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(54) KIT FOR REPLACING A JET FILTER ARRANGED IN AN ENGINE FUEL PUMP

EINRICHTUNG ZUM ERSETZEN EINES JET FILTERS ANGEORDNET IN EINER
MOTORKRAFTSTOFFPUMPE

KIT DE REMPLACEMENT D'UN FILTRE À JETS DISPOSÉ DANS UNE POMPE À CARBURANT
MOTEUR

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Description

TECHNICAL FIELD

[0001] The present invention relates to a kit for replacing a JET filter arranged in an engine fuel pump, as well as to a method for extracting and a method for fitting the JET filter in an engine fuel pump.

BACKGROUND OF THE INVENTION

[0002] It is known that in a fuel pump for a motor vehicle engine, a fuel pump actuator is provided in order to regulate the quantity of fuel flowing from the fuel pump to fuel injectors.

[0003] Fuel flowing through the fuel pump actuator brings impurities coming from different elements of the motor vehicle engine that are crossed by the fuel before arriving at the fuel pump actuator. These elements are for example the fuel tank, the fuel heater or other parts of the fuel pump. Impurities can also appear because of a low quality fuel.

[0004] These impurities are released from the actuator when fuel is conveyed from the actuator to the injection system of the motor vehicle engine. In order to prevent the impurities from entering the injection system, a filter, called JET filter, is provided in the fuel pump in a position close to the actuator. Thus, impurities are accumulated in the JET filter.

[0005] The accumulation of these impurities impacts the functioning of the JET filter, which must be replaced by a new one when the quantity of accumulated impurities is important.

[0006] Nevertheless, in some fuel pump configurations, the JET filter is placed in a position that is hardly accessible by using conventional tools. So, its removal from the fuel pump is difficult. In addition, by using conventional tools, a risk of introducing metallic particles inside the injection system exits.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an object of the present invention to resolve the above-mentioned problem in providing a kit for replacing a JET filter arranged in an engine fuel pump, the JET filter being placed on a lateral wall of a fuel pump cavity. the kit comprising an extractor for extracting said JET filter, a pushing rod for fitting a JET filter in the engine fuel pump, and a centering guide shaped to cooperate with the extractor and the pushing rod.

[0008] The centering guide is configured to be partially positioned in the cavity of the fuel pump. The centering guide comprises a main body including a cavity, wherein the cavity is shaped such that the JET filter can be extracted from the engine fuel pump by the extractor or can be pushed to the engine fuel pump by the pushing rod.

[0009] Thanks to the claimed kit, the JET filter is reached by the extractor when the extractor and the

centering guide cooperate. Hence, the JET filter can be removed from the fuel pump.

[0010] In embodiments, the extractor comprising a handle and a bar, wherein a first end of said bar comprises a threaded surface to engage the JET filter.

[0011] In an embodiment of the extractor, the bar is shaped to cooperate with the centering guide, the extractor being provided with a nut surrounding a portion of said bar.

[0012] In embodiments, the pushing rod comprising a handle and a bar, wherein a first end of said bar is shaped to push the JET filter to a final position in the engine fuel pump.

[0013] In an embodiment of the pushing rod the bar is shaped to cooperate with the centering guide.

[0014] In an embodiment of the centering guide, the main body comprises a cylindrically shaped portion.

[0015] In an embodiment of the centering guide, the main body comprises a trapezoidal prism shaped portion.

[0016] In an embodiment of the centering guide, the trapezoidal prism shaped portion comprises an entry orifice of the cavity of the main body, and the cylindrically shaped portion comprises an exit orifice of said cavity.

[0017] In an embodiment of the centering guide, the entry orifice is arranged on a face of the trapezoidal prism shaped portion, the face being substantially perpendicular to a longitudinal axis of the cavity.

[0018] In an embodiment of the centering guide, the longitudinal axis of the cavity is tilted in relation to a longitudinal axis of the cylindrically shaped portion.

[0019] The invention further extends to a method for extracting the JET filter arranged in the engine fuel pump by means of the present kit, the method comprising the steps of:

- a) positioning the centering guide in the engine fuel pump;
- b) inserting the extractor in the cavity of the centering guide;
- c) making a hole on the JET filter by hitting the handle of the extractor in a direction substantially parallel to the longitudinal axis of the cavity;
- d) screwing the first end of the bar of the extractor to the JET filter; and
- e) extracting the extractor screwed to the JET filter from the cavity of the centering guide.

[0020] The invention yet further extends to a method for fitting the JET filter in the engine fuel pump by means of the present kit, the method comprising the steps of:

- a) positioning the centering guide in the engine fuel pump;
- b) sliding the JET filter inside the cavity of the centering guide by means of the pushing rod;
- c) installing the JET filter in the fuel pump by hitting the handle of the pushing rod in the direction substantially parallel to the longitudinal axis of the cavity;

and

d) extracting the pushing rod from the cavity of the centering guide.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The present invention is now described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a detail of an engine fuel pump.

Figure 2 shows a schematic longitudinal section of an assembly comprising a JET filter extractor and the JET filter centering guide as per the present invention.

Figure 3 shows a schematic longitudinal section of an assembly comprising a JET filter pushing rod as per the present invention and the JET filter centering guide of figure 2.

Figure 4 shows a schematic frontal view of the JET filter extractor of figure 2.

Figure 5 shows a schematic longitudinal section of the JET filter extractor of figure 2.

Figure 6 shows a schematic frontal view of the JET filter pushing rod of figure 3.

Figure 7 shows a detail of the JET filter pushing rod of figure 4.

Figure 8 shows a schematic longitudinal section of the JET filter centering guide of figures 2 and 3.

Figure 9 shows a schematic transversal view of the JET filter centering guide of figures 2 and 3 from a first angle.

Figure 10 shows a schematic transversal view of the JET filter centering guide of figures 2 and 3 from a second angle substantially opposite to the first angle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] As shown in figure 1, an engine fuel pump 1 comprises a cavity 2, and a JET filter 3 placed on a lateral wall of the cavity 2. The cavity 2 has advantageously a substantially cylindrical shape extending along an axial direction A. The axial direction A corresponds to longitudinal axis of the cavity (2).

[0023] The cavity 2 is in particular shaped to install therein a fuel pump actuator. The fuel pump actuator is further screwed to a first hole 4 and to a second hole 5 arranged on a face 6 of the engine fuel pump 1, the face 6 being substantially perpendicular to the axial direction A of the cavity 2. The first hole 4 and the second hole 5 are positioned next to the cavity 2, on diagonally opposite positions between them.

[0024] The JET filter 3 advantageously has a substantially cylindrical shape. A base of the JET filter 3 comprises a grid allowing retaining impurities. A lateral wall of the JET filter 3 comprises a threaded surface.

[0025] The present invention relates to a JET filter extractor 10 and a centering guide 32 shaped to allow the

extraction of the JET filter 3 from the fuel pump 1 when the extractor 10 and the centering guide 32 are used in combination. The present invention further relates to a JET filter pushing rod 20 shaped to allow the fitting of the JET filter 3 in the fuel pump 1 when used in combination with the centering guide 32.

[0026] Figure 2 shows a JET filter extraction assembly used in order to apply a method for extracting the JET filter 3 from the fuel pump 1. The JET filter extraction assembly includes the extractor 10 and the centering guide 32. The centering guide 32 is partially positioned in the cavity 2 of the fuel pump 1, while the extractor 10 goes through the centering guide 32.

[0027] Figure 3 shows a JET filter insertion assembly used in order to apply a method for fitting the JET filter 3 in the fuel pump 1. The JET filter insertion assembly includes the pushing rod 20 and the centering guide 32. As in the JET filter extraction assembly, the centering guide 32 is partially positioned in the cavity 2 of the fuel pump 1, while the pushing rod 20 goes through the centering guide 32.

[0028] The method for extracting the JET filter 3 and the method for fitting the JET filter 3 will be later described.

[0029] Now, the extractor 10 will be described. The extractor 10 is shaped to engage the JET filter 3, so that the JET filter 3 can be extracted from the fuel pump 1. The extractor 10 comprises a handle 11, a bar 12 and a nut 13. The handle 11 and the bar 12 extend along an axial direction B of the extractor 10. A length L1 of the extractor 10 is preferably comprised between 80 mm and 90 mm, preferably between 83 mm and 87 mm.

[0030] As shown in figure 1, the handle 11 comprises a rough portion 14 placed between two substantially smooth portions 15. The handle 11 is made of a metallic material, preferably of unalloyed steel. In particular, the handle 11 is made of a C35 unalloyed steel. Advantageously the handle 11 has a cylindrical shape. A diameter d1 of the handle 11 is comprised in a range between 14 mm and 16 mm, preferably between 14.8 mm and 15.2 mm.

[0031] The bar 12 comprises a first end 16, a second end 17 and a central part 18, the central part 18 being positioned between the first and the second ends 16, 17. The first end 16 comprises a threaded surface. On the contrary, a surface of the second end 17 and a surface of the central part 18 are substantially smooth.

[0032] Advantageously, the second end 17 and the central part 18 have a substantially circular section, a diameter d3 of the central part 18 being larger than a diameter d2 of the second end 17. The diameter d3 is comprised in a range from 5 mm to 6 mm, preferably from 5.3 to 5.8 mm.

[0033] The bar 12 is made of a metallic material, preferably of unalloyed steel. In particular, the bar 12 is made of C45 unalloyed steel.

[0034] The handle 11 and the bar 12 are firmly attached between them. In particular, as shown in figure 5, the

second end 17 of the bar 12 is inserted inside a cavity 19 of the handle 11, the cavity 19 extending along the axial direction B of the extractor 10.

[0035] Advantageously, a screw connection is established between the handle 11 and the second end 17 of the bar 12. Alternatively, the connection between the handle 11 and the second end 17 of the bar 12 is established by adhesive means. The adhesive means are, for example, a layer of glue between the surface of the second end 17 and a surface of the cavity 19. The attachment can also be established by using both the screw connection and the adhesive means.

[0036] Preferably, the cavity 19 has a circular section having a diameter substantially equal to the diameter d2 of the second end 17.

[0037] The nut 13 is coupled to the central part 18 of the bar 12. In particular, the nut surrounds a portion of the central part 18, said portion being close to the handle 11. Preferably, the nut 13 comprises an external surface and an internal surface. The external surface is substantially hexagonal, while the internal surface is substantially circular.

[0038] The internal surface of the nut 13 is in contact with the surface of the central part 18, a diameter of the internal surface of the nut 13 being substantially equal to a diameter of the central part 18. Preferably, the nut 13 is a M5 type nut.

[0039] A length L2 of the first end 16 of the bar is comprised in a range between 14 mm and 17 mm, preferably between 15 mm and 16 mm.

[0040] The threaded surface of the first end 16 of the bar 12 is shaped to cooperate with the JET filter. In particular, said threaded surface is adapted to cooperate with the threaded surface of the lateral wall of the JET filter. Hence, the JET filter can be hooked in the bar 12 by screwing the bar 14 around the B-axis.

[0041] Figure 6 shows the JET filter pushing rod 20. The pushing rod 20 is used to push the JET filter 3 inside the cavity of the centering guide 32, so that the JET filter 3 can be fitted in the fuel pump 1. The pushing rod 20 comprises a handle 21 and a bar 22 extending along an axial direction C of the pushing rod 20. Preferably, the handle 21 and the bar 22 constitute a single piece having a length L3 comprised in a range from 55 mm to 65 mm, preferably from 58 mm to 62 mm.

[0042] The pushing rod 20 is made of a metallic material, preferably of unalloyed steel. In particular, the handle 21 and the bar 22 are made of a C35 unalloyed steel.

[0043] The handle 21 comprises a rough portion 23 placed between two substantially smooth portions 24. Advantageously the handle 21 has a cylindrical shape. A diameter d4 of the handle 21 is comprised in a range between 9 mm and 11 mm, preferably between 9.8 mm and 10.2 mm.

[0044] The bar 22 comprises a first end 25 and a main part 26, the main part 26 being positioned between the first end 25 and the handle 21. In particular, a length L4 of the main part 26 is comprised between 40 mm and 45

mm, preferably between 42 mm and 43 mm. A length L5 of the first end 25 is comprised between 4 mm and 5 mm, preferably between 4.3 mm and 4.8 mm.

[0045] As detailed in figure 4, the first end 25 comprises a first portion 27 and a second portion 28. The first portion 27 extends between the main part 25 and the second portion 28, over a length L6 comprised in a range from 2.5 mm to 3.5 mm, preferably from 2.8 mm to 3.2 mm. A length L7 of the second portion 28 is comprised in a range from 1 mm to 2 mm, preferably from 1.3 mm to 1.8 mm.

[0046] A surface of the first end 25 and a surface of the main part 26 are substantially smooth.

[0047] Advantageously, the first end 25 and the main part 26 have a substantially circular section. A diameter d5 of the main part is in particular comprised between 5 mm and 5.5 mm, preferably between 5.3 mm and 5.4 mm.

[0048] A diameter d6 of the first portion 27 is larger than a diameter d7 of the second portion 28. In particular, the diameter d5 of the first portion 27 is comprised in a range from 3.7 mm to 4.3 mm, preferably from 3.9 mm to 4.1 mm. The diameter d7 of the second portion 28 is in particular comprised in a range from 3.4 mm to 3.8 mm, preferably between 3.5 mm to 3.7 mm.

[0049] An extremity of the first end 25 comprises a hollow 29 adapted to accommodate the JET filter. The hollow 29 extends along a fraction of the first portion 27 and along the integrality of the second portion 28. The hollow 29 includes a first part 30 and a second part 31. Advantageously, the first part 30 has a substantially conical shape, while the second part 31 has a substantially cylindrical shape. A length L8 of the second part 31 is comprised in a range from 1 mm to 1.5 mm, preferably from 1.2 mm to 1.3 mm. A diameter d7 of the second part 31 is comprised in a range from 2.4 mm to 3 mm, preferably between 2.6 mm to 2.8 mm.

[0050] Figure 8 shows the centering guide 32. The centering guide 32 is shaped to guide the access of the extractor 10 to the JET filter 3 installed in the fuel pump 1, as well as to guide the extraction of the JET filter 3 from the fuel pump 1 by means of the extractor 10. The centering guide 32 is further shaped to guide the installation of the JET filter in the fuel pump 1 by means of the pushing rod 20.

[0051] The centering guide 32 is made of a metallic material, preferably of unalloyed steel. In particular, the centering guide 32 is made of C35 unalloyed steel.

[0052] The centering guide comprises a main body 33 including a substantially cylindrically shaped portion 34 juxtaposed to a substantially trapezoidal prism shaped portion 35.

[0053] The cylindrically shaped portion 34 is shaped to be inserted in the cavity 2 of the fuel pump 1 when the actuator is not installed therein. In particular, the cylindrically shaped portion 34 extends along an axial direction D over a length L9 comprised in a range from 16 mm to 17 mm, preferably from 16.3 mm to 16.8 mm. A diameter d8 of the cylindrically shaped portion 34 is comprised in a range from 21.5 mm to 22.5 mm, preferably from

21.7 mm to 22.3 mm.

[0054] The trapezoidal prism shaped portion 35 comprises a front face 36 opposite to a rear face 37. The front face 36 and the rear face 37 are substantially perpendicular to the axial direction D. In particular, when the cylindrically shaped portion 34 is completely inserted in the cavity 2, the rear face 37 contacts the face 6 of the fuel pump.

[0055] The trapezoidal prism shaped portion 35 further comprises an upper face 38 and a lower face 39. The upper face 38 is substantially parallel to the axial direction D, while the lower face 39 is inclined in relation to the axial direction D. In particular, the lower face 39 forms an angle with the axial direction D comprised in a range from 30° to 35°, preferably from 31° to 32°.

[0056] The trapezoidal prism shaped portion 35 comprises a hole 40 extending from the front face 36 to the rear face 37 of the trapezoidal prism shaped portion 35. A length L10 of the hole 40 corresponds to a distance between the front face 36 and the rear face 37. In particular, the length L10 of the hole 40 is comprised between 14 mm and 16 mm, preferably between 14.5 mm and 15.5 mm.

[0057] The hole 40 allows the centering guide 32 to be screwed to the fuel pump 1. In particular, the hole 40 is positioned in the trapezoidal prism shaped portion 35 such that when the cylindrically shaped portion 34 is inserted in the cavity 2, the hole 40 lies in front of the first hole 4 arranged in the fuel pump 1. Thus, a screw can be arranged between the hole 40 and the first hole 4 in order to fix the centering guide 32 to the fuel pump 1.

[0058] The main body 33 further comprises a cavity 41 extending along the cylindrically shaped portion 34 and the trapezoidal prism shaped portion 35. In particular, the cavity 41 extends along an axial direction E, the axial direction being perpendicular to the lower face 39. The axial direction E corresponds to a longitudinal axis of the cavity. Advantageously the cavity 41 has a circular section.

[0059] The cavity 41 comprises a first portion 42 and a second portion 43, a diameter d9 of the first portion 42 being larger than a diameter d10 of the second portion 43. In particular, the diameter d9 of the first portion 42 is comprised in a range from 5.7 mm to 5.9 mm, preferably from 5.75 mm to 5.85 mm. The diameter d10 of the second portion 43 is comprised in a range from 5.5 mm to 5.7 mm, preferably between 5.55 mm and 5.65 mm.

[0060] The cavity 41 is shaped such that the bar 12 of the extractor 10 or the bar 22 of the pushing rod 20 can slide inside said cavity 41. Thus, the diameters d9 and d10 are necessarily larger than the diameter d3 of the bar 12 and larger than the diameter d5 of the bar 22. In particular, the diameter d10 of the second portion 43 is slightly larger than the diameter d3, so that the central part 18 of the bar 12 remains in contact with a lateral wall of the second portion 43 when the extractor 10 is inserted in the cavity 41.

[0061] As shown in figure 7, an entry orifice 44 is ar-

ranged on the lower face 39 of the trapezoidal prism shaped portion 35. The entry orifice 44 connects with the cavity 41. Advantageously, a diameter of the entry orifice 44 is equal to the diameter d9 of the first portion 42 of the cavity 41.

[0062] As shown in figure 8 an exit orifice 45 is arranged on the upper face 38 of the trapezoidal prism shaped portion 35. The exit orifice 45 connects with the cavity 41. Advantageously, a diameter of the exit orifice 45 is equal to the diameter d10 of the second portion 43 of the cavity 41.

[0063] The cavity 41 is further shaped such that when the nut 13 surrounding the bar 12 contacts the lower face 39 of the centering guide 32, the first end 16 of the bar 12 projects from the cavity 41 through the exit orifice 45. Likewise, the cavity 41 is shaped such that when the handle 21 of the pushing rod 20 contacts the lower face 39 of the centering guide 32, the first end 25 of the bar 22 projects from the cavity 41 through the exit orifice 45. Thus, the cavity 41 extends along the axial direction E over a length L11 comprised between 30 mm and 40 mm, preferably between 33 mm and 38 mm. Advantageously, a length L12 of the first portion 42 of the cavity is comprised in a range from 4 mm to 6 mm, preferably from 4.5 mm to 5.5 mm.

[0064] A kit for replacing the JET filter 3 comprises at least one of the extractor 10, the pushing rod 20 or the centering guide 32.

[0065] Now, the method of extracting the JET filter from the fuel pump 1 by means of the extraction assembly of figure 2 is going to be described.

[0066] In particular, the method for extracting the JET filter 3 comprises a first step of positioning the centering guide 32 in the engine fuel pump 1. The centering guide 32 is positioned in the fuel pump 1 by inserting the cylindrically shaped portion 34 inside the cavity 2 such that the rear face 37 of the trapezoidal prism shaped portion 35 contacts the face 6 of the fuel pump 1, and the hole 40 of the centering guide 32 lies in front the hole 4 of the fuel pump 1. Thus, the centering guide 32 can be screwed to the fuel pump 1.

[0067] Secondly, the extractor 10 is inserted in the cavity 41 of the centering guide 32. The bar 12 of the extractor 10 is in particular inserted in the cavity 41 through the entry orifice 44. Then, a first force in a direction substantially parallel to the axial direction E of the cavity is applied on the extractor 10 such that the bar 12 slides along the cavity 41 until the first end 16 of the bar 12 contacts the JET filter 3.

[0068] When the first end 16 of the bar 12 is in contact with the JET filter, a hole on the JET filter 3 must be made on the JET filter 3. In order to make said hole on the JET filter 3, the handle 11 of the extractor 10 is hit in the direction substantially parallel to the axial direction E of the cavity 41 until the nut 13 of the extractor 10 contacts the lower face 39 of the centering guide 32.

[0069] Once the hole is done on the JET filter 3, the first end 16 of the bar 12 is screwed to the JET filter 3.

In particular, the threaded surface of the first end 16 is screwed to the threaded surface of the JET filter 3.

[0070] Finally, the extractor 10 screwed to the JET filter 3 is extracted from the cavity 41 of the centering guide 32. Thus, the JET filter 3 is also extracted. The extraction is possible by applying a second force in a direction substantially parallel to the axial direction E of the cavity. In particular, the second force is applied in a substantially opposite direction than the first force. Since the diameter d10 of the second portion 43 of the cavity 41 is slightly larger than the diameter d3 of the bar 12, the extraction of the extractor 10 from the cavity 41 may require the use of an adjustable wrench applied on the nut 13.

[0071] Now, the method for fitting the JET filter 3 in the fuel pump 1 by means of the insertion assembly shown in figure 3.

[0072] In order to fit the JET filter 3 in the fuel pump 1, the centering guide 32 must be firstly positioned in the fuel pump 1. As for the method for extracting the JET filter 3, the positioning of the centering guide 32 in the fuel pump 1 is carried out by inserting the cylindrically shaped portion 34 inside the cavity 2 such that the rear face 37 of the trapezoidal prism shaped portion 35 contacts the face 6 of the fuel pump 1, and such that the hole 40 of the centering guide 32 lies in front the hole 4 of the fuel pump 1. Thus, the centering guide 32 can be screwed to the fuel pump 1.

[0073] Secondly, the JET filter 3 slides inside the cavity 41 of the centering guide 32 by means of the pushing rod 20. In particular, the sliding of the JET filter 3 inside the cavity 41 is carried out by pushing the JET filter 32 with the first end 25 of the bar 22 of the pushing rod 20. The pushing rod 20 is pushed along the cavity by applying a first force in a direction substantially parallel to the axial direction E of the cavity 41. Said first force is transmitted to the JET filter 3 because of the contact between the pushing rod 20 and the JET filter 3, so that the JET filter 3 slides inside the cavity 41.

[0074] The JET filter 3 and the pushing rod 20 are in particular inserted inside the cavity 41 through the entry orifice 44. Before inserting the JET filter 3 in the cavity 41, an end of the JET filter 3 is positioned on the hollow 29 of the pushing rod 20. Then, the pushing rod 20 with the JET filter 3 placed on the hollow 29 are inserted in the cavity 41. Alternatively, the JET filter 3 is inserted directly in the cavity 41 before inserting the pushing rod 20 in the cavity 41.

[0075] Then, the JET filter 3 is installed in the fuel pump 1 by hitting the handle 21 of the pushing rod 20 in the direction substantially parallel to the axial direction E of the cavity 41 until the handle 21 of the pushing rod 20 contacts the lower face 39 of the centering guide 32. In this configuration, the JET filter 3 is in a final position. In the final position the JET filter 3 is correctly installed in the fuel pump 1.

[0076] Finally, the pushing rod 20 is extracted from the cavity 41 of the centering guide 32. The extraction is possible by applying a second force in a direction substan-

tially parallel to the axial direction E of the cavity 41. In particular, the second force is applied in a substantially opposite direction in relation to the first force.

[0077] Please note that the invention is not limited to the illustrated embodiments. In particular, the method for extracting the JET filter 3 and the method for fitting the JET filter 3 can be carried out successively, so that the centering guide 32 is already positioned in the fuel pump 1 before the start of the method for fitting the JET filter 3 in the fuel pump. Thus, the first step of positioning the centering guide 32 in the fuel pump 1 in the method for fitting the JET filter 3 can be omitted.

[0078] Additionally, the centering guide 32 is not limited to the described shape, other shapes of the centering guide 32 being possible.

[0079] Moreover, the dimensions of the extractor 10, the pushing rod 20 and the centering guide 32 may change in order to adapt them to a diversity of fuel pumps.

20 LIST OF REFERENCES

[0080]

A	axial direction of the cavity
B	axial direction of the JET filter extractor
C	axial direction of the JET filter pushing rod
D	axial direction of the cylindrically shaped portion
E	axial direction of the cavity of the centering guide
L1	length of the extractor
L2	length of the first end of the extractor's bar
L3	length of the pushing rod
L4	length of the main part of the pushing rod
L5	length of the first end of the pushing rod
L6	length of the first portion of the first end of the pushing rod
L7	length of the second portion of the first end of the pushing rod
L8	length of the second part of the hollow
L9	length of the cylindrically shaped portion
L10	length of the hole
L11	length of the cavity of the centering guide
L12	length of the first portion of the cavity of the centering guide
d1	diameter of the handle of the extractor
d2	diameter of the second end of the bar of the extractor
d3	diameter of the central part of the bar of the extractor
d4	diameter of the handle of the pushing rod
d5	diameter of the main part of the bar of the pushing rod
d6	diameter of the first portion of the first end of the pushing rod's bar
d7	diameter of the second portion of the first end of the pushing rod's bar
d8	diameter of the cylindrically shaped portion
d9	diameter of the first portion of the cavity of the centering guide

d10 diameter of the second portion of the cavity of the centering guide

1 engine fuel pump

2 cavity

3 JET filter

4 first hole

5 second hole

6 face of the engine fuel pump

10 JET filter extractor

11 handle of the JET filter extractor

12 bar of the JET filter extractor

13 nut of the JET filter extractor

14 rough portion of the JET filter extractor's handle

15 smooth portion of the JET filter extractor's handle

16 first end of the JET filter extractor's bar

17 second end of the JET filter extractor's bar

18 central part of the JET filter extractor's bar

19 cavity of the JET filter extractor's handle

20 JET filter pushing rod

21 handle of the JET filter pushing rod

22 bar of the JET filter pushing rod

23 rough portion of the JET filter pushing rod's handle

24 smooth portion of the JET filter pushing rod's handle

25 first end of the JET filter pushing rod's bar

26 main part of the JET filter pushing rod

27 first portion of the first end of the JET filter pushing rod

28 second portion of the first end of the JET filter pushing rod

29 hollow

30 first part of the hollow

31 second part of the hollow

32 centering guide

33 main body of the centering guide

34 cylindrically shaped portion of the main body

35 trapezoidal prism shaped portion of the main body

36 front face of the trapezoidal prism shaped portion

37 rear face of the trapezoidal prism shaped portion

38 upper face of the trapezoidal prism shaped portion

39 lower face of the trapezoidal prism shaped portion

40 hole

41 cavity of the centering guide

42 first portion of the cavity of the centering guide

43 second portion of the cavity of the centering guide

44 entry orifice

45 exit orifice

Claims

1. A kit for replacing a JET filter (3) arranged in an engine fuel pump (1), the JET filter (3) being placed on a lateral wall of a fuel pump cavity (2), the kit comprising an extractor (10) for extracting said JET filter (3), a pushing rod (20) for fitting a JET filter (3) in the engine fuel pump (1), and a centering guide (32)

shaped to cooperate with the extractor (10) and with the pushing rod (20); wherein said centering guide (32) is configured to be partially positioned in the cavity (2) of the fuel pump (1), and

said centering guide (32) comprises a main body (33) including a cavity (41), wherein the cavity is shaped such that the JET filter (3) can be extracted from the engine fuel pump (1) by the extractor (10) or can be pushed to the engine fuel pump (1) by the pushing rod (20).

2. The kit of claim 1, wherein the extractor (10) comprising a handle (11) and a bar (12), wherein a first end (16) of said bar (12) comprises a threaded surface to engage the JET filter (3).

3. The kit of claim 2, wherein the bar (12) is shaped to cooperate with the centering guide (32), the extractor (10) being provided with a nut (13) surrounding a portion of said bar (12).

4. The kit of any one of the preceding claims, wherein the pushing rod (20) comprises a handle (21) and a bar (22), wherein a first end (25) of said bar (22) is shaped to push the JET filter (3) to a final position in the engine fuel pump (1).

5. The kit of claim 4, wherein the bar (22) is shaped to cooperate with the centering guide (32).

6. The kit as per any one of the preceding claims, wherein the main body (33) comprises a cylindrically shaped portion (34).

7. The kit as per any one of the preceding claims, wherein the main body (33) comprises a trapezoidal prism shaped portion (35).

8. The kit as per claims 6 and 7, wherein the trapezoidal prism shaped portion (35) comprises an entry orifice (44) of the cavity (41) of the main body (33), and the cylindrically shaped portion (34) comprises an exit orifice (45) of said cavity (41).

9. The kit as per claim 8, wherein the entry orifice (44) is arranged on a face (39) of the trapezoidal prism shaped portion (35), the face (39) being perpendicular to a longitudinal axis (E) of the cavity (41).

10. The kit as per claim 9, wherein the longitudinal axis (E) of the cavity (41) is tilted in relation to a longitudinal axis of the cylindrically shaped portion (34).

11. A method for extracting a JET filter (3) arranged in an engine fuel pump (1) by means of the kit as per any one of the preceding claims, the method comprising the steps of:

- a) positioning the centering guide (32) in the engine fuel pump (1);
 b) inserting the extractor (10) in the cavity (41) of the centering guide (32);
 c) making a hole on the JET filter (3) by hitting the handle (11) of the extractor (10) in a direction substantially parallel to the longitudinal axis (E) of the cavity (41);
 d) screwing the first end (16) of the bar (12) of the extractor (10) to the JET filter (3); and
 e) extracting the extractor (10) screwed to the JET filter (3) from the cavity (41) of the centering guide (32).
- 12.** A method for fitting a JET filter (3) in an engine fuel pump (1) by means of the kit as per any one of claims 1 to 10, the method comprising the steps of:
- a) positioning the centering guide (32) in the engine fuel pump (1);
 b) sliding the JET filter (3) inside the cavity (41) of the centering guide (32) by means of the pushing rod (20);
 c) installing the JET filter (3) in the fuel pump (1) by hitting the handle (21) of the pushing rod (20) in a direction substantially parallel to the longitudinal axis (E) of the cavity (41); and
 d) extracting the pushing rod (20) from the cavity (41) of the centering guide (32).
- Patentansprüche**
- 1.** Kit zum Ersetzen eines JET-Filters (3), der in einer Motorkraftstoffpumpe (1) angeordnet ist, wobei der JET-Filter (3) auf einer seitlichen Wand eines Kraftstoffpumpenhohlraums (2) platziert ist, wobei das Kit eine Auszugeinrichtung (10) zum Herausziehen des JET-Filters (3), eine Schubstange (20) zum Einsetzen eines JET-Filters (3) in die Motorkraftstoffpumpe (1) und eine Zentrierführung (32) umfasst, die so geformt ist, dass sie mit der Auszugeinrichtung (10) und mit der Schubstange (20) zusammenwirkt; wobei die Zentrierführung (32) dafür konfiguriert ist, teilweise in dem Hohlraum (2) der Kraftstoffpumpe (1) positioniert zu werden, und die Zentrierführung (32) einen Hauptkörper (33) umfasst, der einen Hohlraum (41) einschließt, wobei der Hohlraum so geformt ist, dass der JET-Filter (3) durch die Auszugsvorrichtung (10) aus der Motorkraftstoffpumpe (1) herausgezogen werden kann oder durch die Schubstange (20) zur Motorkraftstoffpumpe (1) geschoben werden kann.
- 2.** Kit nach Anspruch 1, wobei die Auszugeinrichtung (10) einen Griff (11) und einen Stab (12) umfasst, wobei ein erstes Ende (16) des Stabs (12) eine Gewindefläche umfasst, um in den JET-Filter (3) einzugreifen.
- 3.** Kit nach Anspruch 2, wobei der Stab (12) so geformt ist, dass er mit der Zentrierführung (32) zusammenwirkt, wobei die Auszugeinrichtung (10) mit einer Mutter (13) versehen ist, die einen Abschnitt des Stabs (12) umgibt.
- 4.** Kit nach einem der vorhergehenden Ansprüche, wobei die Schubstange (20) einen Griff (21) und einen Stab (22) umfasst, wobei ein erstes Ende (25) des Stabs (22) so geformt ist, dass es den JET-Filter (3) zu einer Endposition in der Motorkraftstoffpumpe (1) schiebt.
- 5.** Kit nach Anspruch 4, wobei der Stab (22) so geformt ist, dass er mit der Zentrierführung (32) zusammenwirkt.
- 6.** Kit nach einem der vorhergehenden Ansprüche, wobei der Hauptkörper (33) einen zylindrisch geformten Abschnitt (34) umfasst.
- 7.** Kit nach einem der vorhergehenden Ansprüche, wobei der Hauptkörper (33) einen wie ein trapezförmiges Prisma geformten Abschnitt (35) umfasst.
- 8.** Kit nach den Ansprüchen 6 und 7, wobei der wie ein trapezförmiges Prisma geformte Abschnitt (35) eine Eingangsöffnung (44) des Hohlraums (41) des Hauptkörpers (33) umfasst und der zylindrisch geformte Abschnitt (34) eine Ausgangsöffnung (45) des Hohlraums (41) umfasst.
- 9.** Kit nach Anspruch 8, wobei die Eingangsöffnung (44) auf einer Fläche (39) des wie ein trapezförmiges Prisma geformten Abschnitts (35) angeordnet ist, wobei die Fläche (39) senkrecht zu einer Längsachse (E) des Hohlraums (41) steht.
- 10.** Kit nach Anspruch 9, wobei die Längsachse (E) des Hohlraums (41) in Bezug auf eine Längsachse des zylindrisch geformten Abschnitts (34) gekippt ist.
- 11.** Verfahren zum Herausziehen eines JET-Filters (3), der in einer Motorkraftstoffpumpe (1) angeordnet ist, mittels des Kits nach einem der vorhergehenden Ansprüche, wobei das Verfahren die folgenden Schritte umfasst:
- a) Positionieren der Zentrierführung (32) in der Motorkraftstoffpumpe (1);
 b) Einführen der Auszugeinrichtung (10) in den Hohlraum (41) der Zentrierführung (32);
 c) Erzeugen eines Lochs auf dem JET-Filter (3) durch Schlagen des Griffs (11) der Auszugeinrichtung (10) in eine Richtung im Wesentlichen parallel zur Längsachse (E) des Hohlraums

- (41);
 d) Schrauben des ersten Endes (16) des Stabs (12) der Auszugeinrichtung (10) an den JET-Filter (3); und
 e) Herausziehen der Auszugeinrichtung (10), die an den JET-Filter (3) geschraubt ist, aus dem Hohlraum (41) der Zentrierführung (32).
12. Verfahren zum Einsetzen eines JET-Filters (3) in eine Motorkraftstoffpumpe (1) mittels des Kits nach einem der Ansprüche 1 bis 10, wobei das Verfahren die folgenden Schritte umfasst:
- a) Positionieren der Zentrierführung (32) in der Motorkraftstoffpumpe (1);
 b) Verschieben des JET-Filters (3) innerhalb des Hohlraums (41) der Zentrierführung (32) mittels der Schubstange (20);
 c) Installieren des JET-Filters (3) in der Kraftstoffpumpe (1) durch Schlagen des Griffs (21) der Schubstange (20) in eine Richtung im Wesentlichen parallel zur Längsachse (E) des Hohlraums (41); und
 d) Herausziehen der Schubstange (20) aus dem Hohlraum (41) der Zentrierführung (32).

Revendications

1. Kit de remplacement d'un filtre JET (3) disposé dans une pompe à carburant de moteur (1), le filtre JET (3) étant placé sur une paroi latérale d'une cavité de pompe à carburant (2), le kit comprenant un extracteur (10) pour extraire ledit filtre JET (3), une tige de poussée (20) pour monter un filtre JET (3) dans la pompe à carburant de moteur (1), et un guide de centrage (32) conformé pour coopérer avec l'extracteur (10) et avec la tige de poussée (20); dans lequel ledit guide de centrage (32) est configuré pour être partiellement positionné dans la cavité (2) de la pompe à carburant (1), et ledit guide de centrage (32) comprend un corps principal (33) incluant une cavité (41), dans lequel la cavité est formée de telle sorte que le filtre JET (3) puisse être extrait de la pompe à carburant de moteur (1) par l'extracteur (10) ou puisse être poussé vers la pompe à carburant de moteur (1) par la tige de poussée (20).
2. Kit selon la revendication 1, dans lequel l'extracteur (10) comprend un manche (11) et une barre (12), dans lequel une première extrémité (16) de ladite barre (12) comprend une surface filetée pour venir en prise avec le filtre JET (3).
3. Kit selon la revendication 2, dans lequel la barre (12) est conformée pour coopérer avec le guide de centrage (32), l'extracteur (10) étant muni d'un écrou (13) entourant une partie de ladite barre (12).
4. Kit selon l'une quelconque des revendications précédentes, dans lequel la tige de poussée (20) comprend un manche (21) et une barre (22), dans lequel une première extrémité (25) de ladite barre (22) est conformée pour pousser le filtre JET (3) vers une position finale dans la pompe à carburant de moteur (1).
5. Kit selon la revendication 4, dans lequel la barre (22) est conformée pour coopérer avec le guide de centrage (32).
6. Kit selon l'une quelconque des revendications précédentes, dans lequel le corps principal (33) comprend une partie de forme cylindrique (34).
7. Kit selon l'une quelconque des revendications précédentes, dans lequel le corps principal (33) comprend une partie en forme de prisme trapézoïdal (35).
8. Kit selon les revendications 6 et 7, dans lequel la partie en forme de prisme trapézoïdal (35) comprend un orifice d'entrée (44) de la cavité (41) du corps principal (33), et la partie de forme cylindrique (34) comprend un orifice de sortie (45) de ladite cavité (41).
9. Kit selon la revendication 8, dans lequel l'orifice d'entrée (44) est disposé sur une face (39) de la partie en forme de prisme trapézoïdal (35), la face (39) étant perpendiculaire à un axe longitudinal (E) de la cavité (41).
10. Kit selon la revendication 9, dans lequel l'axe longitudinal (E) de la cavité (41) est incliné par rapport à un axe longitudinal de la partie de forme cylindrique (34).
11. Procédé d'extraction d'un filtre JET (3) disposé dans une pompe à carburant de moteur (1) au moyen du kit selon l'une quelconque des revendications précédentes, le procédé comprenant les étapes consistant à :
 - a) positionner le guide de centrage (32) dans la pompe à carburant de moteur (1);
 - b) insérer l'extracteur (10) dans la cavité (41) du guide de centrage (32);
 - c) réaliser un trou sur le filtre JET (3) en frappant le manche (11) de l'extracteur (10) dans une direction sensiblement parallèle à l'axe longitudinal (E) de la cavité (41);
 - d) visser la première extrémité (16) de la barre (12) de l'extracteur (10) sur le filtre JET (3); et
 - e) extraire l'extracteur (10) vissé au filtre JET (3)

de la cavité (41) du guide de centrage (32).

12. Procédé de montage d'un filtre JET (3) dans une pompe à carburant de moteur (1) au moyen du kit selon l'une quelconque des revendications 1 à 10, le procédé comprenant les étapes consistant à :

- a) positionner le guide de centrage (32) dans la pompe à carburant de moteur (1) ;
- b) faire glisser le filtre JET (3) à l'intérieur de la cavité (41) du guide de centrage (32) au moyen de la tige de poussée (20) ;
- c) installer le filtre JET (3) dans la pompe à carburant (1) en frappant le manche (21) de la tige de poussée (20) dans une direction sensiblement parallèle à l'axe longitudinal (E) de la cavité (41) ; et
- d) extraire la tige de poussée (20) de la cavité (41) du guide de centrage (32).

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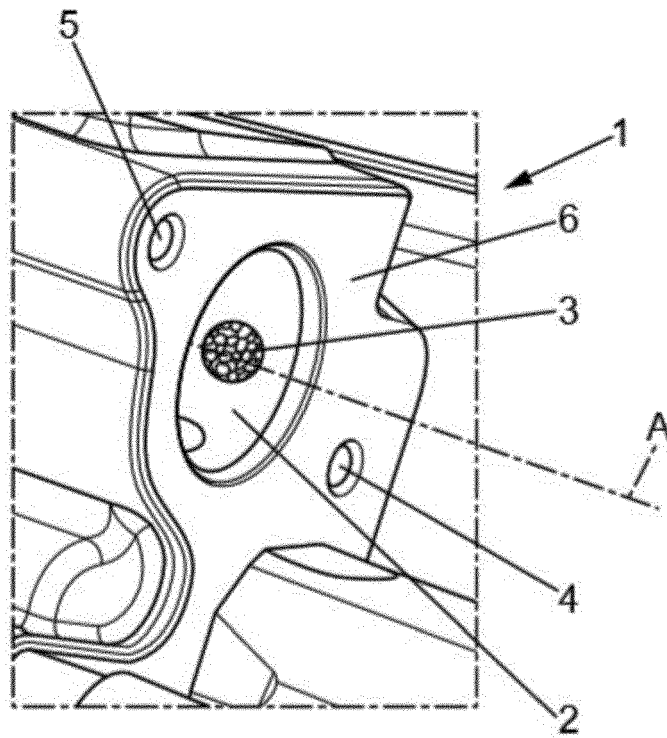


FIG. 1

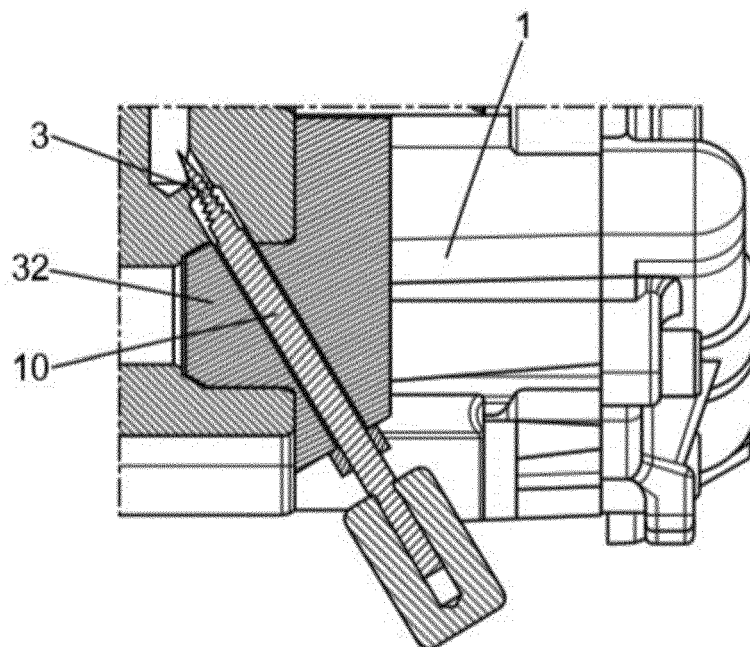


FIG. 2

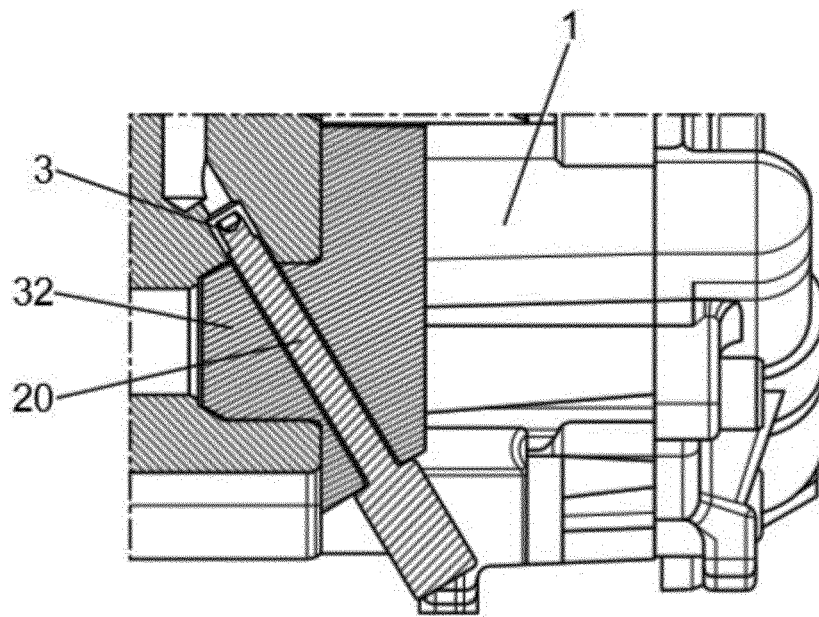


FIG. 3

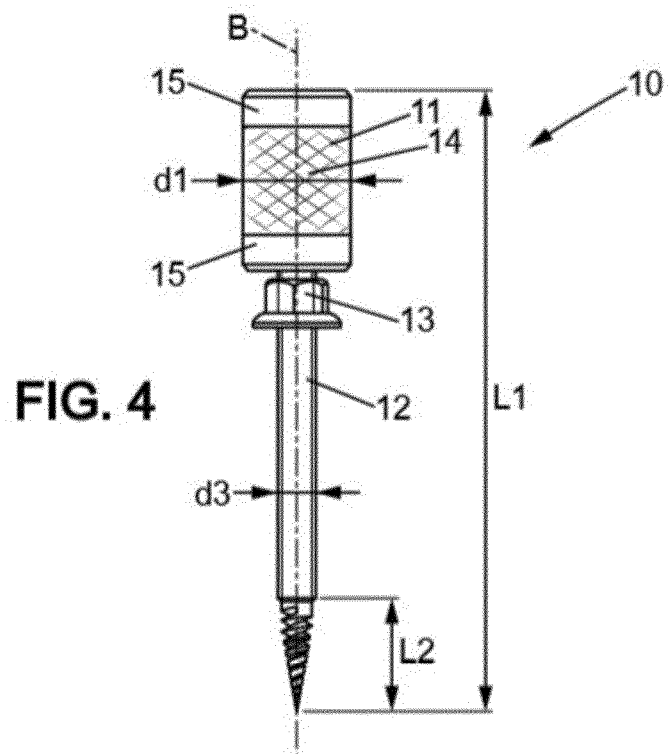


FIG. 4

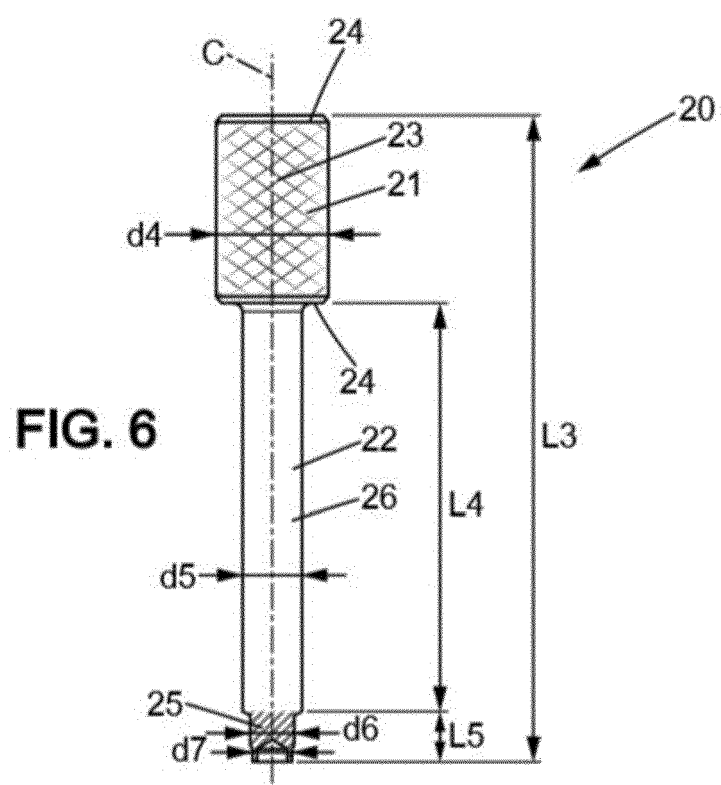
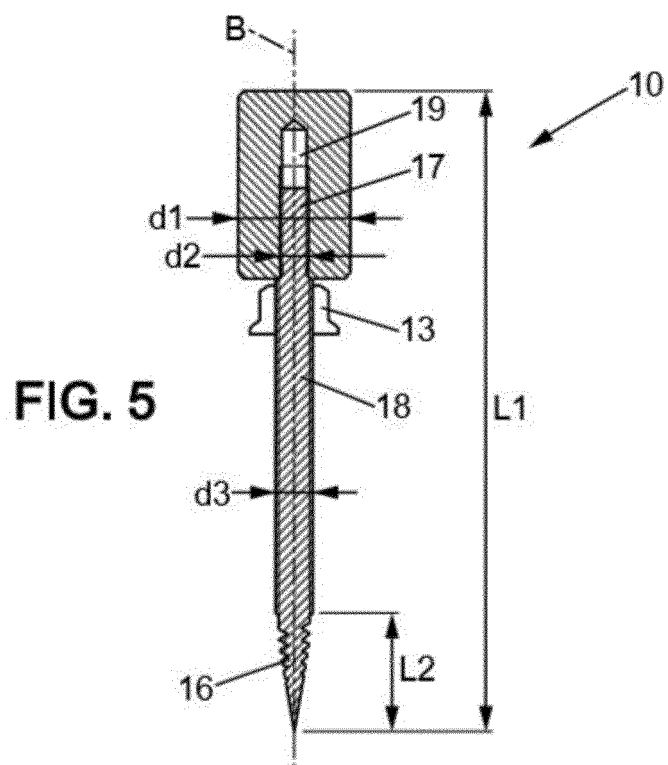


FIG. 7

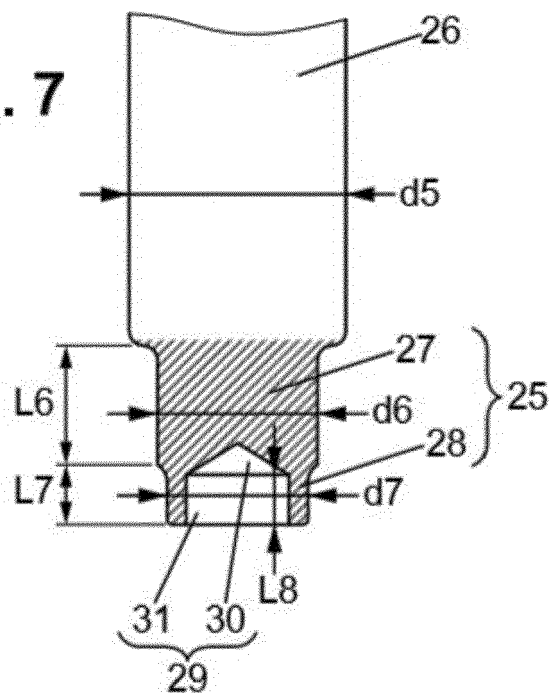
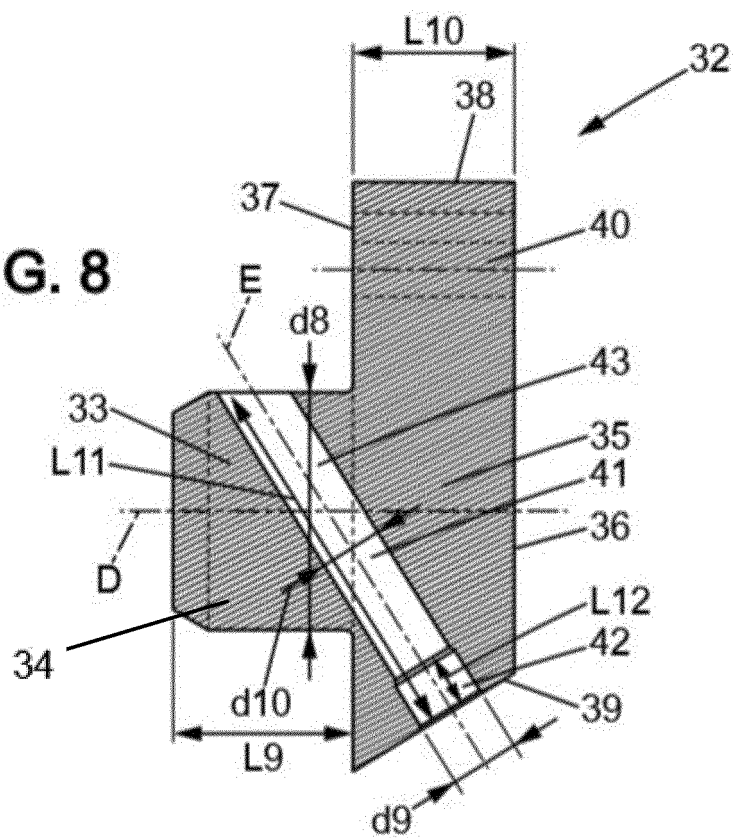


FIG. 8



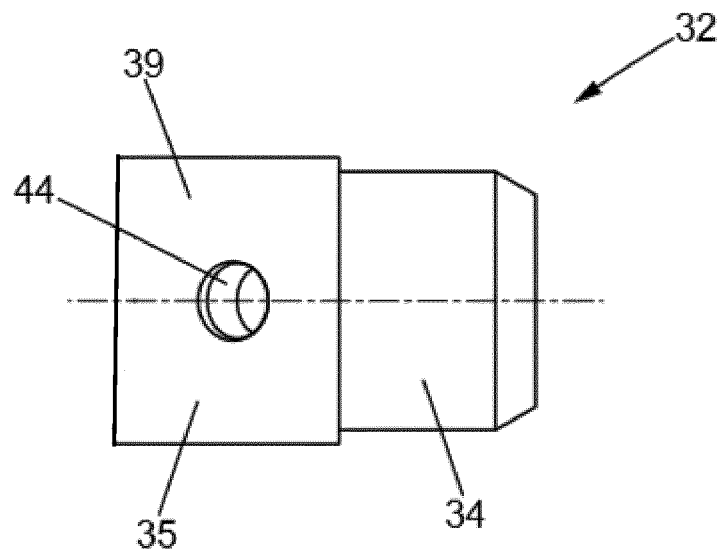


FIG. 9

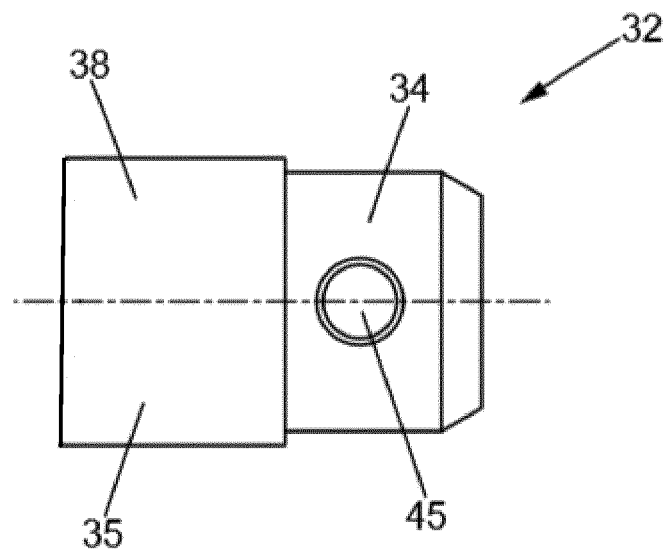


FIG. 10