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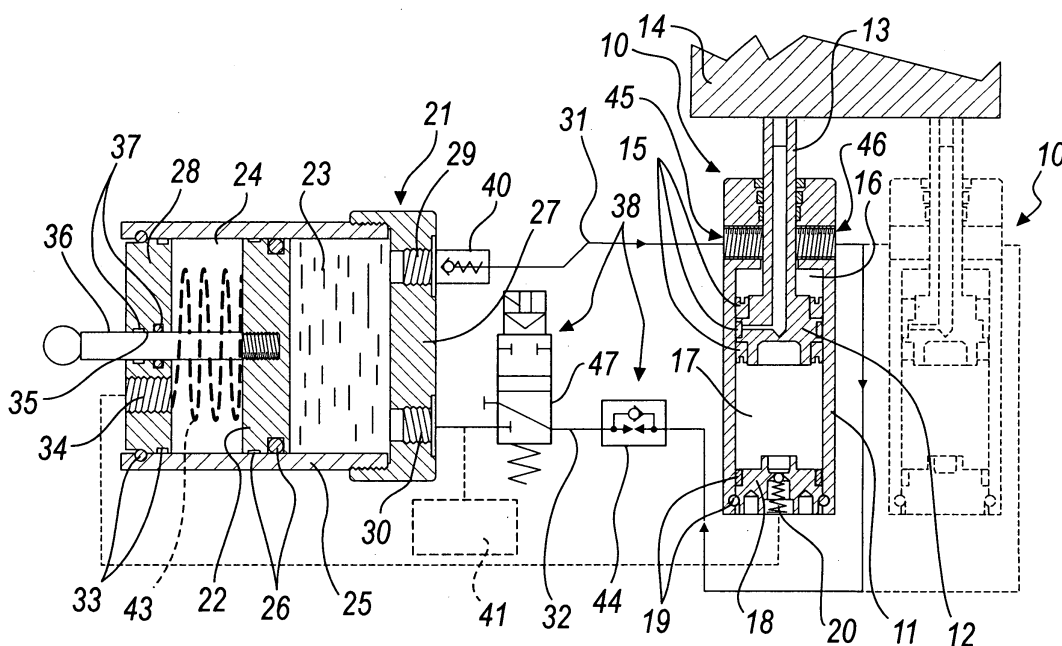
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(54) **Device for delayed and/or slowed return of gas cylinders**

(57) A device for the delayed and/or slowed return of gas cylinders, of the type that comprises a hollow cylindrical body (11) in which a piston (12) can slide, the actuation stem (13) of the piston protruding from the body (11) and being adapted to interact so as to contrast the actuation of mechanical elements; the piston (12) defines and separates inside the body (11) two variable-volume chambers (16, 17), a first one on the side pro-

vided with the stem and a second one on the opposite side; the device comprises a reservoir (21) of hydraulic fluid that is kept at a preset pressure and is connected to a delivery duct (31) and a return duct (32) to the first chamber (16) of at least one gas cylinder (10), whose second chamber (17) is filled with gas; the return duct (32) is controlled by a valve (38) for delaying and/or slowing the flow.



Description

[0001] The present invention relates to a device for delayed and/or slowed return of gas cylinders.

[0002] The invention is used preferably but not exclusively in cold-forging presses which can be associated for example with blanking units for the waste edges of the die and with punches or other blanking tools used to form holes in components made of metal plate.

[0003] A typical gas cylinder that is used comprises a hollow cylindrical body, in which a piston can slide whose actuation stem protrudes from the body and is adapted to interact so as to contrast the actuation of mechanical elements.

[0004] The piston defines and separates, inside the cylinder, two variable-volume chambers, a first one on the side of the stem and a second one on the opposite side, both filled with a gas.

[0005] When the stem and the piston are pushed into the cavity of the cylinder due to an applied force, the contained gas is compressed, and when the force is removed, the gas immediately and rapidly propels the piston and the stem toward the fully extended position.

[0006] In certain cases, rapid return to full extension can cause problems such as warping and inflections of the pressed part, compromising its quality.

[0007] Accordingly, gas cylinders with slowed and/or delayed return, i.e., with a speed reduction or a motionless interval of the return stroke, have been devised.

[0008] To achieve this, the cylinders are associated with a device that comprises a reservoir of hydraulic fluid, one wall of which is constituted by a movable partition that separates the hydraulic fluid from a pressurized gas.

[0009] The reservoir is connected by means of a duct to the second chamber of the cylinder, whose first chamber is filled with gas.

[0010] The duct is controlled by valve means for delaying and/or slowing the flow.

[0011] In this case, when the stem and the piston are pushed into the cavity of the cylinder due to an applied force, the incompressible hydraulic fluid is transferred through the duct into the reservoir, compressing the gas contained on the opposite side with respect to the partition, and when the force is removed the gas propels the transferred fraction, but this is adjusted by the valve means, which delay it and/or slow it, achieving the same effect for the extension of the stem.

[0012] The resulting problem in these gas cylinders with delay and/or slowing device is due to the substantially incompressible hydraulic fluid that is in any case subjected to sudden compressions, which increase very significantly the pressure of the regions filled with said fluid, and this generates a heating thereof that necessarily has to be controlled.

[0013] Currently, the maximum internal pressure that can be withstood for a heat exchanger is approximately 10 bar, which is much lower than the pressure generated

in regions with hydraulic fluid, preventing its use.

[0014] This negative aspect forces manufacturers to adopt complicated and expensive constructive solutions for cooling.

[0015] The aim of the present invention is to provide a device for the delayed and/or slowed return of gas cylinders that eliminates the drawback noted above in conventional gas cylinders by working with low internal pressures (substantially less than 10 bar).

[0016] Within this aim, an object of the present invention is to provide a device for the delayed and/or slowed return of gas cylinders that allows constructive solutions that are simpler and less expensive than current ones.

[0017] Another object of the present invention is to provide a device for the delayed and/or slowed return of gas cylinders that can be applied simultaneously to a plurality of cylinders operating in parallel.

[0018] This aim and these and other objects that will become better apparent hereinafter are achieved by a device for the delayed and/or slowed return of gas cylinders, of the type that comprises a hollow cylindrical body in which a piston can slide, the actuation stem of said piston protruding from the body and being adapted to interact so as to contrast the actuation of mechanical elements, said piston defining and separating inside said body two variable-volume chambers, a first one on the side provided with the stem and a second one on the opposite side, characterized in that it comprises a reservoir of hydraulic fluid that is kept at a preset pressure and is connected by means of a delivery duct and a return duct to the first chamber of at least one gas cylinder, whose second chamber is filled with gas, said return duct being controlled by valve means for delaying and/or slowing the flow.

[0019] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of an embodiment thereof and of some variations, illustrated by way of non-limitative example in the accompanying drawings, wherein the only figure is a schematic sectional view of a gas cylinder with the device according to the invention.

[0020] With reference to the figure, a gas cylinder 10 comprises a hollow cylindrical body 11, in which a piston 12 can slide; an actuation stem 13 of said piston protrudes from the body 11 and is suitable to interact so as to contrast the actuation of mechanical elements such as the bed 14 of a press, which is not shown.

[0021] The piston 12, conveniently provided with circumferential sealing gaskets 15, defines and separates in the body 11 two variable-volume chambers, a first one 16 on the side provided with the stem 13 and a second one 17 on the opposite side.

[0022] The second chamber 17 is enclosed in the body 11 by the piston 12 and by a head 18, which is provided with suitable circumferential sealing rings 19 and with a valve 20 for filling with pressurized gas, preferably nitrogen.

[0023] The device for the delayed and/or slowed re-

turn of the piston 12 comprises a reservoir 21 of hydraulic fluid, such as oil kept at a preset pressure, for example 5-6 bar, in which one wall is constituted by a movable partition 22, which separates a first chamber 23 with the oil from a second chamber 24 with a pressurized gas such as compressed air.

[0024] The reservoir 21 is constituted by a cylindrical hollow body 25, inside which the partition 22 can slide; the partition is conveniently provided with a circumferential sealing gasket 26, with heads 27 and 28; the first one of the heads, on the oil side, is constituted by a lid that is screwed on and is provided with two connecting holes, designated by the reference numerals 29 and 30 respectively, for a delivery duct 31 and a return duct 32.

[0025] The second head 28, provided with circumferential sealing rings 33, is instead provided with a hole 34 for connection to a compressed air system (not shown) and with a hole 35 for the passage of a rod 36 for indicating the level of the oil, which is conveniently provided with seals 37.

[0026] As an alternative to compressed air, the second chamber 24 can be filled with nitrogen, with a duct (see the dashed line 42) for connecting it to the second chamber 17 of the cylinder 10.

[0027] As a further alternative, the gas can be replaced by a cylindrical helical spring (see the dashed line 43), which is preloaded appropriately.

[0028] The delivery and return ducts 31 and 32 are connected to the first chamber 16 of the gas cylinder 10, which is conveniently provided with connecting holes 45 and 46.

[0029] It is possible to connect in series a plurality of gas cylinders 10 (see dashed lines) which operate with the bed 14 in parallel.

[0030] The delivery duct 31 is provided with a one-way valve 40 (optionally in the cylinder 10).

[0031] The return duct 32 is controlled by flow delay and/or slowing valve means, generally designated by the reference numeral 38, which are constituted by an electric valve 47 (of the normally closed type), which is actuated by the press cycle, and/or a flow regulator 44.

[0032] The return duct 32 can be provided with a heat exchanger 41 for cooling the oil.

[0033] As regards operation, during the compression of the stem 13 on the part of the bed 14 the oil contained in the reservoir 21 flows into the first chamber 16 of the gas cylinder 10, propelled by the pressure of the compressed air of the second chamber 24 on the partition 22.

[0034] When motion reverses, the stem 13 remains lowered, until the electric valve 47 intervenes, opening the circuit and allowing the oil to return into the reservoir 21, propelled by the compressed nitrogen of the second chamber 17 of the gas cylinder 10.

[0035] By instead using in combination the flow regulator 44, it is possible to adjust or block the return of the stem 13.

[0036] By means of the regulator 44 alone, immediate

flow reversal occurs, but return is slowed.

[0037] In practice it has been found that the present invention has achieved the intended aim and objects.

[0038] It should in fact be noted that the delay device thus structured no longer subjects the hydraulic fluid (oil) to sudden pressure variations, since such fluid is not directly subjected to the action of the bed 14, with consequent reduced heating.

[0039] The pressure inside the ducts is considerably lower than in conventional delay devices.

[0040] The hydraulic fluid is therefore kept at a pressure that is lower than the pressure that can be withstood by heat exchangers and therefore heat dissipation is no longer a problem.

[0041] The present invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; likewise, the constructive details can be replaced with other technically equivalent elements.

[0042] The materials, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to requirements.

[0043] The disclosures in Italian Utility Model Application No. PD2002U000058 from which this application claims priority are incorporated herein by reference.

[0044] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A device for the delayed and/or slowed return of gas cylinders, of the type that comprises a hollow cylindrical body (11) in which a piston (12) can slide, the actuation stem (13) of said piston protruding from the body (11) and being adapted to interact so as to contrast the actuation of mechanical elements, said piston (12) defining and separating inside said body (11) two variable-volume chambers (16, 17), a first one on the side provided with the stem (13) and a second one on the opposite side, **characterized in that** it comprises a reservoir (21) of hydraulic fluid that is kept at a preset pressure and is connected by means of a delivery duct (31) and a return duct (32) to the first chamber of at least one gas cylinder (10), whose second chamber (17) is filled with gas, said return duct (32) being controlled by valve means (38) for delaying and/or slowing the flow.
2. The device according to claim 1, **characterized in that** said valve means (38) for delaying and/or slowing the flow are constituted by an electric valve (47).

3. The device according to claim 1, **characterized in that** said valve means (38) for delaying and/or slowing the flow are constituted by a flow regulator (44).
4. The device according to one or more of the preceding claims, **characterized in that** in said reservoir of hydraulic fluid (21), said movable partition (22) separates said first chamber (23), which is filled with oil, from a second chamber (24), which is provided with a hole (34) for connection to a compressed air system. 5 10
5. The device according to one or more of claims 1 to 3, **characterized in that** in said reservoir (21) of hydraulic fluid said movable partition (22) separates said first chamber (23), which is filled with oil, from a second chamber (24), which is filled with nitrogen, with a duct (42) for connection between said second chamber and the second chamber (17) of said gas cylinder (10). 15 20
6. The device according to one or more of claims 1 to 3, **characterized in that** in said reservoir (21) said movable partition (22) separates said first chamber (23), which is filled with oil, from a second chamber (24), in which a preloaded helical cylindrical spring (43) is arranged. 25
7. The device according to claim 1, **characterized in that** said return duct (32) is provided with a heat exchanger (41) for cooling the oil. 30

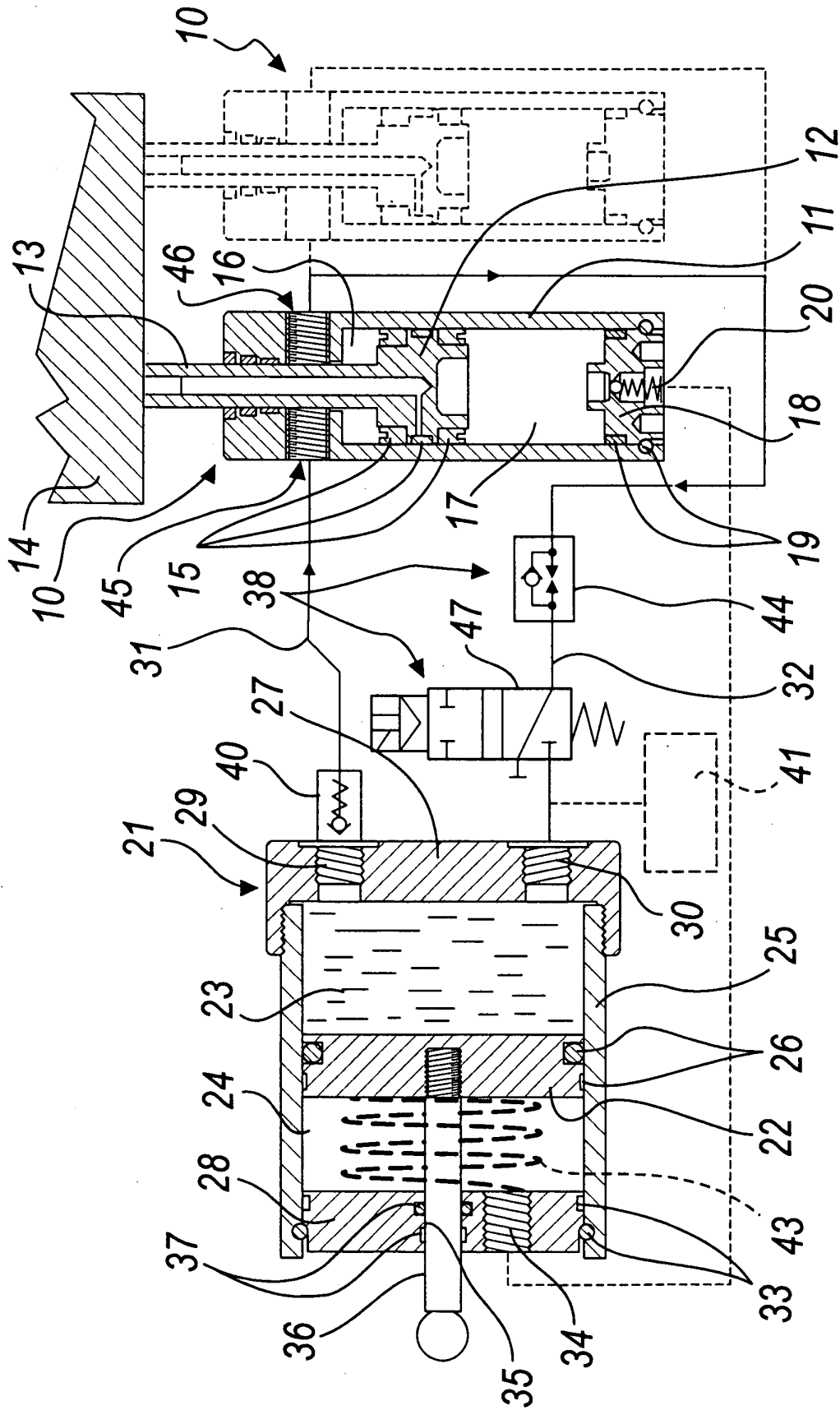
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EUROPEAN SEARCH REPORT

Application Number
EP 03 01 6527

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Place of search MUNICH		Date of completion of the search 10 September 2003	Examiner Busto, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

Application Number
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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