis 18.

[0052] Such an arrangement may allow for a hose 30d having a diameter being smaller than the diameter of the hose 30 of Fig. 2(c)-(d) to be guided by the hose guider 10c. Such an arrangement may allow for a hose 30d to be supported by the hose guider 10d also in an idle mode, i.e. when the hose is placed in a nozzle boot.

[0053] Fig. 2(h) is a front view of a hose guider 10e according to an embodiment. The hose guider 10e is similar to the hose guider 10 of Figs.2(a)-(d), the hose guider 10b of Fig. 2(e), the hose guider 10c of Fig. 2(f) and the hose guider 10d of Fig. 2(g).

[0054] Fig. 3(a) is a perspective view of an arrangement 40 of a hose guider 10 and a nozzle boot 42, such as the nozzle boot disclosed above with reference to Fig. 1. Fig. 3(b) is a side view of the same. Alternatively the arrangement 40 may comprise a hose guider such as any one of the hose guiders 10b-10d disclosed above with references to Figs. 2(e)-(h). The nozzle boot may be made of a non-conductive plastic material. Alternatively the nozzle boot may be made of a non-conductive plastic material. The nozzle boot 42 may comprise the complementary gripping means 44. Thus the hose guiding guider 10 may be attachable to the nozzle boot 42. The hose guiding guider 10 may be attachable to the lower end of the nozzle boot 42. The hose guider 10 may be integral with the nozzle boot 42.

[0055] The gripping means 20 of the hose guider 10, 10b-10e may thus be engagable with the complementary gripping means 44 of the nozzle boot 42, thereby enabling the hose guider 10, 10b-10e to be pivotable around the second axis 22. The pivotable range may depend on the hose guider 10, 10b-10e, the gripping means 20, the complementary gripping means 44 and/or the nozzle boot 42. In general the hose guider 10, 10b-10e may be pivotable between a first state, hereinafter denoted as the idle state, and a second state, hereinafter denoted as the operating state, see below.

[0056] Fig. 4(a) is a first perspective view of a portion of a fuel dispensing unit 50, such as the fuel dispensing unit 1 of Fig. 1. Fig. 4(b) is a second perspective of the same and Figs. 4(c)-(d) are first and second side views, respectively, of the same. The fuel dispensing unit 50 comprises first and second vertical support means 52a, 52b. The vertical support means 52a, 52b may be profiles of the fuel dispensing unit 50. The vertical support means 52a, 52b may be part of a housing of the fuel dispensing unit 50. The vertical support means 52a, 52b may be metal bars.

[0057] The fuel dispensing unit 50 further comprises a hose guider, such as the hose guider 10 of Figs. 2(a)-(d), the hose guider 10b of Fig. 2(e), the hose guider 10c of Fig. 2(f) and the hose guider 10d of Fig. 2(g). The fuel dispensing unit 50 further comprises a nozzle boot, such as the nozzle boot 42 of Figs. 3(a)-(b). The nozzle boot 42 may be attachable to the vertical support means 52a, 52b.

[0058] When an arrangement 40 comprising a hose guider 10, 10b-10e and a nozzle boot 42 is implemented in a fuel dispensing unit, such as the fuel dispensing unit 50 the vertical centre axis (not explicitly shown) of the nozzle boot 42 preferably substantially coincides with the vertical centre axis (not explicitly shown) of the hose guider 10, 10b-10e. However, the hose guider 10, 10b-10e may also be mounted in a way wherein the vertical centre axis of the nozzle boot 42 does not coincide with the vertical centre axis of the hose guider 10, 10b-10e.

[0059] Friction between the hose and the hose guider 10, 10b-10e may cause static electricity to be formed. Such static electricity should be avoided in the fuel dispensing unit since electric charges may cause an explosion (or the like) when being in contact with fumes of the petrol, which fumes may be present in the fuel dispensing unit due to leakage or the like. The spring means 28a, 28b of the hose guider 10, 10b-10e may be arranged to be in contact with a bar 54 made of an electric conductive material. Thereby the hose guider 10, 10b-10e may be joined to ground. Thus as an effect static electricity may be removed from the hose guider 10, 10b-10e and/or the nozzle boot 42. The bar 54 may be a metal bar. The bar 54 may be attached to the vertical support means 52a, 52b. The bar 54 may support the vertical support means 52a, 52b.

[0060] As stated above the hose guider 10, 10b-10e may be pivotable between an idle state and an operating state. Fig. 4(c) shows the hose guider 10 in the operating state and Fig. 4(d) shows the hose guider 10 in the idle state. In the operating state the front edges 24a, 24b of the hose guider 10 may be in line with the front line of the vertical support means 52a, 52b. In the operating state the rollers 26a, 26b of the hose guider 10 may be in line with the front line of the vertical support means 52a, 52b. Thus in the idle state the front edges 24a, 24b (and the rollers 26a, 26b) may be contained inside the fuel dispensing unit 50 thereby being protected from environmental conditions, such as rain, snow, cold, sunlight, and the like. Thus in the operating state the front edges 24a, 24b (and the rollers 26a, 26b) may enable improved handling of the hose 30.

[0061] The spring means 28a, 28b may enable a spring effect around the second axis 22. In a state of relaxation the spring means 28a, 28b may enable the hose guider 10 to be in the idle state, whereas in a state of tension the spring means 28a, 28b may enable the hose guider 10 to be in the operating state. Thus, since the idle state is associated with the state of relaxation the idle state may be a preferred state by the spring means 28a, 28b.

[0062] Hence, unless the hose guider 10 is affected by an outer force, such as friction caused by a hose 30 being guided by the main element 14 of the hose guider 10, the spring means 28a, 28b may cause the hose guider 10 to stay in the idle state. Furthermore, in case the hose guider 10 is in the idle state and an outer force representing an extracting movement of the hose 30 is applied, this may cause the hose guider 10 to pivot to the operating state. Similarly, in case the hose guider 10 is in the operating state and an outer force representing a retracting movement of the hose 30 is applied, this may cause the hose guider 10 to pivot to the idle state.

[0063] The invention has mainly been described above with reference to a certain examples. However, as is readily appreciated by a person skilled in the art, other examples than the ones disclosed above are equally possible within the scope of the invention, as defined by the appended patent claims.

Claims

1. A hose guider (10, 10b, 10c, 10d) comprising a main body (12) comprising a first side (16a) and a second side (16b), and a main element (14) arranged between said first side (16a) and said second side (16b), wherein said main element (14) is arranged to guide a hose around a first axis (18) defined as an axis parallel with the normal of said first side (16a) and said second side (16b) of said main body (12), and wherein said hose guider (10, 10b, 10c, 10d) is arranged to be pivotable around a second axis (22), said second axis (22) being substantially parallel with said first axis (18).

2. The hose guider (10, 10b, 10c, 10d) according to claim 1, wherein at least a first portion (32a) of said first side(16a) and a second portion (32b) of said second side (16b) of said main body (12) are substantially parallel, and wherein said main element (14) is rotatably arranged between said first portion (32a) and said second portion (32b).

3. The hose guider (10, 10b, 10c, 10d) according to claim 1, wherein said main body (12) and said main element (14) are formed as a unit.

4. The hose guider (10, 10b, 10c, 10d) according to any one of claims 1-3, wherein said first side (16a) and said second side (16b) of said main body (12) each have a front edge (24a, 24b), said hose guider (10,10b, 10c, 10d) further comprising at least one side roller (26a, 26b) arranged on said front edge (24a, 24b) of at least one of said first side (16a) and said second side (16b) of said main body (12).

5. The hose guider (10, 10b, 10c, 10d) according to any one of claims 1-4, said main body (12) further comprising spring means (28a, 28b) enabling a spring effect around said second axis (22).

6. The hose guider (10, 10b, 10c, 10d) according to claim 5, said main body (12) further comprising at least one spring leg, said at least one spring leg comprising said spring means (28a, 28b).

7. The hose guider (10, 10b, 10c, 10d) according to any one of claims 1-6, wherein said hose guider (10, 10b, 10c, 10d) is made of a conductive plastic material.

8. The hose guider (10, 10b, 10c, 10d) according to any one of claims 1-7, said main body (12) further comprising gripping means (20) rotatably engagable with complementary gripping means (44), thereby guiding said hose guider (10, 10b, 10c, 10d) around said second axis (22).

9. The hose guider (10, 10b, 10c, 10d) according to claim 8, wherein said gripping means (20) are arranged on at least one of said first side (16a) and said second side (16b) of said main body (12).

10. A system (40) comprising a hose guider (10, 10b, 10c, 10d) according to any one of claims 8-9 and a nozzle boot (42) comprising said complementary gripping means (44).

11. A fuel dispensing unit (50) for filling up a motor vehicle, said fuel dispensing unit (50) comprising a hose guider (10, 10b, 10c, 10d) according to any one of claims 1-9.

12. The fuel dispensing unit (50) according to claim 11, further comprising a nozzle boot (42), wherein said hose guider (10, 10b, 10c, 10d) is attachable to said nozzle boot (42).

13. The fuel dispensing unit (50) according to claim 12, wherein said nozzle boot (42) is made of a non-conductive plastic material.

14. The fuel dispensing unit (50) according to any one of claims 11-13 when dependent on claim 6 , wherein said spring means (28a, 28b) are arranged to be in contact with a bar (54) made of an electric conductive material, thereby joining said hose guider (10, 10b, 10c, 10d) to ground.

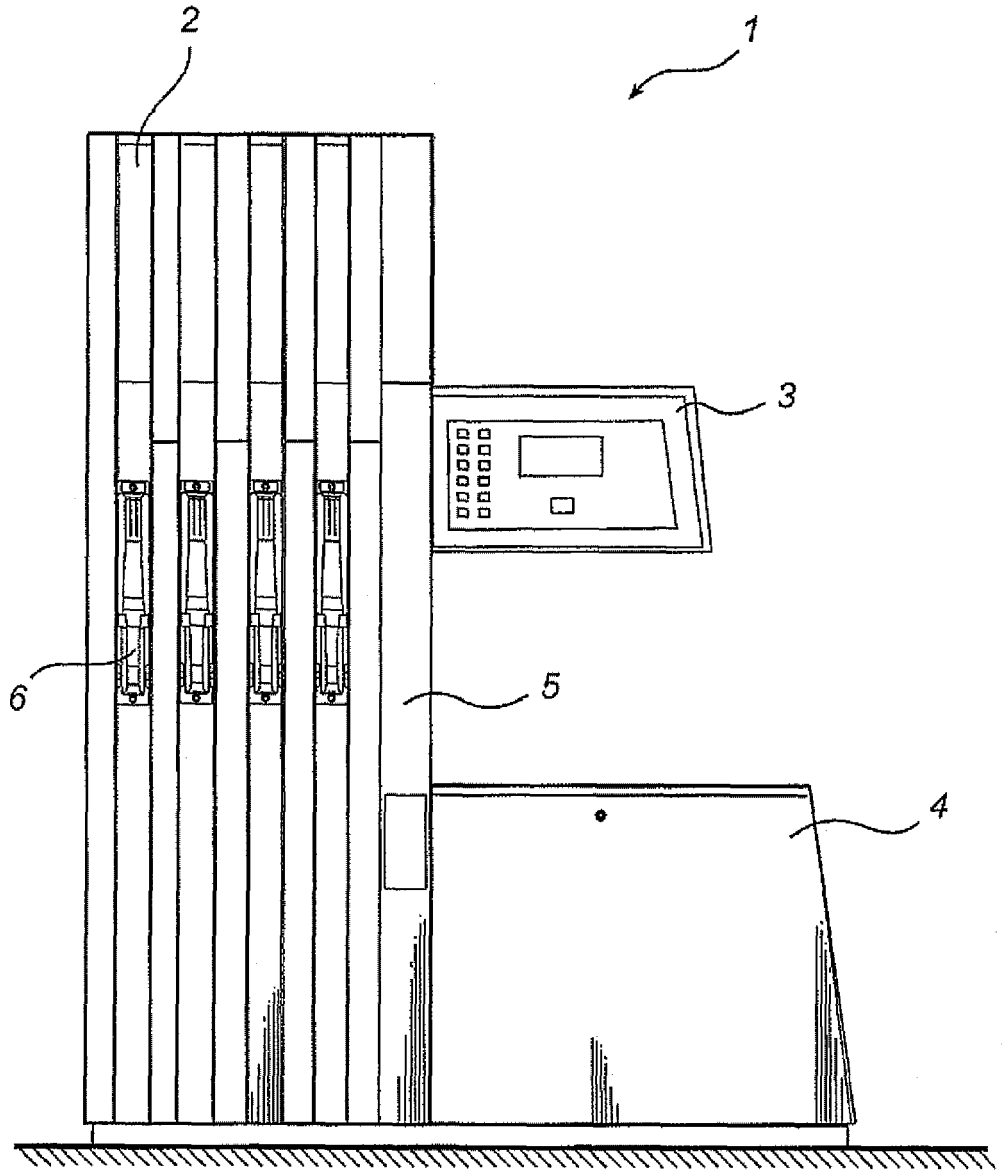


Fig. 1

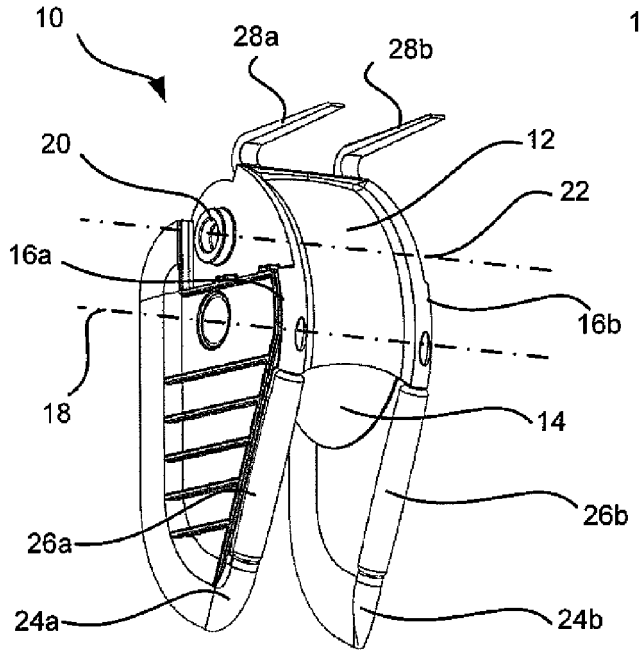


Fig. 2(a)

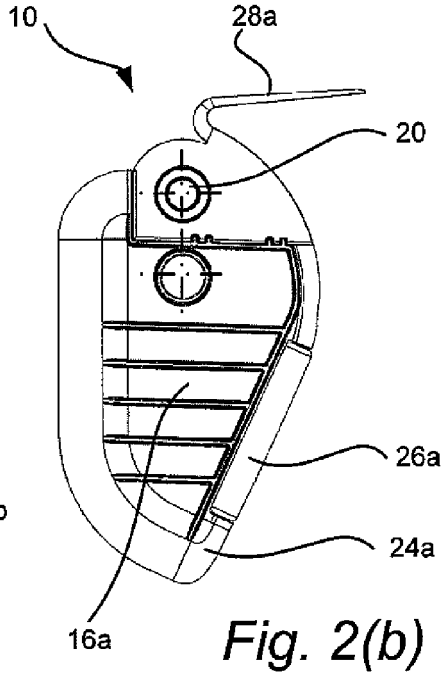


Fig. 2(b)

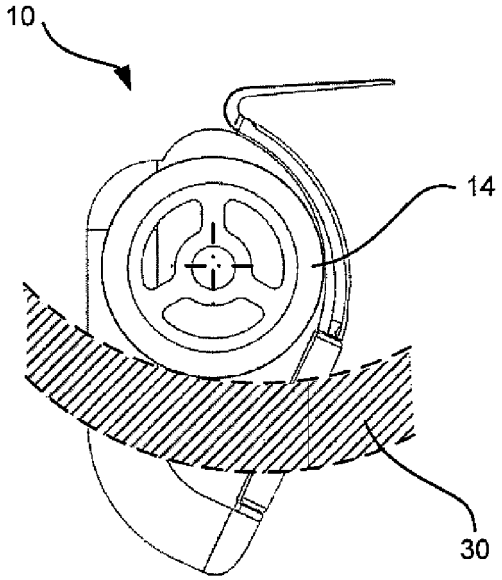


Fig. 2(c)

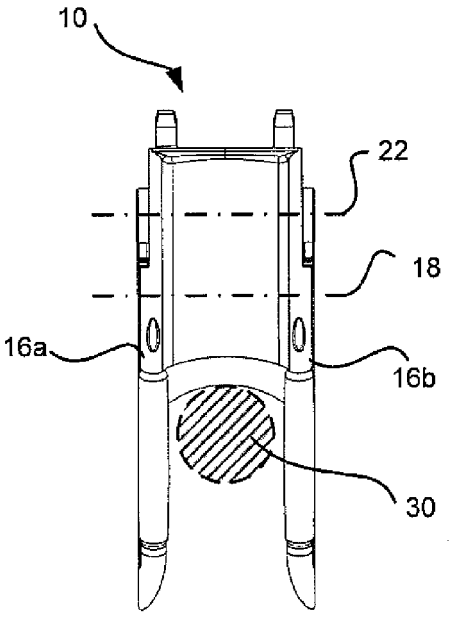


Fig. 2(d)

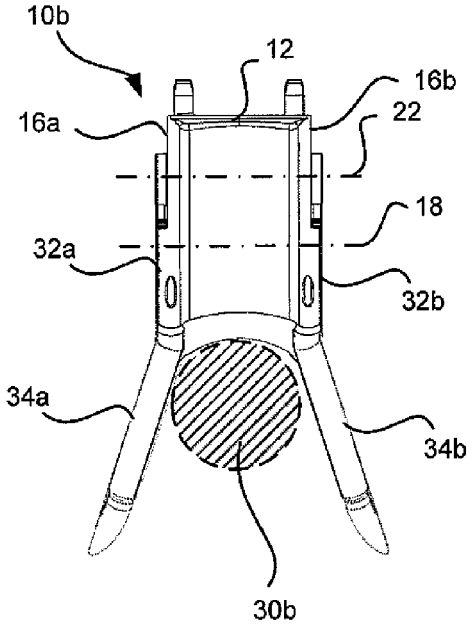


Fig. 2(e)

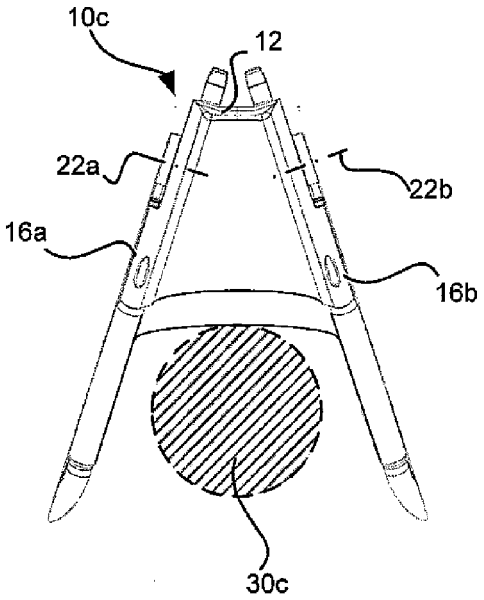


Fig. 2(f)

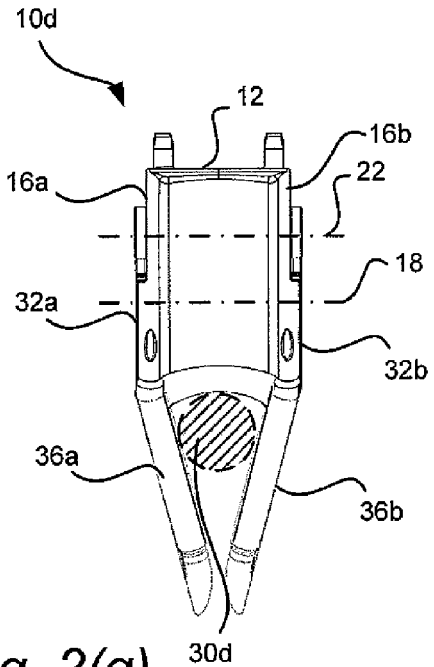


Fig. 2(g)

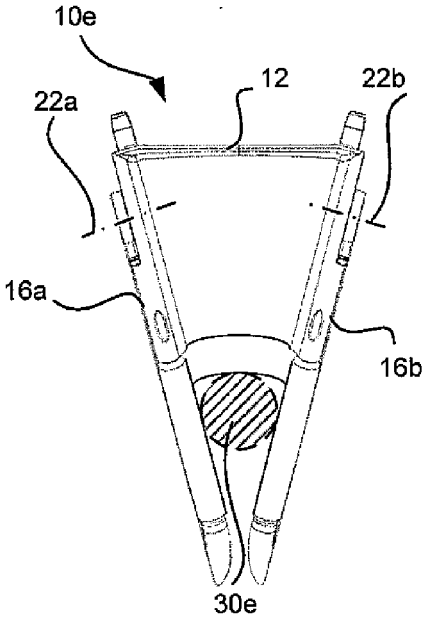


Fig. 2(h)

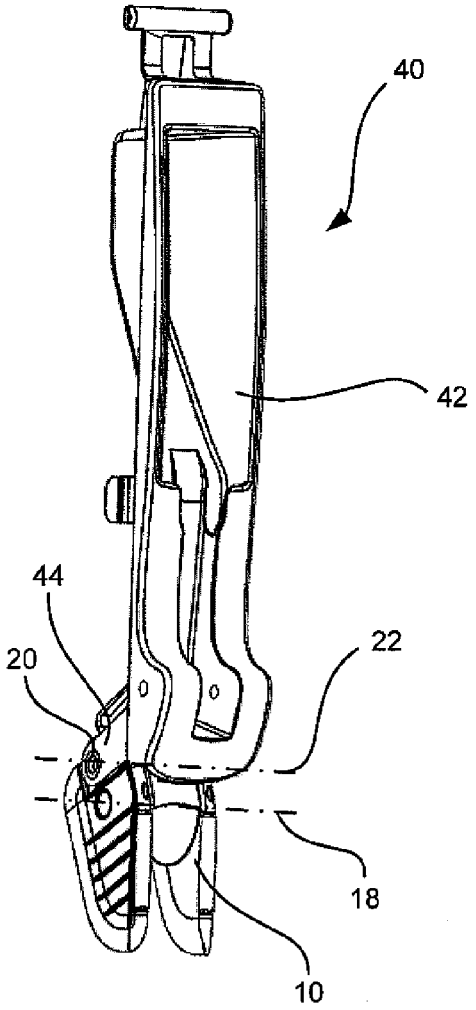
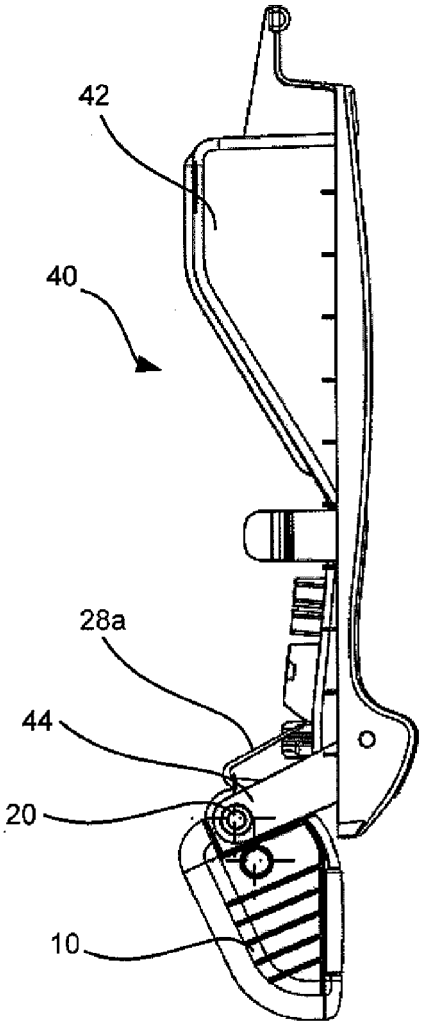


Fig. 3(a)

Fig. 3(b)



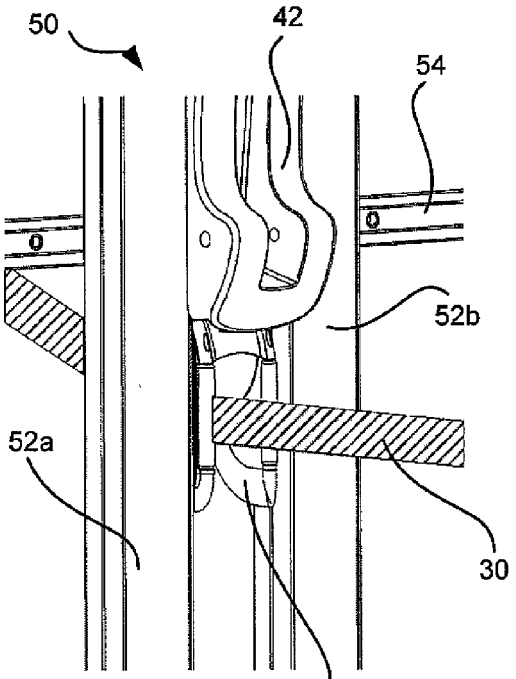


Fig. 4(a)

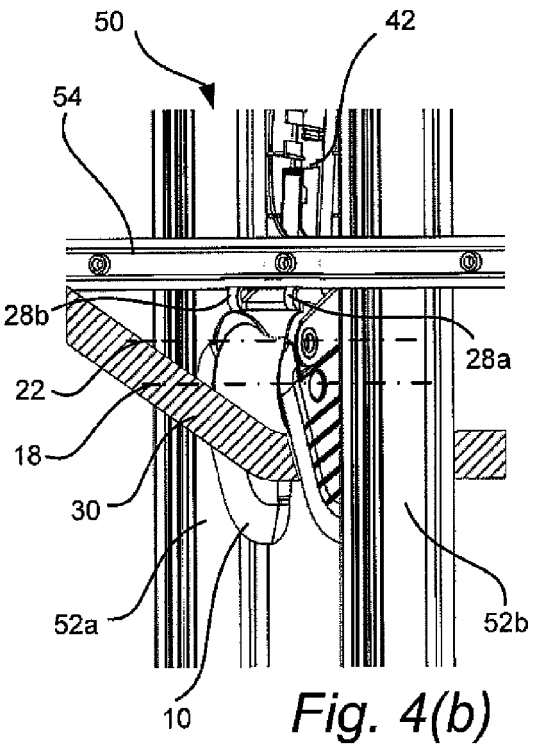


Fig. 4(b)

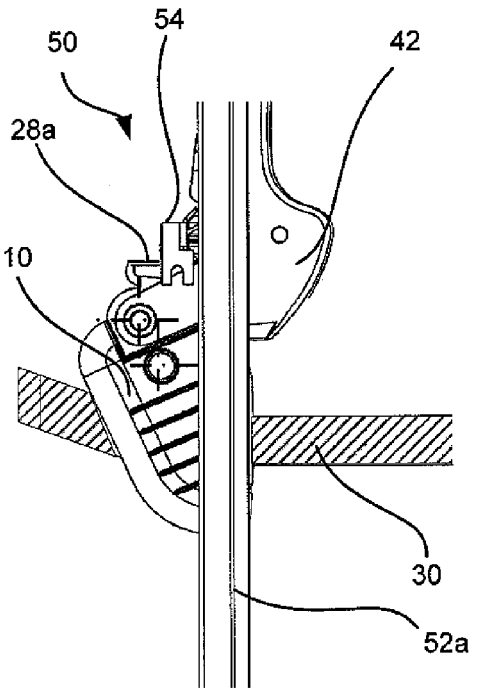


Fig. 4(c)

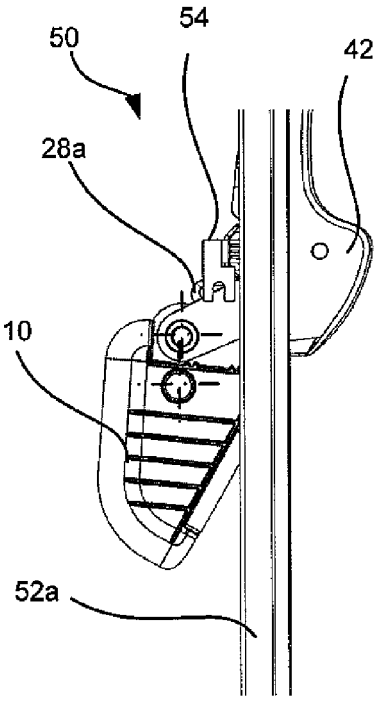


Fig. 4(d)

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EUROPEAN SEARCH REPORT

Application Number
EP 08 17 2408

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