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(54) **GAS CYLINDER FITTED WITH A SYSTEM FOR STOPPING COMPLETELY THE ROD**

(57) The gas cylinder is of the type used for example in punching installations or tools, and comprises two hermetic and independent chambers (7) and (8), the first placed axially to the corresponding rod (6) and the latter placed annularly and externally, with said two chambers externally communicated through branches (16) and (17) which end in a common chamber (14) of a pressure accumulator (11), in which is defined a second chamber (13) which can be charged with nitrogen and is provided with a movable piston (12) for the filling and corresponding pressure balancing between chambers (14), (7) and (8). An electrovalve (18) can be closed at will after attaining the pressure balance between said three chambers (14), (7) and (8), preventing rod (6) from recovering its original position after the force exerted on it during operation ceases.

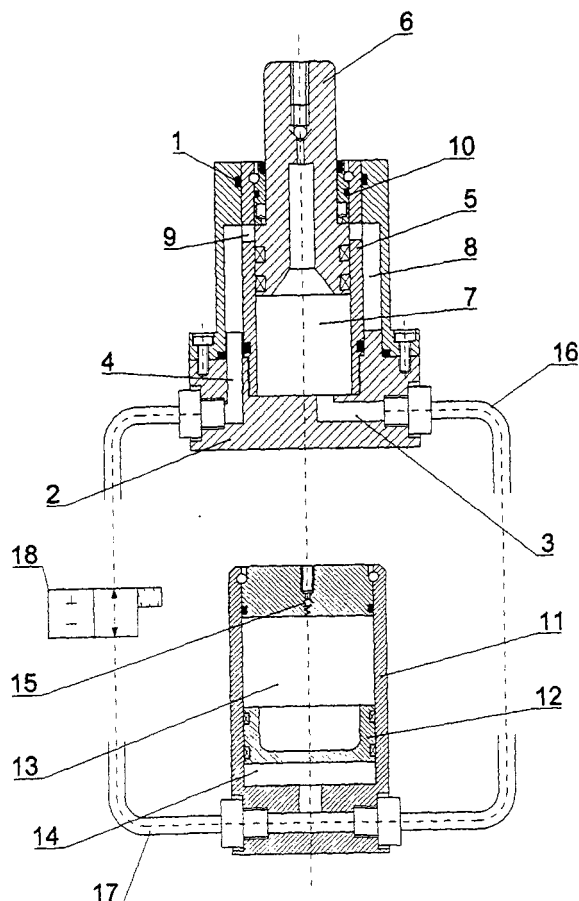


FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] The invention relates to a gas cylinder associated to a system by which the corresponding cylinder rod is locked in its end position of its stroke, also allowing to control and adjust the return of said rod to its initial position.

[0002] The invention is mainly applicable to cylinders as those used for example in punching installations or tools, without prejudice of its use in any other practical cases requiring these characteristics.

[0003] It is therefore the object of the invention to lock a gas cylinder rod at the final position of its stroke, preventing its return when the external force which causes the gas to compress ceases, with the expansion of the gas and the ensuing return of the rod to its initial position occurring only by activation of an electrovalve.

BACKGROUND OF THE INVENTION

[0004] In gas cylinders used in punching installations when the external pressure on the rod stops the rod quickly returns to its original position due to the expansion of the previously compressed gas, as the external pressure exerted during the work of the cylinder acts against a gas which is compressed, so that its force of expansion after the external pressure stops or after its work is performed will return the rod to its original position.

[0005] However, this quick, practically instantaneous return of the gas cylinder rod can result in damage to the part being worked upon, whether by direct action or by indirect action through the tools or machine parts located between the cylinder and the part.

DESCRIPTION OF THE INVENTION

[0006] The gas cylinder disclosed presents a number of specific characteristics which in combination with a system comprising a pressure accumulator and an electrovalve solves the above described problem in a simple, effective and reliable manner, as the assembly of cylinder, accumulator and electrovalve conform an elastic force system which allows to control the return of the cylinder rod at will.

[0007] More specifically, the cylinder of the invention is characterised by comprising two hermetic and independent chambers, one which is arranged axially to the corresponding rod, which runs inside a bushing concentric to the outer cylindrical body of the cylinder, so that between said outer wall and said bushing inside which the rod moves axially, the second chamber is defined which may be in communication with the rod but not with the axial chamber in which it moves.

[0008] The two chambers, which contain the hydraulic oil, are externally communicated by a pressure accumu-

lator formed by a cylindrical body with two chambers, one charged with nitrogen through an external charging valve to a given pressure and the other meant to transfer the pressure through a piston interposed between this second chamber and the nitrogen-filled chamber of the accumulator being described, in order to balance pressures in the gas cylinder chamber and in the second chamber of the accumulator.

[0009] An electrovalve is installed in the branch which communicates the external chamber of the gas cylinder to the second chamber of the accumulator. This valve can be opened and closed at will, so that when open to it maintains pressure in the external chamber and locks the inwards axial displacement of the rod by means of an external force, that is, during the active operation of the cylinder. Thus, if the external force on the rod ceases due to the chamber being closed, because of the electrovalve the rod cannot return to its original position unless this electrovalve is opened, and thus allows hydraulic oil to pass from said chamber to the second chamber of the accumulator, and naturally towards the axial chamber of the gas cylinder itself, allowing the rod to recover its original position.

[0010] The accumulator, in addition to transmitting pressure when charged with nitrogen to the gas cylinder chambers until the pressure balance of the system is restored, also absorbs through the pressurised gas chamber the excess pressure produced by the volume reduction of the gas cylinder chambers.

[0011] On its part the electrovalve installed in the branch which communicates the external gas cylinder chamber to the corresponding accumulator chamber is meant to control at will the flow of oil between the two chambers of the gas cylinder when said electrovalve is actuated with an external electrical signal.

DESCRIPTION OF THE DRAWINGS

[0012] These characteristics of the invention will become clearer in view of the accompanying drawing of a preferred embodiment, which form an integral part of the description and where for purposes of illustration only and in a nonlimiting manner the single figure represents a sectional view of the gas cylinder associated to the pressure accumulator and the electrovalve interposed in one of the branches which communicate the gas cylinder with the pressure accumulator itself.

PREFERRED EMBODIMENT OF THE INVENTION

[0013] As can be seen in the figure, the gas cylinder which is preferably employed in punching installations or devices comprises an external gas cylinder (1) which on one of its ends incorporates a flange by which it is attached to a base (2), with two passages (3) and (4).

[0014] Between base (2) and the free open end of cylindrical body (1) is mounted a bushing (5) on which moves axially the corresponding cylinder rod (6), all

such that in said general cylinder are defined two chambers (7) and (8), the first axial to rod (6) and therefore inside bushing (5), and the second placed annularly between bushing (5) and the external wall of cylindrical body (1), with this second chamber (8) having a lateral orifice (9) in bushing (5) for communicating said chamber (8) and rod (6).

[0015] Passage (4) leads to chamber (8) and passage (3) leads to chamber (7).

[0016] The cylinder is further provided with a bushing (10) placed in correspondence with the end of bushing (5), so that said bushing (10) acts as a mechanical stop ending the stroke of rod (6).

[0017] In said gas cylinder are provided the corresponding gaskets establishing a hermetic seal between the chambers and the participating elements.

[0018] The gas cylinder is further provided with a pressure accumulator comprising a cylindrical body (11) with a piston (12) which defines two chambers labelled (13) and (14), in which the first is a chamber pressure which receives nitrogen gas through a charging valve (15), and the second chamber (14) is filled with hydraulic oil, as are the aforementioned chambers (7) and (8) of the gas cylinder, since this cylinder communicates with chamber (14) through branches (16) and (17), the first connected by passage (3) to chamber (7) and the second connected by passage (4) to chamber (8).

[0019] Therefore, chambers (7) and (8) of the gas cylinder are independent, although they are communicated externally by branches (16) and (17) in combination with chamber (14) of the pressure accumulator. This chamber (14) is naturally independent of and totally sealed from pressure chamber (13) of the accumulator.

[0020] In branch (17) is placed an electrovalve (18) meant to control oil flow between chambers (7) and (8) of the gas cylinder, using an external electrical signal as described further below.

The operation is as follows:

[0021] When an external axially oriented force is applied to the gas cylinder rod (6) the end of its working stroke is reached, so that said rod (6) is retracted inwards, and hydraulic oil of chamber (7) passes through branch (16) to chamber (14) and through chamber (17) to chamber (8), so that through orifice (9) oil is allowed through chamber (8) into the chamber defined inside piston (5) when rod (6) retracts.

[0022] Previously chamber (13) of the pressure accumulator has been charged with nitrogen through valve (15) to a given pressure, so that this pressure is transmitted through piston (12) to the entire system and the pressures in chambers (7), (8) and (14) are balanced.

[0023] Once this pressure balance is attained electrovalve (18) is closed, so that when pressure on rod (6) ceases or when the cylinder stops acting, said rod (6) will be locked in its retracted position as the aforementioned pressure balance prevents rod (6) from recover-

ing its original position, that is, it will not move in the direction of expansion as the pressure balance prevents this.

[0024] However, if valve (18) is actuated and opened, oil in chamber (8) will return freely through branch (17) to chambers (14) and (7) respectively, allowing a controlled expansion of said rod (6), that is, its movement towards its original position with bushing (10) acting as a stop for the end of the stroke.

[0025] Finally, as an option a second electrovalve can be installed in branch (16) which may be useful in certain applications, particularly to prevent a possible rebounding effect of cylinder rod (6).

Claims

1. Gas cylinder with total rod stoppage system, of those used for example in punching installations or tools, of the type which recover their original position by means of hydraulic pressure after the force exerted axially by the rod itself in its operation ceases, **characterised in that** inside cylindrical body (1) of the gas cylinder are defined two hermetic independent chambers (7) and (8), the former placed axially to the corresponding rod (6) and the latter placed annularly and externally to bushing (5), in which bushing is defined the first chamber (7) and in which moves said rod (6); said hermetic chambers (7) and (8) are externally communicated by a gas accumulator (11) in which are also defined two hermetic and independent chambers, a gas chamber (13) charged with nitrogen and a chamber (14) which contains hydraulic oil, as do the chambers (7) and (8), with communication of this chamber (14) and chambers (7) and (8) established by branches (16) and (17), such that chambers (13) and (14) of the pressure accumulator (11) are separated by an interposed piston (12), while branch (17) which communicates to the external chamber (8) of the gas cylinder incorporates an electrovalve (18) controlled externally and at will.
2. Gas cylinder with total rod stoppage system, as claimed in claim 1, **characterised in that** the gas cylinder, in correspondence with the bottom end of bushing (5) inside which moves rod (6) and in which is defined axial chamber (7), is provided with a bushing (10) which acts as a mechanical stop for the end of stroke in the motion of rod (6) towards its original expansion position; and with the wall of bushing (5) provided with an orifice (9) which communicates the annular external chamber (8) and the rod (6), allowing to lock the latter in its retracted position, which was brought about by an external axial force exerted on it, after balancing pressures between chambers (7), (8) and (14) opening electrovalve (18).

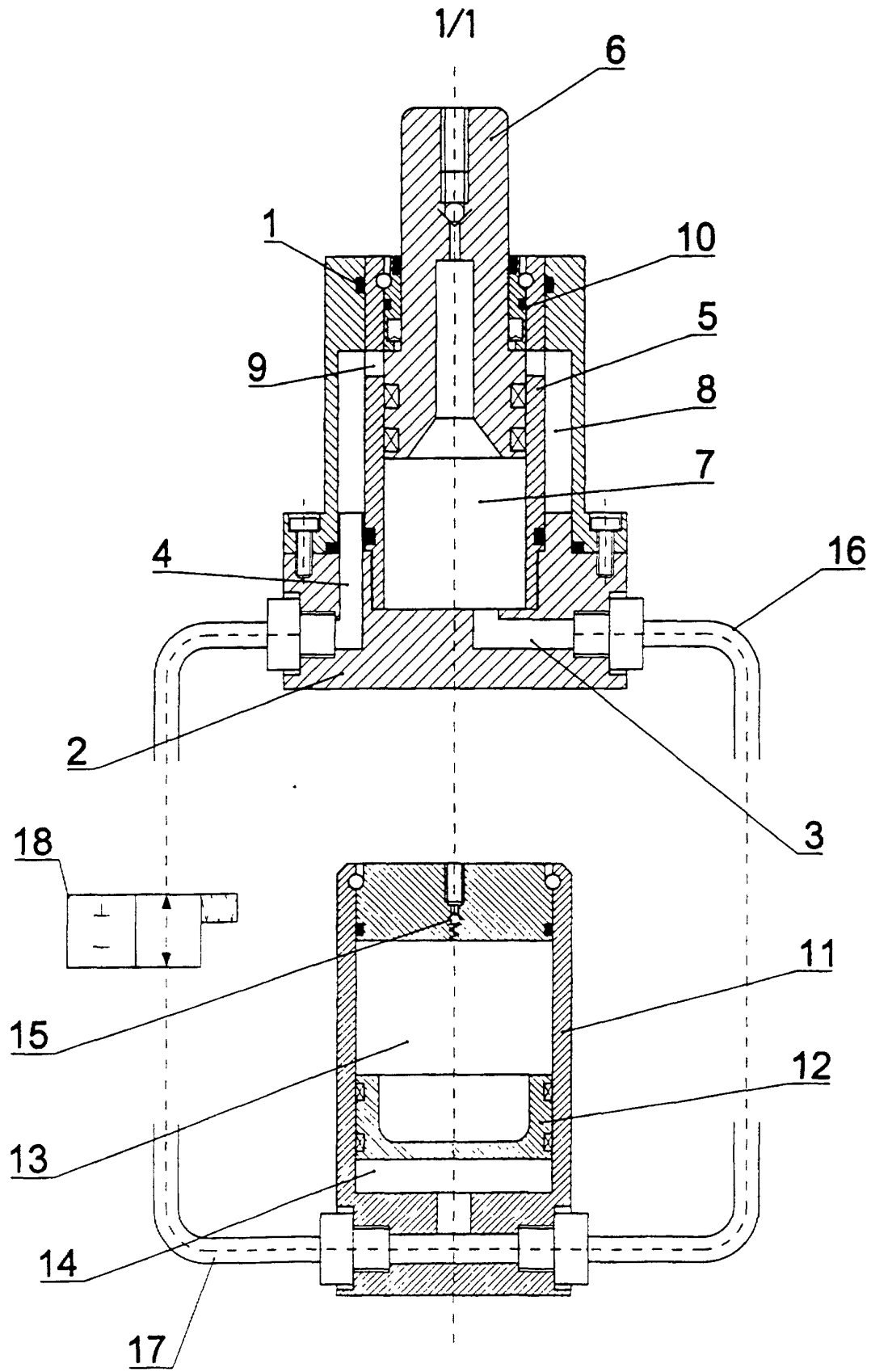


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES99/00308A. CLASSIFICATION OF SUBJECT MATTER⁶:

IPC6: B30B 15/16

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)
IPC6: B30BDocumentation searched other than minimum documentation to the extent that such documents are included in the fields searched
EPODOC, WPI

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US4235088-A (Kreiskorte) 25 November 1980 (20.11.80)	1
A	US4389874-A (Riboldi) 28 June 1983 (28.06.83)	1
A	US4022096-A (Forichon) 10 May 1977 (10.05.77)	1

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

* Special categories of cited documents:

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"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
7 January 2000 (07.01.00)Date of mailing of the international search report
17 January 2000 (17.01.00)

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International Application No
 PCT/ ES 99/ 00308

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US4235088	25.11.1980	GB2006654 CH0634254 DE2747548 IT0099404	10.05.79 31.01.83 17.04.86 18.09.85
US4389874	28.06.1983	IT1130562	18.06.86
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Form PCT/ISA/210 (patent family annex) (July 1992)