



(51) International Patent Classification:
F17C 13/00 (2006.01) *F17C 5/02* (2006.01)

(21) International Application Number:
PCT/IB2010/051041

(22) International Filing Date:
10 March 2010 (10.03.2010)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
PR2009A00013 10 March 2009 (10.03.2009) IT

(71) Applicant (for all designated States except US): **A.T. PETROLEUM S.R.L.** [IT/IT]; Via Marco Polo, 37, I-43036 Fidenza (PR) (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **FRANGIPANE, Luciano** [IT/IT]; c/o A.T. Petroleum S.r.l., Via Marco Polo, 37, I-43036 Fidenza (Parma) (IT).

(74) Agent: **FUOCHI, Riccardo**; Piazza dei Martiri, 1, I-40121 Bologna (IT).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: GUN FOR DISPENSING GASEOUS FUEL

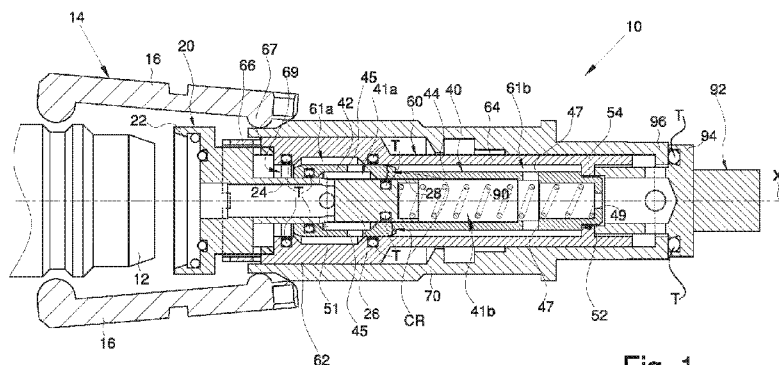


Fig. 1

(57) Abstract: A gun for dispensing gaseous fuel, e.g. LPG, has a dispensing head (10) which comprises a coupling head (20) to a filler (12) to be supplied, with breather holes (67) towards the external environment, a conduit (24, 51, 41a, 45, 61a, 61b, 54), inside the dispensing head (10), through which the fuel can flow coming from an inlet (54) towards an outlet (24) leading to the filler (12), the conduit can also communicate by means of a passage (51, 41a, 45, 61a, 69) with the breather holes (67); a shutter element (40) movable sealed inside the conduit between two positions, the shutter element (40) comprises a shutter portion which in the first position closes the inlet (54), and another shutter portion which in the second position closes the passage (51, 41a, 45, 61a, 69), a spring (90) for pushing the shutter element (40) to the first position, the shutter element (40) has a surface (CR) transversal to the fuel flow occurring during the dispensing towards the filler (12), which receives the pressure of the fuel in opposition to the spring (90) so that the shutter element (40) is conveyed and kept to the second position.

"GUN FOR DISPENSING GASEOUS FUEL"

TECHNICAL FIELD OF THE INVENTION

This invention relates to a gun for dispensing gaseous fuel, in particular for so-called liquid petroleum gas, abbreviated by LPG, specifically for the truck and car sector, et cetera, as referred to in the following example.

Moreover, here below, for the sake of simplicity and with no misinterpretation of meaning, the term LPG will be used to indicate various gaseous fuels which become liquid at relatively low pressures and substantially at room temperature, including e.g. butane, propane, et cetera.

BACKGROUND ART

The refuelling of cars and similar vehicles powered by LPG is done at fuel stations fitted with specific delivery nozzles, which normally present a gun which is inserted into and fixed to a filler connected to the vehicle fuel tank.

The dispenser guns are handled by trained staff and, in compliance with the safety legislation of the most advanced countries, cannot be used in a self-service manner for reasons of user safety.

In fact, this is to prevent untrained users from coming into contact with the LPG which remains in the gun between the delivery valve and the filler of the vehicle at the end of the refuelling operation, and which instantly vaporises on the user's hand.

Furthermore, it should be remembered that it is not simple to hook the gun to the filler, and given the nature and the pressure of the liquid in question it is not recommended to allow any improvisation on the part of the user.

OBJECTS OF THE INVENTION

One object of the present invention is to improve the background art.

Another object of the present invention is to provide a gun for dispensing gaseous fuel of the
5 aforementioned type which prevents all danger for the person using the gun.

Another object is to provide a gun of the above type which is reliable and has a guaranteed operating quality over time.

10 Such objects are achieved by a gun for dispensing gaseous fuel having the characteristics defined in the claims 1.

The preferred forms of embodiment of the gun are defined in the dependent claims.

15 BRIEF DESCRIPTION OF THE DRAWINGS

These and other advantages will be better understood by any technician of the field from the following description and annexed drawings, given as not limited example, in which:

20 figure 1 shows a vertical section view of a valve being part of the gun for dispensing gaseous fuel according to the present invention, in a first configuration;

figure 1a shows a vertical section partial view
25 of another version of the valve being part of the gun for dispensing gaseous fuel according to the present invention;

figure 2 shows a vertical section view of the valve of figure 1 in a second configuration;

30 figure 3 shows a vertical section view of the valve of figure 1 with the flow paths illustrated; and

figure 4 shows a gun for dispensing gaseous fuel containing the valve of figure 1.

EMBODIMENTS OF THE INVENTION

Figure 1 partially illustrates a dispensing head 10 which is part of a gun P for dispensing gaseous fuel illustrated in figure 4, with the so-called European type coupling to the filler.

Figure 1a illustrates another version of the gun P with the dispensing head 10, with the so-called Italian type coupling to the filler.

The dispensing head 10, substantially the same for the two versions with European or Italian coupling, has a longitudinal extension along an X axis and is placed in front of a filler 12 of a tank to be refuelled (not illustrated). The head 10, which has a substantially radial symmetry around the X axis, comprises an external tubular cursor 70 coupled to a gripper coupling 14 with a plurality of tightenable levers 16 suited to gripping the filler 12. Inside the cursor 70 there is a sleeve 60 which in turn contains an internal cursor, or shutter element 40, which moves axially along the X axis, the sleeve 60 also houses an adaptor, or coupling head 20, for the filler 12.

As can be seen from Figures 1 and 1a, the coupling head 20 has geometric characteristics which allow the coupling to different standards of fillers, shown in the example with the European and Italian types, and also, with the appropriate modifications, to other coupling standards which are not illustrated here.

The external cursor 70 moves axially above and around the sleeve 60. Sliding (towards the left in Figure 1) the cursor 70 can push and lift with the edge one end of the levers 16, bringing them into the gripping configuration on the filler 12 (see Figures 2 and 1a), the levers 16 being hinged inside the body of the gun (illustrated only in figure 4).

The sleeve 60 is composed of a head 62 and a hollow cylindrical shank 64, of a smaller diameter, which extends axially from the head 62.

5 The head 62 marks the edge of an internal cylindrical cavity 61a, while the shank 64 marks the end of an internal cylindrical cavity 61b, of a smaller diameter.

10 Inside a circular appendix 66 of the head 62 the adaptor 20 is mounted, which comprises an external section 22 which rests directly on the filler 12, fitted with suitable seals, a hollow conduit 24 which brings the liquid fuel towards the filler 12 and an end segment 26 which, on one end, has a seat 28.

15 The shutter element 40 is composed of a hollow head 42, with an external diameter which is substantially the same size as the internal diameter of the shank 64, and a tubular body 44, with a smaller external diameter, in order to leave a ring-shaped space around the shank 64 which forms the cavity 61b.

20 The shutter element 40 is inserted in the cavities 61a, 61b. On the head 62 seals T are mounted which are in contact with the head 42 which isolate the two cavities 61a, 61b to form two isolated chambers for the LPG.

25 For the sake of simplicity, here and hereafter T is used to indicate all O-rings or seals (or combinations thereof) present in the head 10.

30 The head 42 and the shank 44 of the cursor 40 mark the edge of a cylindrical internal cavity, in the initial part of which are housed to seal the end part of the hollow conduit 24, the whole segment 26 and the seat 28. Seals T on segment 26 in particular divide the internal cavity in the shutter element 40 into two isolated sub-cavities 41a, 41b, forming two separate

chambers for the LPG. For the sake of simplicity it is preferred to indicate the two chambers thus formed with the same reference used for the relative cavities.

5 The chamber 41a surrounds the conduit 24 and communicates both with the same conduit by means of through holes 51 made in the conduit 24 itself, and with the chamber 61a thanks to through holes 45 made in the head 42. The chamber 41b communicates with the
10 chamber 61b through radial holes 47 made in the shank 44.

The end of a spring 90 rests in the seat 28 and is pushed, on the other end, against a distal wall of the shank 44. This wall has a through hole 49 along the X
15 axis, which communicates with the outlet of a loading valve 92, which in turn is connected to an LPG supply pipe (not illustrated).

The valve 92 is composed of a fixed stop 94 with seals T and the (mobile) end 96 of the cursor 70.

20 The end of the shank 44 has a circular step 52 which stops on an internal circular edge 54 of the shank 64 from which, by opposition, the end-of-stroke position is set.

On the appendix 66 are obtained radial breather holes
25 67 which communicate with the external environment and extend into the resting section 22 to the edge of the head 62. The head 62 has an axial opening 69 through which the holes 67 can communicate with the chamber 61a. The sizes of the opening 69 correspond to the
30 section of the head 42 so that the latter can close it by simply filling its width. Special seals T on the edges of the opening 69 guarantee the tightness in this case.

The shutter element 40 can move along the X axis

inside the casing 60 substantially between two positions, illustrated respectively in figures 1 and 2. In the first position (Figure 1) the shutter element 40 is moved to its furthest position on the right (in the Figure). The chamber 41a communicates with the chamber 61a, and this with the outside through the holes 67. Therefore also the inside of the conduit 24 is in communication with the outside.

In the second position (figure 2) the shutter element 40 is moved to its furthest position to the left (in the drawing). The chamber 41a communicates again with the chamber 61a, but no longer with the outside, because the holes 67 are no longer in communication with the opening 69, as this opening 69 is closed by the section of the head 42 of the shutter element 40.

The chamber 61a on the other hand is now in communication with the chamber 61b, as the rear portion of the head 62 no longer acts as a partition wall but - having been moved - has freed the common section to the two chambers 61a, 61b.

The head 10 works as described below.

Initially, the user must connect the head 10 (which will be contained in the gaseous fuel dispensing gun) to the filler 12. The loading valve 92 is closed so the head 10 is isolated from the dispensing column and the shutter element 40, pushed by the spring 90, is maintained in the position shown in figure 1, i.e. pressed against the edge 54. The user then moves the head 10 to the filler 12 to match it with the resting section 22 and align it with the conduit 24.

The cursor 70 (through a mechanism which is not illustrated, e.g. a lever on the gun) is pushed towards the filler 12 in order to push the levers 16 to grip the filler 12 (figure 2).

The movement of the cursor 70 moves the end 96 away from the stop 94, opening the valve 92. Generally in the pipe which connects the dispensing column to the gun some LPG remains at a relatively low pressure, for example 4-5 bar.

Therefore the liquid, through the hole 49, fills the chambers 41b, 61b and its pressure counteracts the force of the spring 90 discharging only on a circular crown CR represented by the ring-shaped surface given by the difference between the external diameter of segment 26 and the external diameter of the head 42.

The spring 90 is sized to oppose and overcome a similar force, given by the product of the ring-shaped surface of the circular crown CR multiplied by the relatively low pressure of the LPG which remains in the pipe which connects the dispensing column to the gun, so that the position of the cursor 40 is that shown in figure 1.

At this point the head 10 is fixed to the filler 12 and the dispensing phase can take place.

By pressing for example a filling button on the column, the so-called "dead man" button, the LPG is forced under pressure (approx. 11-16 bar) into the head 10 through the valve 92. The increased pressure of the LPG discharges once more on the crown CR, and this time overcomes the resistance of the spring 90 and by pushing moves the shutter element 40 (in Figures 1-3 to the left), to reach the configuration shown in figure 2.

The movement of the cursor 40 means that:

the shank 44 is detached from the edge 54, leaving the internal section completely free for the flow of LPG;

the head 42 moves to the left (in Figures 1-3)

removing the partition between the chambers 61a and 61b, and the opening 69 is blocked, isolating the chamber 61a from the outside.

The LPG therefore enters the head 10 from the valve 92, runs through the chambers 61b and 61a, comes into the chamber 41a through the holes 51, is sent, through the holes 51, into the conduit 24 from where it will reach the filler 12 and thus the tank to be filled.

The arrows in figure 3 illustrate the path of the LPG.

Having completed the filling operation, the user releases the button and the LPG pressure in the head 10 drops to the relatively low pressure indicated above, e.g. 4-5 bar.

The spring 90 no longer has sufficient opposing force and pushes the shutter element 40 back to its initial position (as shown in figure 1). Doing this, the chambers 61a, 61b are once more separated by the head 62, while the chamber 61a communicates with the atmospheric pressure through the holes 67 and the opening 69, which is once again free.

Therefore the LPG remaining inside the conduit 24 comes out through the holes 67 with a typical "puff", avoiding any contact with the user's hand and therefore preventing any danger for the users when they have to remove the gun from the filler 12.

The specific construction of the head 10 assures the automatic, very fast and repeatable commutation between the two end positions of the shutter element 40, which translates into a high-performing high dispensing rate whatever the refuelling column and its working pressure.

It should be noted that initially the pressure of the dispensed liquid, which discharges on the crown CR, has only to overcome the resistant force of the spring

90, given that the left portion (Figure 2) of the shutter element 40 is at atmospheric pressure through the holes 67 and therefore no fluid runs at excess pressure in addition to the force of the spring 90.

5 Moreover, during dispensing the same can be said: only the pressure of the LPG against the crown CR has an impact. Once again the LPG (in liquid phase at 11-16 bar) presses the spring 90 pushing the shutter element 40 only against the crown CR, and avoiding all
10 counter-pressure on the filler 12 side, as the LPG present in the chamber 41a exerts a uniform pressure on all its walls, and the result of this force on the shutter element 40 is nil.

In practice, the shutter element 40 is an automatic
15 valve activated by two different LPG pressures:

the pressure without the dispensing of the LPG, at relatively low pressure, for example 4-5 bar, which remains in the pipe which connects the dispensing column to the gun; and

20 the higher pressure of LPG dispensing, for example 11-16 bar.

By way of example, figure 4 illustrates the valve 10 associated to a grip to form a gun P to dispense the LPG.

25 With a lever L, operated manually, the user can open or close the valve 92 and therefore start or end dispensing.

It should be noted that the operation of the valve 10, and the gun P, according to the present invention, is
30 irrespective of the type of coupling or interface between the head and the filler on the tank to be refuelled.

The present invention has been described according to preferred embodiments, but equivalent variations can

be conceived without exiting from the protection ambit offered by the following claims.

CLAIMS

1. Gun (P) for dispensing gaseous fuel, e.g. LPG, having a dispensing head (10) comprising a coupling head (20), for the connection with a filler (12) to be supplied, equipped with breather holes (67) towards the external environment, a conduit (24, 51, 41a, 45, 61a, 61b, 54), inside the dispensing head (10), through which the fuel can flow coming from an inlet (54) towards an outlet (24) leading to the filler (12), the conduit being suitable for communicating by means of a passage (51, 41a, 45, 61a, 69) with said breather holes (67); a shutter element (40) is movable sealed inside the conduit between two positions, the shutter element (40) comprising a shutter portion which only in the first position is suitable for closing said inlet (54), and another shutter portion which only in the second position is suitable for closing said passage (51, 41a, 45, 61a, 69), elastic means (90) for pushing the shutter element to the first position, **characterised by the fact that** the shutter element (40) comprises a surface (CR) transversal to the fuel flow occurring during the dispensing towards the filler (12), the surface (CR) receiving the pressure of the fuel in opposition to the elastic means (90) so that the shutter element (40) is conveyed and kept to the second position.
2. Gun according to the claim 1, wherein the shutter element (40) comprises a first shutter portion (42, 61b) suitable for closing the inlet of the conduit, and a second shutter portion (42, 69), which extends towards said outlet (24).
3. Gun according to the claim 1 or 2, wherein said shutter element (40) comprises internal and external side surfaces, having different radial dimensions, so

as to define, by means of the difference in radial dimensions, a push surface (CR) transversal to the fuel flow.

4. Gun according to any of the preceding claims, wherein the shutter element (40) comprises a substantially cylindrical head (42) and a tubular body (44) which extends axially from said head.

5. Gun according to any of the preceding claims, wherein the coupling head (20) comprises a conduit (24) and the shutter element (40) is assembled to contain said conduit (24) sliding sealed.

6. Gun according to the claim 5, wherein the coupling head (20) comprises an end segment (26) and the head (42) of the shutter element (40) is hollow, and said head (42) has an outer diameter which is bigger than the outer diameter of the end segment (26) so to obtain a surface (CR) transversal to the fuel flow through the difference in radial dimensions.

7. Gun according to the claim 5 or 6, wherein the shutter element (40) has an outer surface in sealed contact with an outer sleeve (60), said shutter element (40) being axially sliding in an inner cavity (61a, 61b) of the sleeve (60).

8. Gun according to the claim 6 or 7, comprising a spring (90) arranged between the end segment (26) and one end of the tubular body (44) of the shutter element (40), said spring (90) being suitable for keeping the shutter element (40) in the first position.

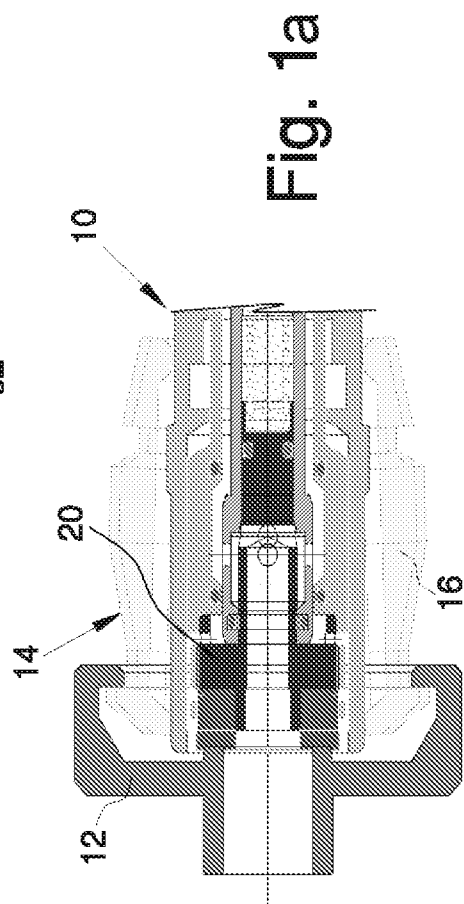
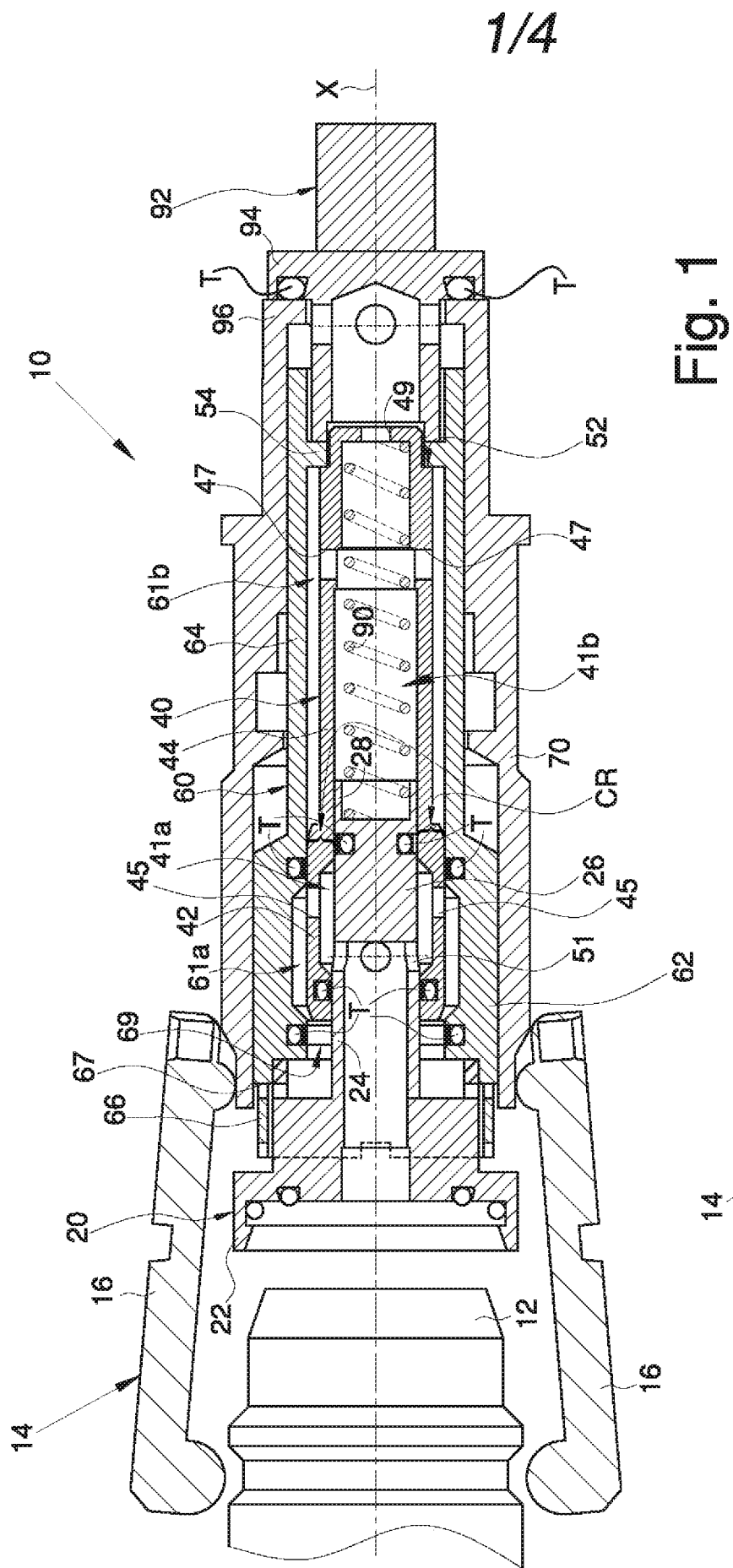
9. Gun according to one of the claims from 6 to 8, wherein said internal cavity of the sleeve (60) has a radial widening (61a) in the proximity of breather holes (67) of the head (20) and an adjacent opening (69), occupable and closable by a shutter portion of

the shutter element (40), which communicates with said breather holes (67).

10. Gun according to one of the claims from 6 to 9, wherein an end of the tubular body (44) of the shutter
5 element (40) is positioned against a relief (54), protruding from said inner cavity (61b), which acts as an end of stroke.

11. Gun according to a claim from 6 to 10, comprising a tubular cursor (70), assembled externally sliding on
10 the sleeve (60), so that an end (96) of the tubular cursor (70) is suitable for contacting sealed or removing from a stop (94), in order to block or allow the flow of fuel, respectively.

12. Gun according to the claim 11, wherein the
15 tubular cursor (70) comprises another end cooperating with the mechanism (14, 16) of a coupling to the filler (12).



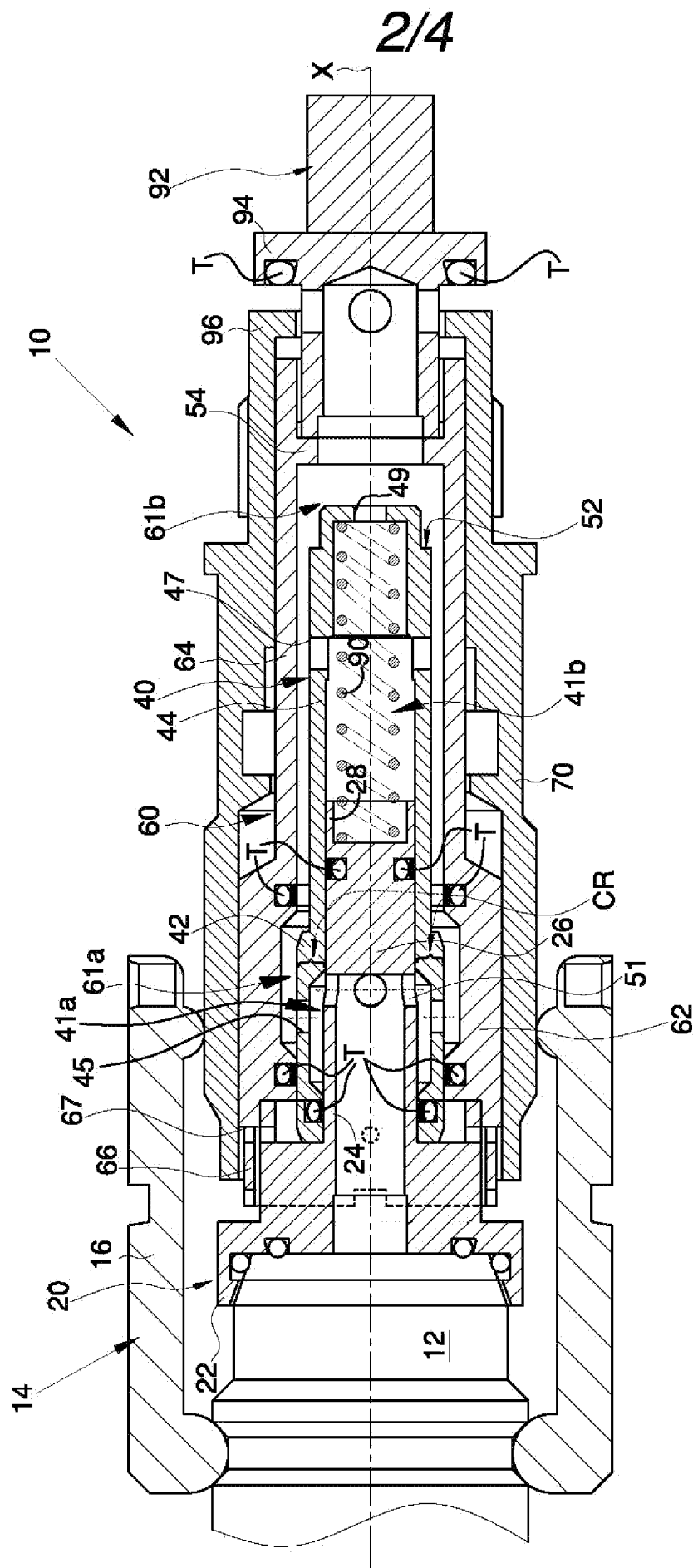


Fig. 2

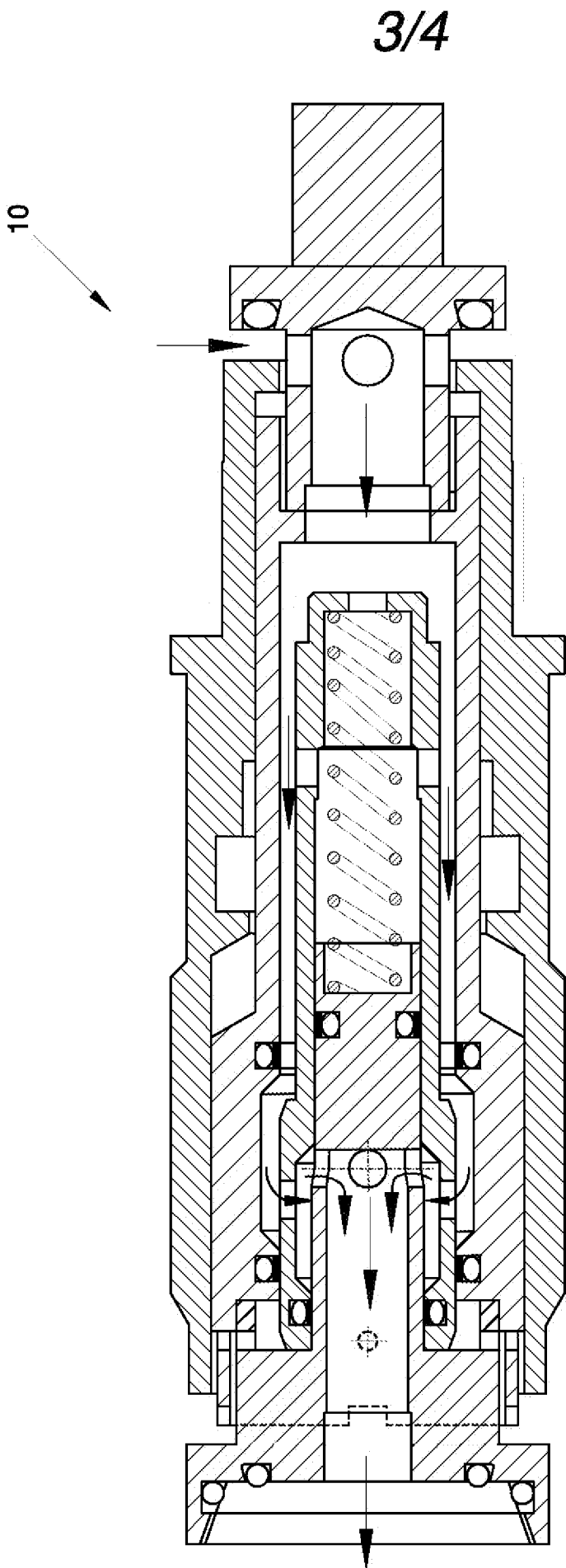


Fig. 3

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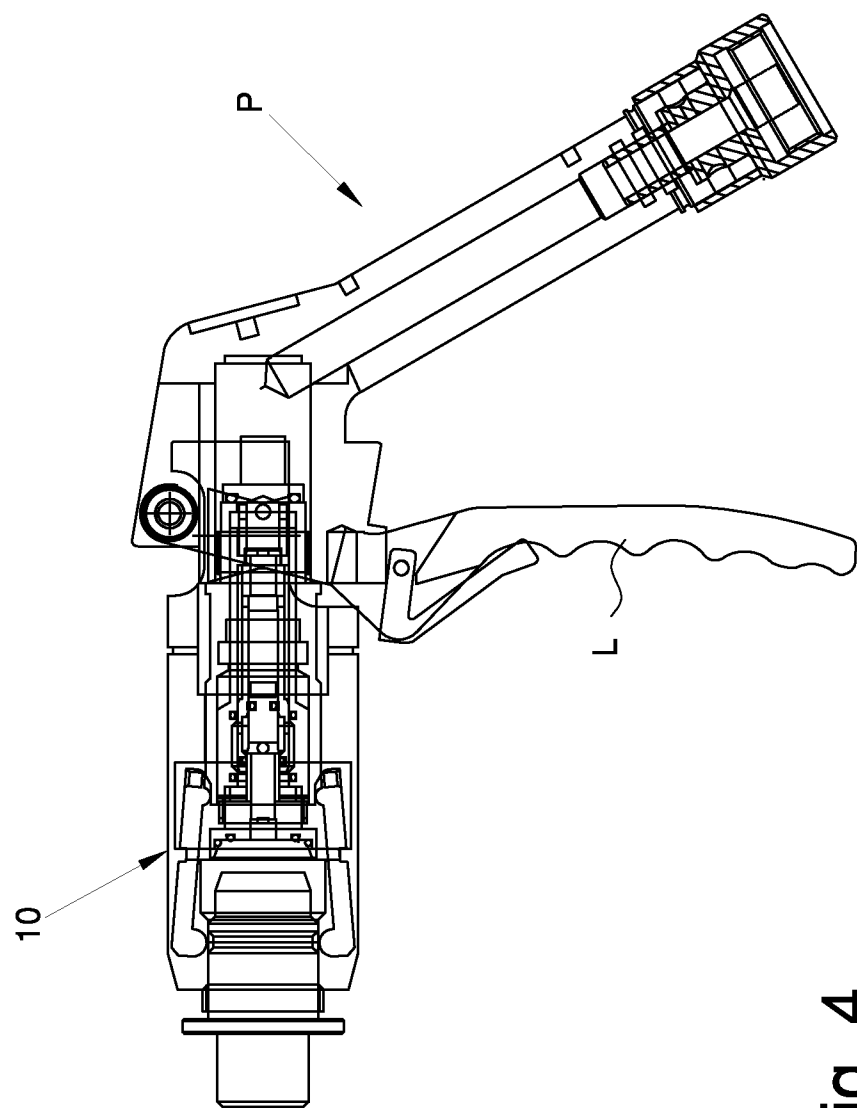


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2010/051041

A. CLASSIFICATION OF SUBJECT MATTER

INV. F17C13/00 F17C5/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F17C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

26 May 2010

Date of mailing of the international search report

04/06/2010

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Ott, Thomas

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2010/051041

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INTERNATIONAL SEARCH REPORT

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