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- (54) Title:** SELF-CLOSING PRESSURE CONTROL VALVE OF GAS CYLINDER

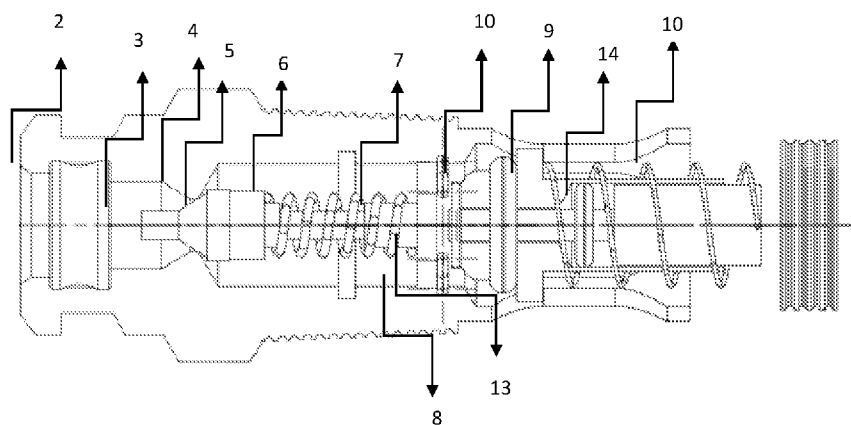


FIG 1

- (57) Abstract:** The present invention pertains to the pressure control valve/nozzle assembly that fits at the opening of a gas cylinder. The pressure control nozzle/valve assembly comprising: a nozzle, which comprises of nozzle O-ring, valve pin, pin rubber, pin cap, small spring and triangle support pin wherein the nozzle pin facilitates the release of the gas, the nozzle O-ring is attached to the valve pin to prevent the leakage of gas. The valve is integrated with nozzle and control pin assembly at its lower open end that facilitates controlled release of the gas. The Control pin controls the release of gas during low pressure and high pressure. During the low pressure the valve pin rises upward and is retrieved back facilitating the controlled passage of gas through the nozzle, and during high pressure the control pin gets pulled upward and fixed inside valve.

SELF-CLOSING PRESSURE CONTROL VALVE OF GAS CYLINDER

Technical field

The present invention relates to a gas cylinder valve assembly which is attached to a gas cylinder containing compressed gas or liquefied gas for the use of taking out the gas and charging it, and to a
5 pressure reducing valve provided in the valve assembly.

Background Art

The valve assembly is comprised of regulators, gauges and delivery valves. The cylinders are designed to be portable and are generally long cylinders in shape, they are subject to be knocked over by accident. The valve system being the weak link in the compressed gas system, such an accidental
10 turning of the bottle could cause unexpected impacts to the valve system which results in the threaded junction of valve and tank or the valve assembly rupturing or breaking the pressurized seal between valve and tank, the sudden escape of compressed gas could result in the release of violent gas resulting in destruction of the whole system.

When gases are supplied in gas cylinders, the cylinders have a stop angle valve at the end on top of
15 the cylinder. When the gas in the cylinder is to be used at low pressure, the cap is taken off and a pressure-regulating assembly is attached to the stop valve. This attachment typically has a pressure regulator with inlet and outlet pressure gauges and a further downstream needle valve and outlet connection. The regulator is be adjusted to control the outlet pressure, which will limit the maximum flow of gas out of the cylinder at the pressure shown by the downstream gauge.

20 The pressure reducing valve provided in a gas cylinder valve assembly of the traditional gas cylinder has a piston member inserted into a pressure reducing valve chamber within a housing, the piston member being adapted so as to move for opening and closing by a balance between a spring force for valve opening and a secondary (valve-outlet) pressure for valve closing.

A housing for the valve assembly has to be made compact in accordance with the size of a gas cylinder.
25 Therefore, conventionally, superposed coned disc springs are adapted so as to apply the spring force for valve opening in order that a pressure reducing valve to be provided within the housing can be

made compact. The structure of superposed coned disc springs has, in its height direction, one end received by the housing and the other end received by the piston member.

Summary of Invention

The present invention pertains to the pressure control valve/nozzle assembly that fits at the opening
5 of a gas cylinder. The term 'gas cylinder' is applied herein to containers of compressed gas irrespective of whether the container has a cylindrical shape or not.

A pressure controlling valve/nozzle assembly is fitted in the mouth of a gas cylinder which fulfils the function of acting as a closure for the gas cylinder so that gas can be successfully stored therein under pressure, sometimes up to 300 bar or higher, of enabling gas to be withdrawn from the gas cylinder
10 by a user, and of enabling the cylinder to be refilled with gas. A gas cylinder valve/nozzle assembly includes one or more rotary spindles which fit within the main body of the valve.

The pressure control nozzle/valve assembly comprises of the following parts; a nozzle 17, which comprises of nozzle O-ring 2, valve pin 3, pin rubber 4, pin cap 5, small spring 6 and triangle support pin 7 wherein the nozzle pin facilitates the release of the gas, the nozzle O-ring 2 is attached to the
15 valve pin 3 to prevent the leakage of gas. Pin rubber 4 and pin cap 5 facilitates the fixing of the valve pin 3 inside the nozzle body 1 along with the small spring 6 around the spindle shaped body of the valve pin 3 to avoid the displacement of the valve pin assembly 11. Triangle support pin 7 keeps the small spring 6 at the center i.e. keeps it in place. The nozzle body 1 has three holes 16, 16a and 16b which helps the gas to get into the cylinder. The C- lock 8 holds the valve pin assembly 11 inside the
20 valve body 1. The valve is integrated with nozzle and control pin assembly 18 at its lower open end 22 that facilitates controlled release of the gas i.e. releases gas at low pressure and prevents gas release at high pressure. This nozzle and control pin assembly 18 is mainly used to control the high pressure. It has a pin which is known as the control pin 14 which operates the system. The nozzle 9 has short spindle shaped body with dome-shaped head that has nozzle O-ring 10 to exactly fit the nozzle 9 into
25 the nozzle body 1 that completely seals the opening for the passage of gas. The control pin 14 fits into the nozzle 9 with its tip piercing through the small opening/hole 19 in the head of the nozzle 9. The control pin 14 is held inside the valve with the valve pin lock 13 at the tip of the control pin 14. The nozzle and control pin assembly 18 also comprises of the big spring 12 that holds the valve pin 14 assembly inside the nozzle 17.

The Control pin 14 controls the release of gas during low pressure and high pressure. During the low pressure the valve pin rises upward and is retrieved back facilitating the controlled passage of gas through the nozzle 9 into the nozzle 17. However during high pressure the control pin 14 gets pulled upward and fixed inside valve thus sealing the opening in the valve 19 for gas release. The 30° angle
5 20 of the valve-pin 14 facilitates the complete sealing of the valve-pin 14 into the nozzle 9 thus preventing any gas passage. This prevents gas uptake at high pressure and facilitates the gas release only at low pressure in controlled manner.

Brief Description of Drawings

FIG 1 represents the complete assembly of the gas cylinder self-closing pressure control nozzle/valve.

10 FIG 2 represents the complete assembly of the gas cylinder self-closing pressure control nozzle/valve with each component separated in a sequence of assembly.

FIG 3 represents the side view of the nozzle/valve assembly of the gas cylinder.

FIG 4 represents the transverse top view of nozzle assembly; i.e, nozzle O-ring, nozzle pin, pin rubber and pin cap.

15 FIG 5 represents the transverse top view of pressure controlling valve assembly; i.e, Small spring, triangle support pin, C-lock and valve.

FIG 6 represents the transverse top view of valve O-ring, big spring and valve pin lock.

FIG 7 represents the transverse top view of Valve pin and Chuck nut.

FIG 8 represents the side view of the position of valve pin in the valve at low pressure.

20 FIG 9 represents the side view of the position of valve pin in the valve at high pressure.

Description of the Embodiments

The present invention pertains to a self-closing pressure control valve/nozzle comprising of plurality of parts. This pressure control valve/nozzle provides the safe and controlled release of gas from the gas cylinder/container of compressed gas. The gas released is according to the pressure applied which
25 can be low pressure or high pressure. In application of valves/nozzle to the gas cylinders or containers

of compressed gas there is always the possibility of gas being utilized at high pressure for commercial use from the gas cylinders/containers that are intended for domestic use only causing the gas theft and subsequent loss to the government on the subsidies it provide. Also there is always the chance of valve rupture due to high pressure thus causing severe casualties.

- 5 The present invention is directed to the construction of self-closing pressure control valve/nozzle assembly inside the gas cylinder/container which facilitates the gas release only at low pressure and prevents the gas flow at high pressure.

Referring to the FIG 1 there is the shown the complete assembly of the present invention in the integrated form. The valve pin assembly 11 inside the valve body 1 provides the gas release by the
10 movement of the valve pin 3. The nozzle and control pin assembly 18 is attached at its uppermost end to the valve pin assembly 11 to allow the gas release only at low pressure and prevents at high pressure. As the pressure is applied through the regulator, the valve pin 3 moves downwards thus facilitating the passage of gas. The small spring 6 around the valve pin 3 provides the controlled movement of the valve pin 3 and retrieves the valve pin 3 back to its initial position once the pressure is removed.
15 In the nozzle and control pin assembly 18, the control pin 14 is fitted inside the nozzle 9 that is also capable of upward and downward movement. At low pressure the control pin 14 rises and falls backward thus allowing the passage of gas through the nozzle opening 19. At high pressure, the control pin 14 is pulled upward thus sealing the nozzle opening 19 and preventing any gas passage.

FIG 2 describes the complete self-closing pressure control nozzle/valve assembly with every
20 component in sequence of assembly. The valve body 1 has valve O-ring 2 at its upper end 23 that fits in with the regulator and three holes 16,16a and 16b at its lower end 22 just below the threading 21 which is between the two ends. These holes facilitates passage of gas inside the cylinder/container during the filling and emptying of gas cylinder/container. In the valve pin assembly 11, the valve pin 3 is attached with the pin rubber 4 and pin cap 5 that facilitates the fixing of the valve pin 3 inside the
25 valve body. The small spring 6 goes around the spindle shaped body of the valve pin which facilitates its upward and downward movement as the gas pressure is applied. The triangle support pin 7 fits in at the lowermost end of the valve pin 3 holding the valve pin 3 in center position inside the valve body 1.

The C-lock 8 seals the space between the valve pin assembly 11 and nozzle and control pin assembly 18 that prevents any gas passage. The nozzle and control pin assembly 18 is attached to the lower end of the valve pin assembly 11 wherein the control-pin 14 is fixed inside the nozzle 9 along with small spring 12 around the control-pin 14 that allows the movement of the control-pin 14 in up and down direction. The nozzle O-ring 10 seals the nozzle 9 to the valve 17 thus preventing any gas leakage. The control pin 14 is inserted inside the nozzle 9 through the lower open end 25 of the nozzle 9. The control-pin 14 is held inside the nozzle 9 with the control-pin lock 13 at the tip 26 of the control-pin 14 that passes through the nozzle opening 19 of the nozzle 9 at its upper end 24. The chuck nut 15 supports the control pin 14 from its lower end 27.

Referring to FIG 8, the control-pin 14 inside the nozzle 9 passes through an opening 19 in the nozzle 9 that is for the passage of the gas. The control-pin 14 is capable of controlled upward and downward movement through the opening 19 which is facilitated by the compression and relaxation of the big spring 12 around the control pin 14. During low pressure, the control pin 14 rises up through the opening 19 and falls back with controlled release of gas through the valve opening 19.

Referring to FIG 9, the control pin 14 has an angle of 30° degree 20 that facilitates the complete closure of the valve opening 19 when the high pressure is applied. The control pin 14 gets pulled upward during high pressure thus sealing the opening 20 preventing any gas passage.

When the pressure is applied to through regulator, the valve pin 3 of the valve pin assembly 11 inside the nozzle body 1 moves according to the amount of pressure applied. The valve pin 3 displaces as much as the amount of pressure thus allowing the passage of gas. The nozzle 17 functions and releases the gas according to the pressure applied. This can however lead to gas release even at high pressure which may cause incidences of gas theft and accidental valve rupture causing accidents. The nozzle and control pin assembly 18 attached at the lower end of valve assembly 11 is capable of gas released only at low pressure which is applied during the domestic use only. At low pressure, the control pin 14 inside the nozzle 9 rises and retrieves back to its position thus making the way for gas release through the valve opening 19 into the nozzle. However during high pressure which is applied mostly for commercial purposes, the control pin 14 gets pulled upward from its initial position wherein the 30° angle of the nozzle 9 body gets fixed at the nozzle opening 19 due to high pressure. This leads to the complete closure of the nozzle opening 9 preventing any gas release. It remains in this sealed position until the high pressure is applied.

Examples

Example 1- The self-closing pressure control valve position during filling of the gas in cylinder.

During filing of the gas in the cylinder, the self-closing valve pin 3 in the valve 1 displaces downward up to 5mm, allowing the passage of gas downwards. The nozzle and control valve pin assembly 18
5 gets further displaced in down direction which facilities the filling of the gas in the cylinder through holes 16, 16a and 16b at the lower end 22 of the nozzle 1 just below the threading 21 of the nozzle 1.

Example 2- The self-closing pressure control valve position during low pressure.

During the regular usage ,the valve pin 3 is fixed inside the valve 1 followed by the nozzle and control pin assembly 18 which completely seals the passage of the gas through holes 16, 16a and 16 b. The
10 only space for the gas release is through the opening at the tip of the nozzle 9 that is controlled by control valve pin 14. During low pressure as used for domestic purpose, the control valve pin 14, rises upwards through the hole and falls down backward due to low pressure thus allowing the gas passage through the nozzle opening 19 and into the nozzle.

Example 3- The self-closing pressure control valve position during high pressure.

15 During high pressure applied for mainly commercial purposes, the valve 1 and the valve pin 3 gets displaced downwards for gas release. However, due to high pressure, the control-valve pin 14 with its 30° angle completely seals the nozzle opening 19 preventing any gas passage from the cylinder through the nozzle 9 into the valve 1. This avoids the gas utilization at high pressure with the system operating only at low pressure for domestic usage. This prevents unauthorized use or storage of gas
20 for commercial purposes and also prevents accidents due to valve rupture.

I claim:

1. A self-closing pressure control valve assembly comprising of:

- a. valve, valve pin, valve O-ring, pin rubber, pin cap, small spring and triangle support pin;
- b. nozzle, control pin, C-lock, nozzle O-ring, control pin lock, big spring and chuck nut;

wherein, a valve pin with small spring around its spindle body, pin rubber and pin cap fixed near its upper end and triangle support pin at the valve pin lower end together form an valve pin assembly; a control pin with big spring wrapped around it, nozzle O-ring at nozzle upper end, control pin lock at the tip of control pin and chuck nut at the lower end of the control pin together forms the control pin assembly.

2. A self-closing pressure control valve claimed in claim 1 wherein, the valve pin assembly is fixed inside the valve with its lower end extending up-to the valve threads.

3. A self-closing pressure control valve claimed in claim 1 wherein, the control pin assembly is inserted inside the nozzle from its lower open end and the tip of the control pin passes through the nozzle opening at the upper closed end of the nozzle together forming the nozzle and control pin assembly.

4. A self-closing pressure control valve claimed in claim 1 wherein, the nozzle and control pin assembly claimed in claim 3 is inserted inside the valve through its lower open end wherein the nozzle and control pin assembly seals the holes in the lower open end of the valve.

5. A self-closing pressure control valve claimed in claim 1 wherein, the nozzle and control pin assembly claimed in claim 3 is inserted such that the upper end of the nozzle and control pin assembly is attached with the lower end of the valve pin assembly inside the valve body with the space between the two sealed by the C-lock.

6. A self-closing pressure control valve claimed in claim 1 wherein, the valve pin assembly is capable of downward displacement according to the pressure applied through the regulator.

7. A self-closing pressure control valve claimed in claim 1 wherein, the nozzle and control pin assembly is capable of vertical downward movement during the filling of the gas through holes at the lower open end of the valve.

8. A self-closing pressure control valve claimed in claim 1 wherein, the control pin assembly inside the nozzle is capable of upward and downward movement according to the low pressure or high pressure applied through the regulator.

9. A self-closing pressure control valve claimed in claim 8 wherein, the control pin assembly inside the nozzle is pulled upwards such that it seals the nozzle opening at the upper closed end of the nozzle during high pressure.

10. A self-closing pressure control valve claimed in claim 8 wherein, the control pin assembly inside the nozzle rises upward and falls down to initial position such that the space between the control pin tip and the nozzle opening allows the passage of gas during low pressure.
11. A self-closing pressure control valve claimed in claim 1 wherein, the control pin has 30 angle
5 along its spindle shaped body wherein the 30angle seals the nozzle opening at its upper closed end during high pressure.
12. A self-closing pressure control valve claimed in claim 1 wherein, the small spring around the valve pin and the big spring around the nozzle facilitates the extension and compression of the valve pin inside the valve and the control pin inside the nozzle respectively.
- 10 13. A self-closing pressure control valve claimed in claim 1 wherein, the nozzle pin lock at the tip of the control pin prevents the downward displacement of the control pin below the nozzle opening at the upper closed end of the nozzle.

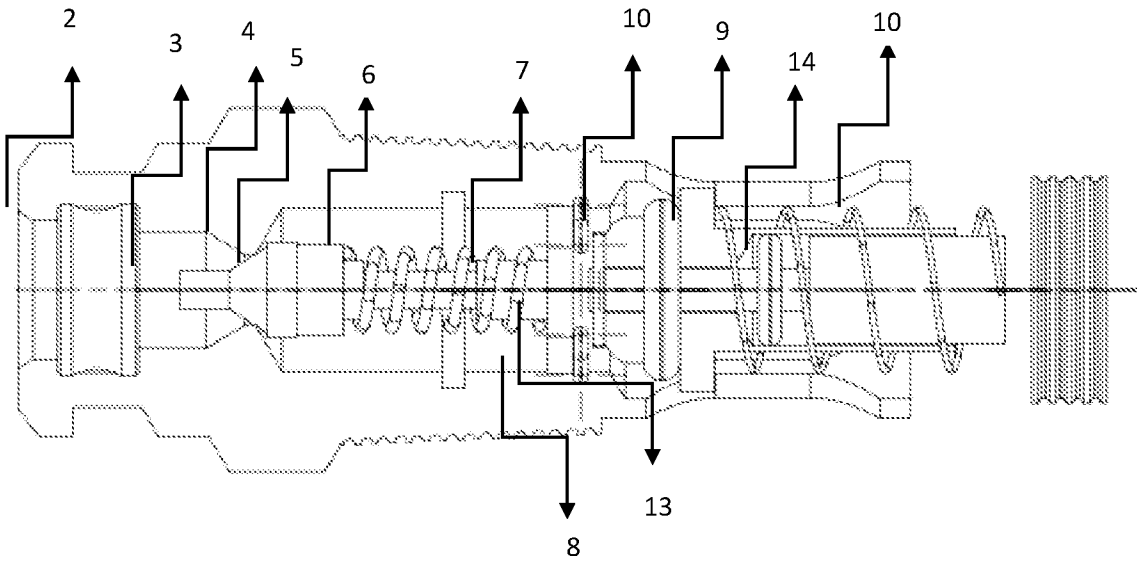
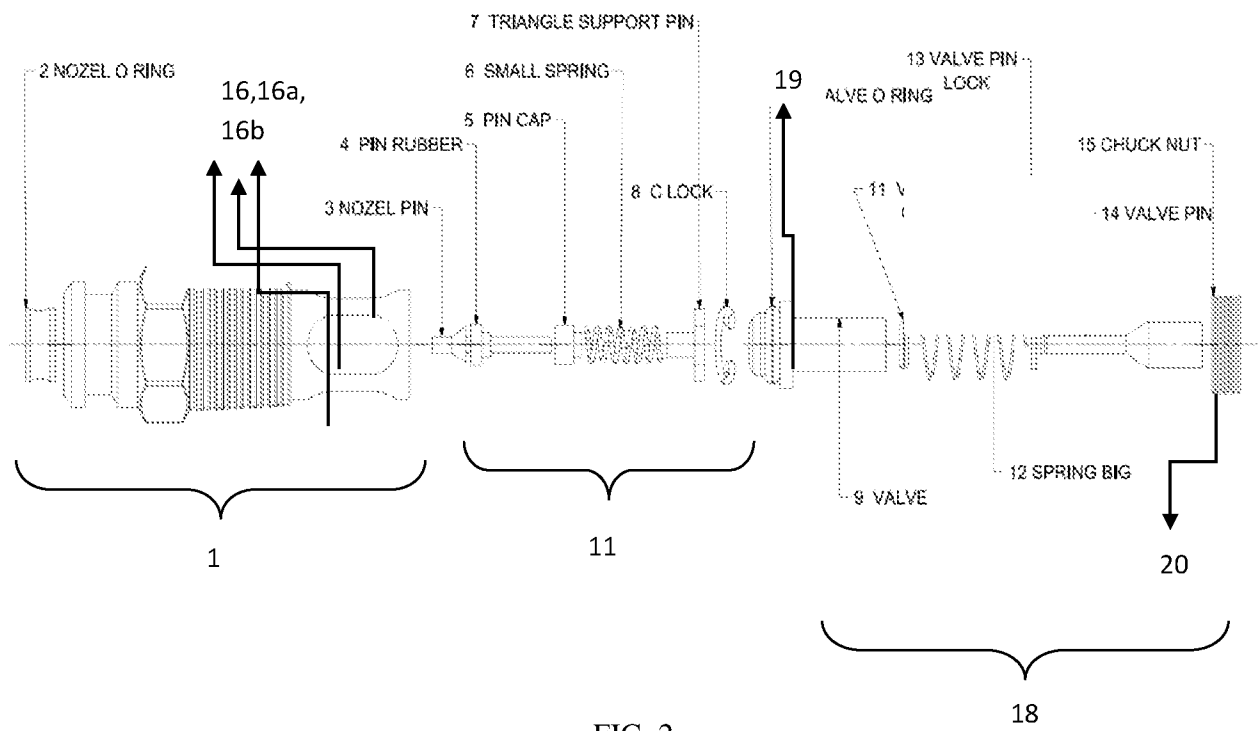


FIG 1



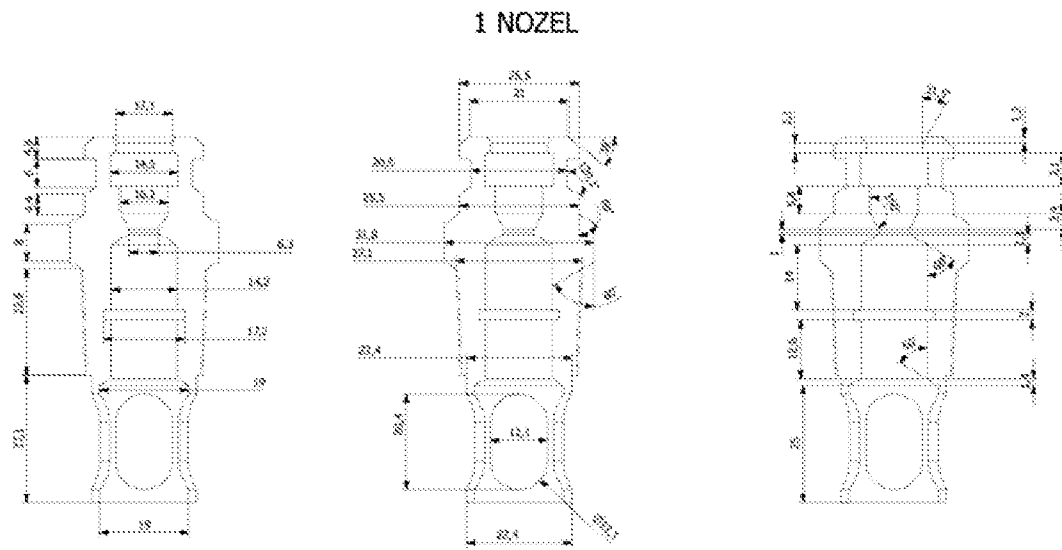


FIG. 3

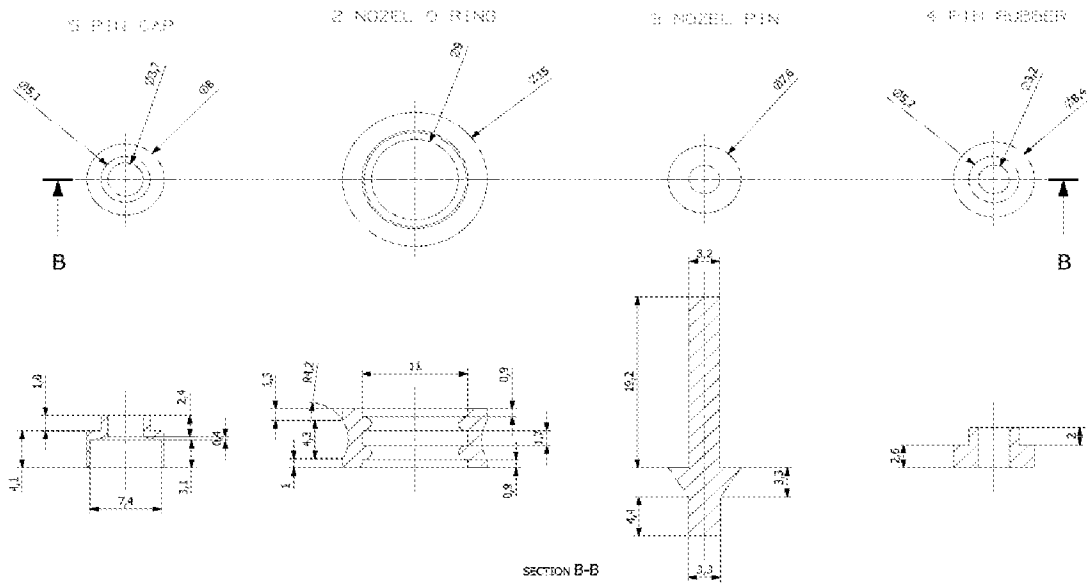


FIG. 4

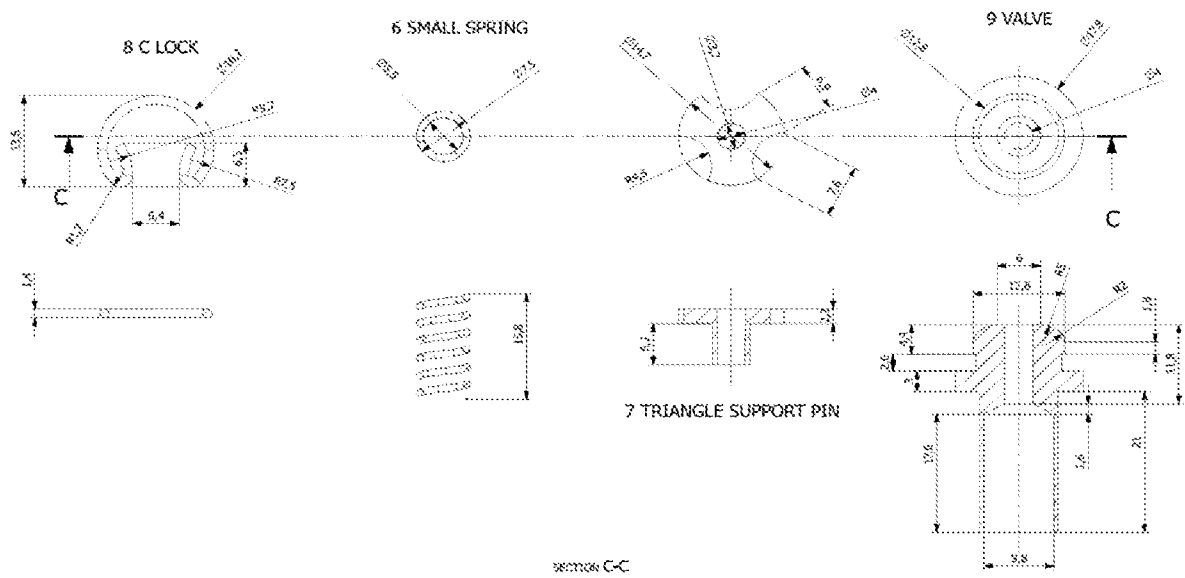


FIG. 5

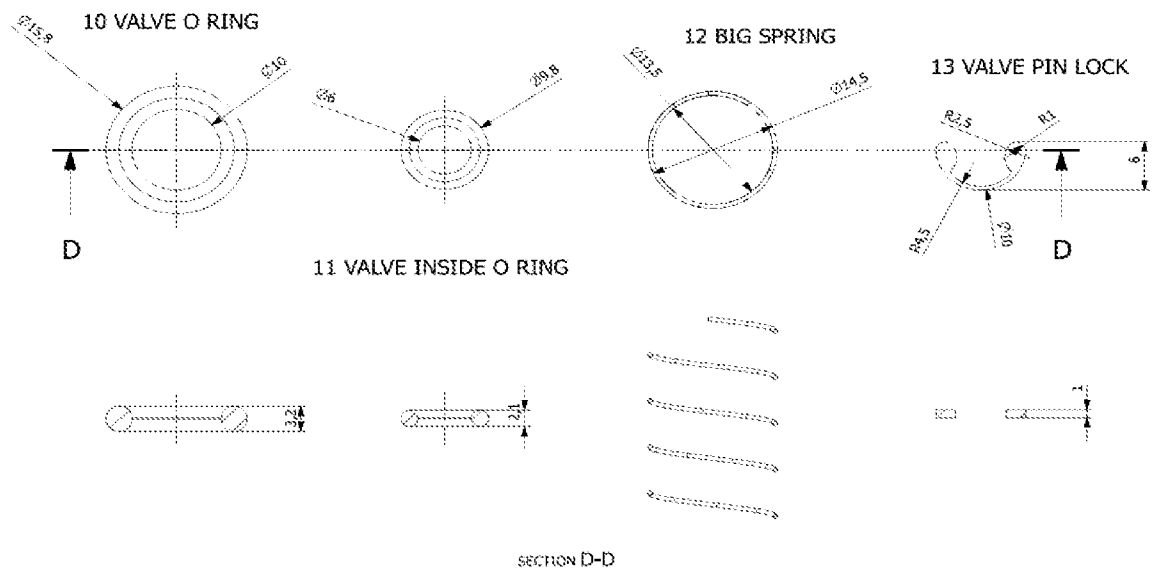


FIG. 6

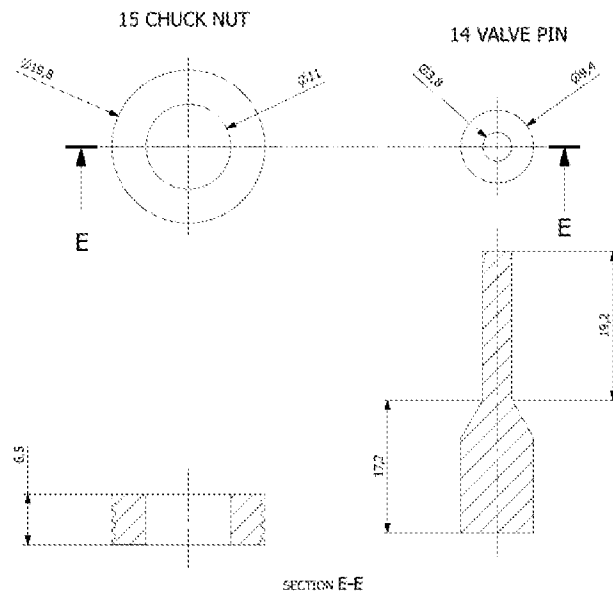


FIG. 7

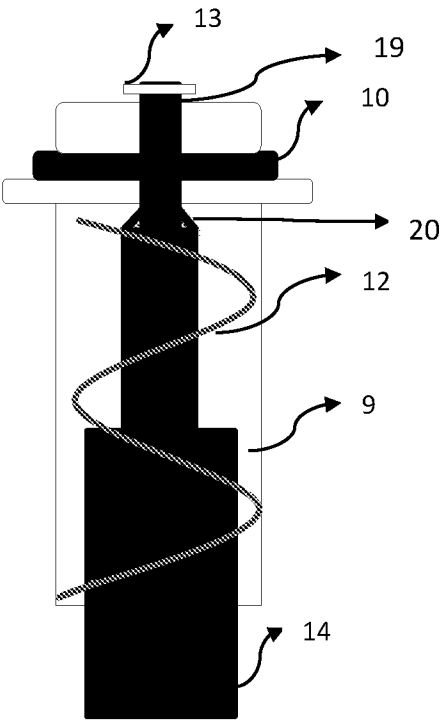


FIG 8

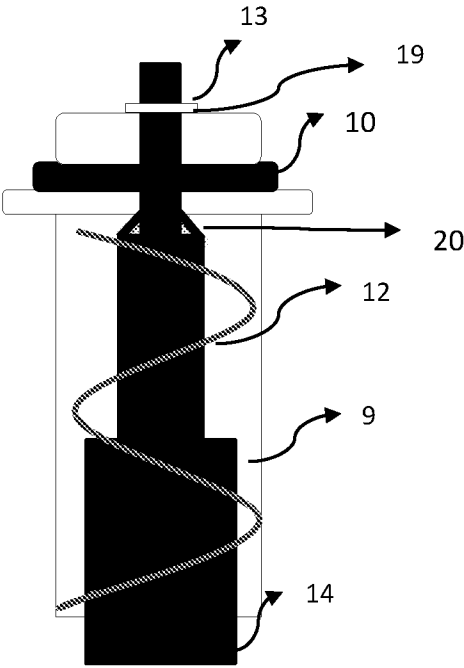


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2018/050715

A. CLASSIFICATION OF SUBJECT MATTER
F16K21/04, F16K31/528 Version=2019.01

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)

F16K, F16C

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 practicable, search terms used)

TotalPatent One, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN202790736U (CHINA PETROLEUM et al.) 13 MAR 2013 Para [0008] to [0009], [0018], [0026] and claim-1	1-13
A	EP0959293A2 (MESSER CUTTING AND WELDING AG) 24 NOV 1999 para [0022], [0036] to [0038] and figure-1	1-4, 12-13
A	KR1020090014809A (WOONGJIN CUCHEN CO. LTD.) 11 FEB 2009 para [0009] to [0012], para [0021]-[0047] and figure-1	1-4, 6-10

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2018/050715

Citation	Pub.Date	Family	Pub.Date
EP 0959293 A3	30-08-2000	DE 19822368 A1	25-11-1999