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(54) **Pressure sensitive valve.**

(57) A valve including a moveable and spring actuated valve body (8).
The valve body (8) acts via a stem (6) and a closure member (4) together with a conical seat (3) disposed on the housing (1). A rectlinear continuous flow path (2) through the valve is provided by a central bore (12c, 8c) through spring seat (12) and through valve body (8) and by a circular valve opening (3a) in the conical valve seat (3).

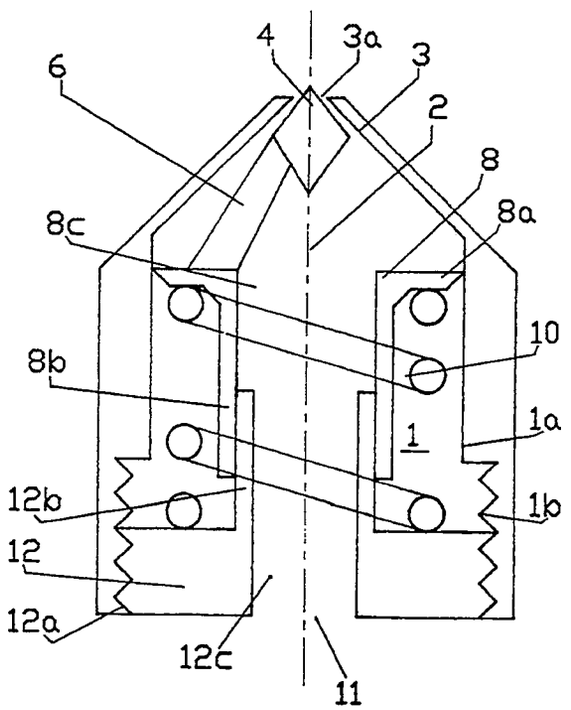

Fig. 1

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PRESSURE SENSITIVE VALVE

The present invention relates to a valve of the kind, having a cylindrical valve housing with a rectlinear continuous flow path, a conical valve seat disposed on the valve housing concentric to the flow path and a discshaped valve body with at least a stem and a closure member. The valve body is arranged fluid tight and moveable in the valve housing and actuated by a spring device, which further end makes contact to a spring seat.

The valve according to the invention may be employed for controlling the flow of a liquid or gaseous medium from a container or in a pipe, wherein the medium is contained.

Valves for this service are usually globe valves with a valve body fastened to a stem, which stem being actuated by the force of an actuator spring arranged externally to the valve housing. The valve closure member of such a valve is lifted from the valve seat when the pressure in the medium to be controlled extends a predetermined limit where the spring force is defeated, which otherwise forces the closure member against the seat.

As a disadvantage, the medium flow through the known globe valves is caused to take a non-linear path through the seat and along the closure member, which results in a large pressure drop.

A valve with a linear flow path is the known gate valve. This valve is opened when the gate is moved by the stem into the yoke or top section of the valve. The yoke or top section is positioned externally to the valve housing. Neither this kind of valve provides a compact valve assembly, having all components arranged within the valve housing.

A compact seat valve with a substantially rectlinear continuous flow path is mentioned in DK-Patent Publication No. 4345/75, wherein a circular valve seat is arranged within the valve housing concentric to the flow path.

A valve ball, which works together with the seat is spring loaded by a spiral spring.

One end of the spring makes contact to a spring seat provided with a central bore. The opposite end of the spring, which actuates the valve ball, makes contact to a further spring seat having in its circumference grooves parallel to the axis of the spring seat. The flow path is thereby obtained through the grooves and the central bore of the spring seat. According to this reference, the valve is suitable as a check valve for a suction flask.

A disadvantage of the mentioned valve is the restricted path through the grooves of the spring seat and the arrangement of the spring within the flow path. This is particular disadvantageous, when the valve is used to control flow of highly viscous media or flowable solids.

The object of the present invention is to provide a valve of that kind, which has a rectlinear continuous flow path through the valve housing, and which is useful to control a stream of highly viscous or flowable media without the disadvantages of the known valves.

Accordingly, the present invention comprises a valve of the introductory mentioned kind, which valve is characterized in that the stem is coaxially to the axis of the flow path arranged on the valve body, which concentric to the axis of the flow path is provided with a central bore and with an axially directed cylindrical nozzle opposite to the stem, the nozzle surrounds concentric and moveable in fluid tight manner a cylindrical nozzle guide arranged on the spring seat around an inlet section, the inlet section is in form of a central bore through the spring seat and has a cross sectional area, which is less than the cross sectional area of the valve body, the spring device is concentrically arranged around the axially directed nozzle.

The flow path through the valve according to the invention is thus provided by the central bore through the spring seat, the central bore through the valve body together with the axially directed nozzle, and by the conical seat, which concentric to the axis of the flow path is arranged on the valve housing.

The spring device is thereby disposed outside the flow path, which is advantageous, in particular when the valve is flushed by viscous liquids or particulate materials.

A particular feature of the valve according to the inventor is the difference between the cross sectional areas of the inlet section and the disc-shaped valve body, which is exposed to the pressure in the medium controlled by the valve.

The pressure exerted by a fluid in closed containers is as known the same all over the boundaries of a container. Thus the pressure in the valve can be expressed by the following relationship :

$$Pm = Ff/Af = Fv/Av = const.,$$

where Pm is the pressure exerted by the fluid in the valve ; Ff and Fv is the force acting in the central bore of the inlet section and on the valve disc of the valve body, respectively ; and Af and Av is the cross sectional area of the central bore and the valve disc, respectively.

By providing the valve disc with a larger area than the area of the inlet section a large spring force exerted by the spring device can act on the closure member in order to provide an air tight closure of the valve, which is particular advantageously, when the medium to be controlled comprises air sensible or air hardening components, such as pastes or adhesives. On the other hand the pressure in the medium can be relatively low in order to open the valve, which is further desirable, when the medium is released from a con-

tainer by manual pressure on the container.

In a further embodiment of the invention, the distance between the valve body and the spring seat can be regulated continuously by arranging the spring seat displaceable in the valve housing. The spring seat is thereby formed as a cylinder with projections on the cylinder wall, preferably a thread, which acts together with a compatible projection on the inner wall of the valve housing. By regulating the distance, the spring force acting on the valve body, is regulated by screwing the valve housing or the spring seat a number of turns around its axis.

In still an embodiment of the invention, the valve closure member is provided with an auxillary check valve. The check valve may be of the kind comprising a plug with peripheral grooves parallel to the axis of the plug, thereby providing a flow path from the inside of the main valve housing to the outside of the valve. The plug may be disposed in a bore through the closure member and has on the side being outside the main valve housing a bonnet or a thickening, which prevents the plug from sliding through the bore. On the side being inside the housing, the plug is provided with a cone or disc-shaped body, which upon pressure in the main valve is forced tightly against the closure member.

At vacuum or under pressure inside the valve housing, the pressure is equalized by leaking air or a medium outside the valve through the grooves in the plug and into the space defined by the main valve body and valve seat.

The valve according to the invention may further advantageously be used as exit nozzle in extruders. For this purpose, the valve seat may be provided with e.g. a cylindrical nozzle piece.

In the following description the invention is more fully described with reference to the drawings, in which

FIG. 1 shows a cross sectional view of a valve constructed according to one embodiment of the invention ;

FIG. 2 is a cross sectional view of a valve closure member according to a further embodiment of the invention ; and

FIG. 3 is a horizontal section through the valve closure member of FIG. 2.

Referring now to FIG. 1, the valve comprises a cylindrical valve housing 1, which in its upper part is provided with a cone-shaped valve seat 3. Valve seat 3 has a circular opening 3a concentric to the axis of flow path 2 through the valve. Opening 3a constitutes the outlet of the valve.

A valve closure member 4, which acts together with valve seat 3, has in the shown embodiment a conical shape. Other shapes, such as a hemispherical or a lentoide shape, may be suitable as well. Closure member 4 may as mentioned above be provided with an inlet valve 40 (FIG. 2).

As shown in FIG. 2 and FIG. 3 the closure member 4 has in such an embodiment built in a cylindrical plug 41, which slides in a central bore 42 through closure member 4. Plug 41 is provided with peripheral grooves 41a parallel to the axis of the plug. A bonnet 41b on the plug 41 outside the main valve, prevents the plug from sliding completely through bore 42. On the opposite side plug 41 has a conical body 41c, which acts together with an equivalent curving 4b on the downside of closure member 4. Closure member 4 (FIG. 1) is connected via a valve stem 6 to a valve body 8, which consists of a valve disc 8a and an axial directed nozzle 8b around a central bore 8c through body 8.

The peripheral part of valve disc 8a makes fluid tight contact to the inner wall 1a of housing 1. Body 8 is at its downside loaded with a spiral spring 10, which further end makes contact to a cylindrical spring seat 12. Spring seat 12 is in the shown embodiment formed as screw plunger with a thread 12a, which acts together with a compatibel thread 1b at the inner wall 1a of the valve housing.

As mentioned hereinbefore it is possible to control in such an embodiment of the valve the flow through the valve by varying the distance between spring seat 12 and the closure member 8. The valve may be closed constantly, by screwing seat 12 into the valve housing 1, until seat 12 hits nozzle 8b, so that any movement of body 8 is prevented.

Spring seat 12 is further provided with a central bore 12c, and an axial disposed guide nozzle 12b, which is surrounded tightly slidding ny nozzle 8b. Central bore 12c constitutes the valve inlet 11, through which the medium to be controlled flows into the valve flow path 2. Flow path 2 is further constituted by central bore 12c and 8c through spring seat 12 and valve disc 8, and by guide nozzle 12b, nozzle 8b and the conical valve seat 3 with annular opening 3a.

The valve is in its normal state closed and a medium flowing into the valve housing fills up the space between valve seat 3 and the upper side of valve body 8. The body 8 is moved by a force directed against the upper side of valve disc 8a, which force is proportional to the medium pressure at inlet 11 and the area of disc 8a. Body 8 is moved thereby towards spring seat 12 when this force overcomes the spring force of spring 10. The flow path through opening 3a in the valve seat is then opened and the medium flows through the valve.

The circumferential part of disc 8a slides tightly along the inner wall 1a of the valve housing and nozzle 8b slides along guide nozzle 12b, thereby preventing fluttering of the valve body 8. At decreasing pressure in the medium and consequently a decreasing force on disc 8a, the spring force acting oppositely on disc 8a overcomes this force and the valve returnes to its closed position.

Although the present invention has been shown

and described with reference to particular embodiments thereof, the invention is not limited to the shown embodiments. Thus in further embodiments of the invention, the outer wall of valve housing 1 may be provided with a thread allowing the valve to be screwed into a pipe or tube.

Furthermore, the central bore 12c through the spring seat 12, may be provided with a thread, a coupler or a spring lock by which the valve may be fastened to a container.

Dimensions and materials of the valve are not important to the invention and may be chosen freely.

Claims

1. A valve of the kind having a cylindrical valve housing (1) with a rectlinear continuous flow path (2), a conical valve seat (3) having a circular valve opening (3a) and being disposed concentric to the flow path (2) on the valve housing (1), and a valve body (8) comprising a valve disc (8a) and arranged on the valve disc (8a) at least a stem (6) and via the stem (6) a valve closure member (4), said valve body (8) being arranged fluid tight and moveable in the housing (1) and being actuated by a spring device (10), the further end of the spring device (10) making contact to a spring seat (12), **characterized** in that the stem (6) is arranged axially displaced to the flow path (2) on the valve body (8) is provided with a central bore (8c) and on the opposite side to the stem (6) concentrically to the central bore (8c) with an axially directed cylindrical nozzle (8b), the nozzle (8b) surrounds concentric and moveable in fluid tight manner a cylindrical nozzle guide (12b) arranged on the spring seat (12) concentric to an inlet section (11), the inlet section (12) is centrally bored through the spring seat (12) and has a cross sectional area less than the cross sectional area of the valve disc (8a), the spring device (10) concentrically surrounds the axially directed nozzle (8b, 12b).

2. The valve according to claim 1, characterized in that the spring seat (12) in its circumference is provided with a projection (12a), which acts together with an equivalent projection (1b) on the inner wall (1a) of the valve housing.

3. The valve according to claim 2, characterized in that the projection (12a, 1b) is formed as a thread.

4. The valve according to claim 2, characterized in that the projection (12a, 1b) is formed as a spring lock.

5. The valve according to claim 1, characterized in that the inlet section (11) is provided with a coupling device.

6. The valve according to claim 5, characterized in that the coupling device is in the form of a thread.

7. The valve according to claim 1, characterized in that the valve closure member (4) is provided with an auxillary check valve (40).

8. The valve according to claim 7, characterized in that the check valve (40) comprises a cylindrical plug (41), which in its circumference is provided with axis parallel grooves (41a).

9. The use of a valve according to any one of the preceding claims as exit nozzle to an extruding apparatus.

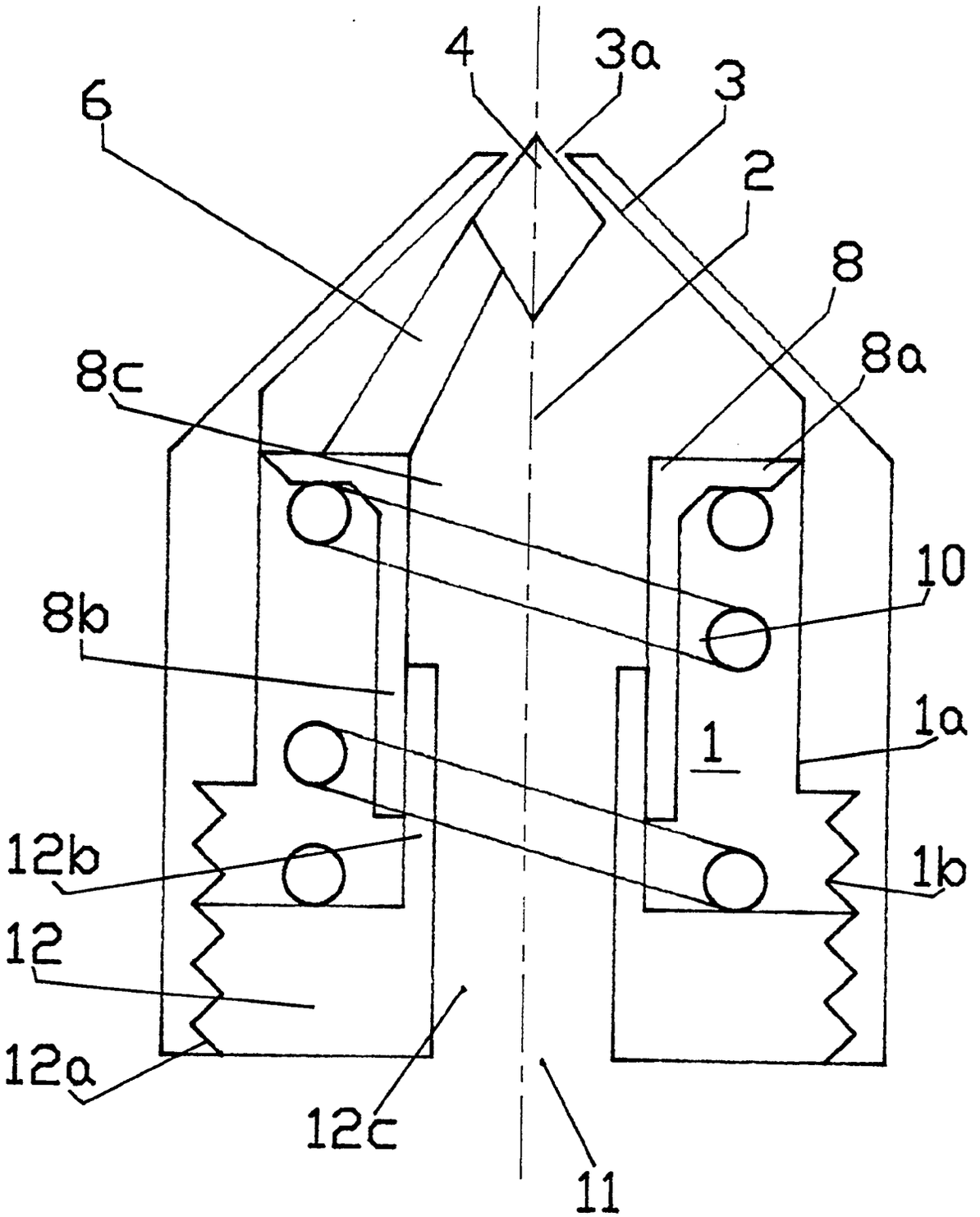

Fig. 1

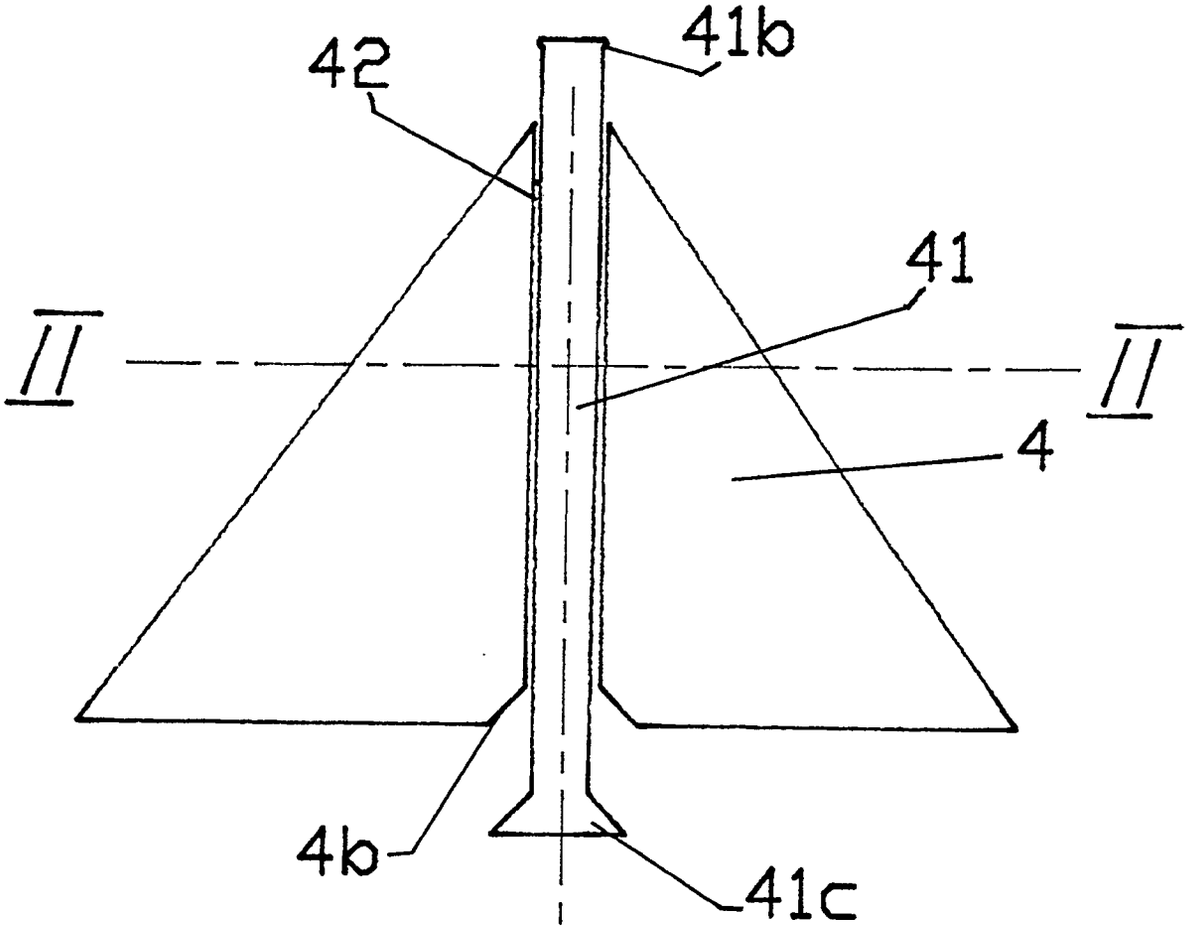

Fig. 2

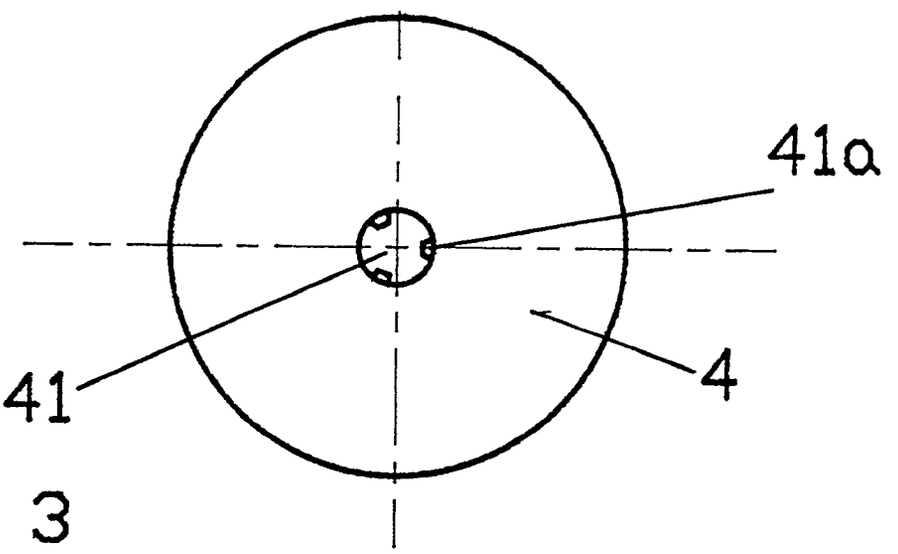

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number

EP 90 61 0073

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-2 109 397 (LAUGHLIN) * All * ---	1,2	B 05 B 1/30 B 65 D 35/50
X	FR-A- 825 740 (EDEL) * Page 2, line 37 - page 3, line 4 * ---	1,2,5,6	
X	DE-A-2 703 095 (CHARALAMBOS) * Page 2 * ---	1,2,3	
X	DE-A-2 715 787 (CHARALAMBOS) * Page 2 * -----	1,2,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 05 B B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18-03-1991	VERELST P.E.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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