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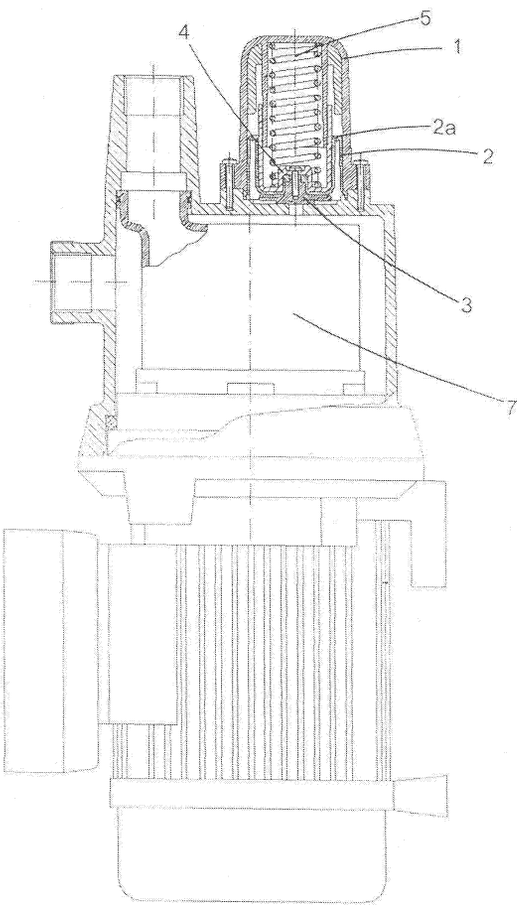
Remarks:
A request for correction of the drawings has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) Accumulator device for a hydraulic installation and electric pump including said device.

(57) Accumulator device for a hydraulic installation which includes an interior membrane (2), said membrane (2) forming a fluid-accumulation cavity. It is characterised in that the membrane (2) includes a fold (2a) which forms two sections, a first section from the wall of the cylindrical body (1) to said fold (2a) and a second section from said fold (2a) to the moving support element (3), with the fold zone (2a) moving as the moving support element (3) moves. It allows sufficient volumes of water accumulation to space apart the starting and stopping of the electrically-driven pump, but with small diameters of the membrane's moving support element.

Fig.4



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Description

[0001] This invention relates to an accumulator device for a hydraulic installation and to an electrically-driven pump which includes said accumulator device.

BACKGROUND OF THE INVENTION

[0002] Known in the art are appliances or devices that switch a hydraulic pump on and off within certain maximum and minimum pressure limits. Such appliances are provided with a hydrosphere inside which there is a moving membrane which encloses a certain volume of air under pressure, whose volume and pressure vary depending on the pressure in the hydraulic circuit, with said hydrosphere accumulating a certain volume of water in order to space apart the pump's starting and stopping sequences and in order to dampen the water-hammer effect.

[0003] Such appliances have the disadvantage of the hydrosphere being very voluminous and of the air pressure inside them not being easily adjustable, while over time a certain loss of pressure always occurs and calls for replacement of the air at intervals.

[0004] Also known are appliances for controlling the starting and stopping of a pump, which include a pressure detector and a spring to push the pressure detector. The pressure detector includes a practically flat membrane on whose surface the hydrostatic pressure acts and which moves in response to the output pressure of the water from the controller, being able to accumulate a certain volume of water in order to facilitate spacing apart of the pump's stopping and starting sequences. That membrane is linked with a position detector that acts on an electronic circuit which in turn controls the electrically-driven pump, causing it to stop or start in accordance with the position of the membrane or, which is equivalent, depending on the pressure in the pipes upstream of the controller.

[0005] The controlling appliances outlined in the preceding paragraph have the disadvantage that the volume of water accumulation produced by the pressure detector's membrane is limited, due to the inherent limitation of the membrane's elasticity that does not permit significant displacements. The membrane of the controlling appliances described is flat or practically flat, so that the water accumulation produced is proportional to the diameter of the membrane. Thus, larger membrane diameters accumulate greater volumes of water. Such larger diameters nevertheless have the disadvantage that they condition equipment design, both in terms of size and of technical characteristics.

[0006] Also known are pressure regulators that include an accumulator device with an interior membrane on which the hydrostatic pressure acts, and a spring that counteracts the fluid pressure. Such membranes are attached by their ends to the wall of the regulator and by their central zone to a moving support element, forming a fluid-accumulation cavity. When the hydraulic pressure applied on the membrane overcomes the action of the spring the moving support element is displaced and the membrane is deformed elastically, increasing the volume of the accumulation cavity.

[0007] The disadvantage of the accumulator device described is that the membrane works by using its elastic properties, so that stretching occurs at the points of said membrane by which it is attached to the wall of the regulator and that stretching gives rise to continuous wear due to the travel of the moving support element to which the membrane is attached.

[0008] No electrically-driven pumps are known with accumulator devices such as those described.

DESCRIPTION OF THE INVENTION

[0009] The objective of this invention is to resolve the disadvantages mentioned by developing an accumulator device for a hydraulic installation which includes an unfurlable membrane, and an electrically-driven pump which includes said accumulator device.

[0010] In accordance with this objective, the accumulator device of this invention is characterised in that the membrane includes a fold which forms two sections, a first section from the wall of the cylindrical body to said fold and a second section from said fold to the moving support element, with the fold zone moving as the moving support element moves.

[0011] Thanks to these characteristics, the device of this invention includes a membrane which moves as the moving support element moves, without being subjected to any kind of elastic deformation. Moreover, its folded-membrane design permits membrane travel-runs very much greater than those found in the flat membranes of the state of the art. This shows itself in greater volumes of water accumulation for a given diameter of the membrane's moving support element.

[0012] The accumulator device of this invention has the advantage that it can be installed in any part of the hydraulic installation. It further allows sufficient volumes of water accumulation to be achieved suitably to space apart the starting and stopping sequences of the hydraulic installation's electrically-driven pump, but with small diameters of the membrane's moving support element. The use of moving support elements of small diameter extends the design possibilities of the accumulator devices and makes it easier to integrate them either into electrically-driven pump controllers or inside the electrically-driven pump itself. Moreover, the small diameter also means a reduction of the resulting load borne by the supporting element, owing to the specific pressure acting upon a smaller surface area, which shows itself in a more compact design and a saving of materials.

[0013] Preferably, said accumulator device includes a magnet integral to the moving support element, the magnet exciting a sensor mounted in an appliance for

controlling the starting and stopping of a hydraulic pump, or mounted in an electrically-driven pump. In such cases, the accumulator device is integrated into an electrically-driven pump controller or into an electrically-driven pump, in such a way that the membrane is linked with a position detector that acts on the electronic circuit which sets the pump running at a certain pressure.

[0014] In accordance with the same objective, the electrically-driven pump of this invention is characterised in that it includes an accumulator device such as that described in Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] For a better understanding of all that has been set out some drawings are attached which show, schematically and solely by way of non-restrictive example, a practical case of embodiment.

[0016] In said drawings,

Figure 1 shows a longitudinal section of the accumulator device of this invention when there are consumer points open and the pump of the hydraulic installation is running.

Figure 2 shows a longitudinal section of the accumulator device of this invention when the pump is stopped and the membrane is totally unfurled.

Figure 3 shows a longitudinal section of the accumulator device of this invention which includes a magnet integral to the moving support element.

Figure 4 shows a longitudinal section of the device of this invention integrated into an electrically-driven pump.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0017] Figure 1 shows an accumulator device of this invention that includes a cylindrical body 1 and whose main components consist in an interior membrane 2 attached between a moving support element 3 and a guiding element 4 for said membrane 2, and a spring 5 mounted between the cylindrical body 1 and said guiding element 4.

[0018] The interior membrane 2 forms a cavity for accumulating a certain volume of water which depends on the pressure received by the hydraulic circuit. The membrane 2 includes a fold 2a that defines two sections. The fold zone 2a moves as the moving support element 3 moves under the action of the water pressure in the hydraulic circuit. Said moving element 3 provides a secure anchorage for the guiding element 4 to the membrane 2, and a good base basis for preventing undesired unfurling movements of the membrane 2. The element 4 serves as a guide for the membrane during its travel and prevents it expanding laterally. In its turn, the spring 5 is compressed under the effect of pressurisation by the water, storing the energy necessary to move the membrane 2 in the opposite direction and evacuate the accumulated volume of water to the hydraulic installation.

[0019] Thanks to the fact that the membrane 2 is unfurlable, the travel-run it makes is greater than that which can be made by a flat membrane submitted to elastic deformation. Thus, the device of this invention accumulates a greater volume of water than the devices known in the state of the art.

[0020] Figure 1 shows an accumulator device that can be installed in any part of the hydraulic installation. The position of the membrane 2 of Figure 1 shows the case in which consumption points are open and the pump of the hydraulic installation is running. When these consumption points are closed the pressure of the installation rises until it reaches the maximum pressure provided by the electrically-driven pump. The spring 5 of the accumulator is compressed by the effect of pressure and the membrane 2 passes into the position shown in Figure 2. The electronic controller, or appliance which controls the stopping and starting of the hydraulic pump, will then proceed to stop the pump.

[0021] When any valve in the installation is opened again the pressure falls and the spring 5 will tend to return to its initial position along with the membrane 2, so that a certain volume of water will be evacuated. The internal pressure of the installation will gradually fall in accordance with release of the volume of water accumulated until it reaches a pressure at which the controller or corresponding appliance sets the pump running again.

[0022] Figure 3 shows an accumulator device that forms part of an electronic controller or appliance for stopping or starting a hydraulic pump. In this case the moving support element 3 has a built-in magnet 6 and, likewise, when any valve in the installation is opened and the pressure falls the spring 5 tends to return to its original position. The moving support element 3, together with the membrane 2, likewise regains its initial position, while the pressure of the installation falls steadily until it reaches a pressure at which the magnet 6 gives a magnetic signal to a reed relay or Hall effect sensor or the like attached to the controller body, which at the same time acts on the power-supply circuit of the electrically-driven pump and causes it to start.

[0023] Figure 4 shows an accumulator device of this invention integrated into an electrically-driven pump. In this case the moving element 3 does not include a magnet 6 and thus acts as a simple water-accumulation device. It is nevertheless possible for the accumulator device integrated into the electrically-driven pump to include a magnet 6 located on the moving support element 3, while said magnet 6 can likewise adopt the function of starting up the pump at a particular pressure by acting on a reed relay or Hall effect sensor or the like.

Claims

1. Accumulator device for a hydraulic installation which includes a cylindric body (1), an interior membrane (2) attached by its ends to the wall of the cylindrical body (1) and by its central zone to a moving support element (3), said membrane (2) forming a fluid-accumulation cavity, and which further includes a spring (5) to counteract the pressure of the fluid, **characterised in that** the membrane (2) includes a fold (2a) which forms two sections, a first section from the wall of the cylindrical body (1) to said fold (2a) and a second section from said fold (2a) to the moving support element (3), with the fold zone (2a) moving as the moving support element (3) moves.

2. Accumulator device for a hydraulic installation according to Claim 1, **characterised in that** it includes a magnet (6) integral to the moving support element, the magnet (6) exciting a sensor mounted in an appliance for controlling the starting and stopping of a hydraulic pump, or mounted in an electrically-driven pump.

3. Electrically-driven pump **characterised in that** it includes an accumulator device in accordance with Claim 1.

Fig.1

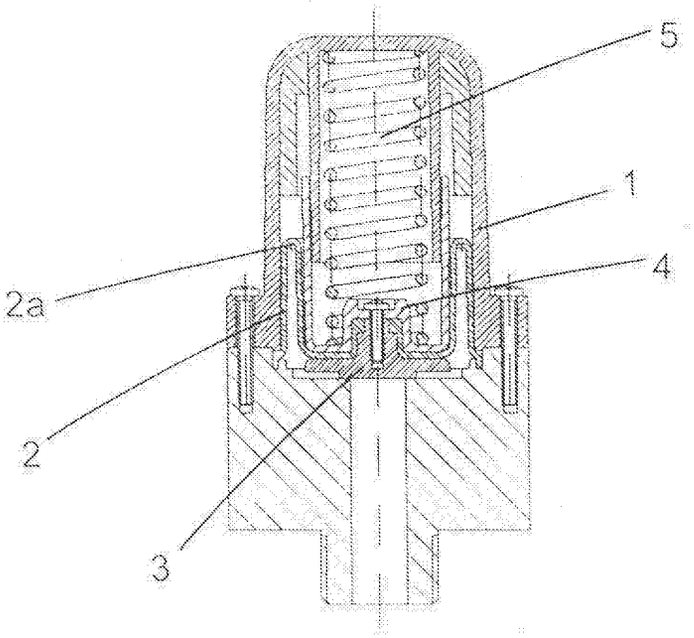


Fig.2

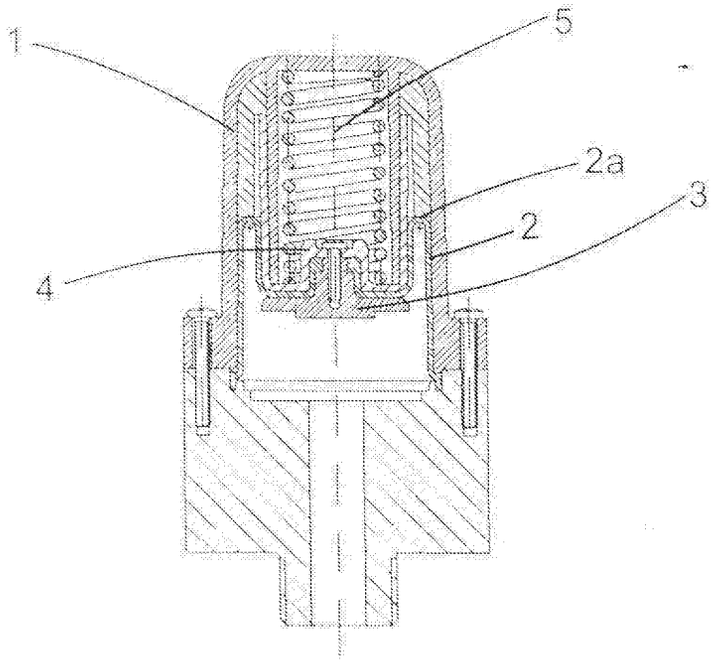
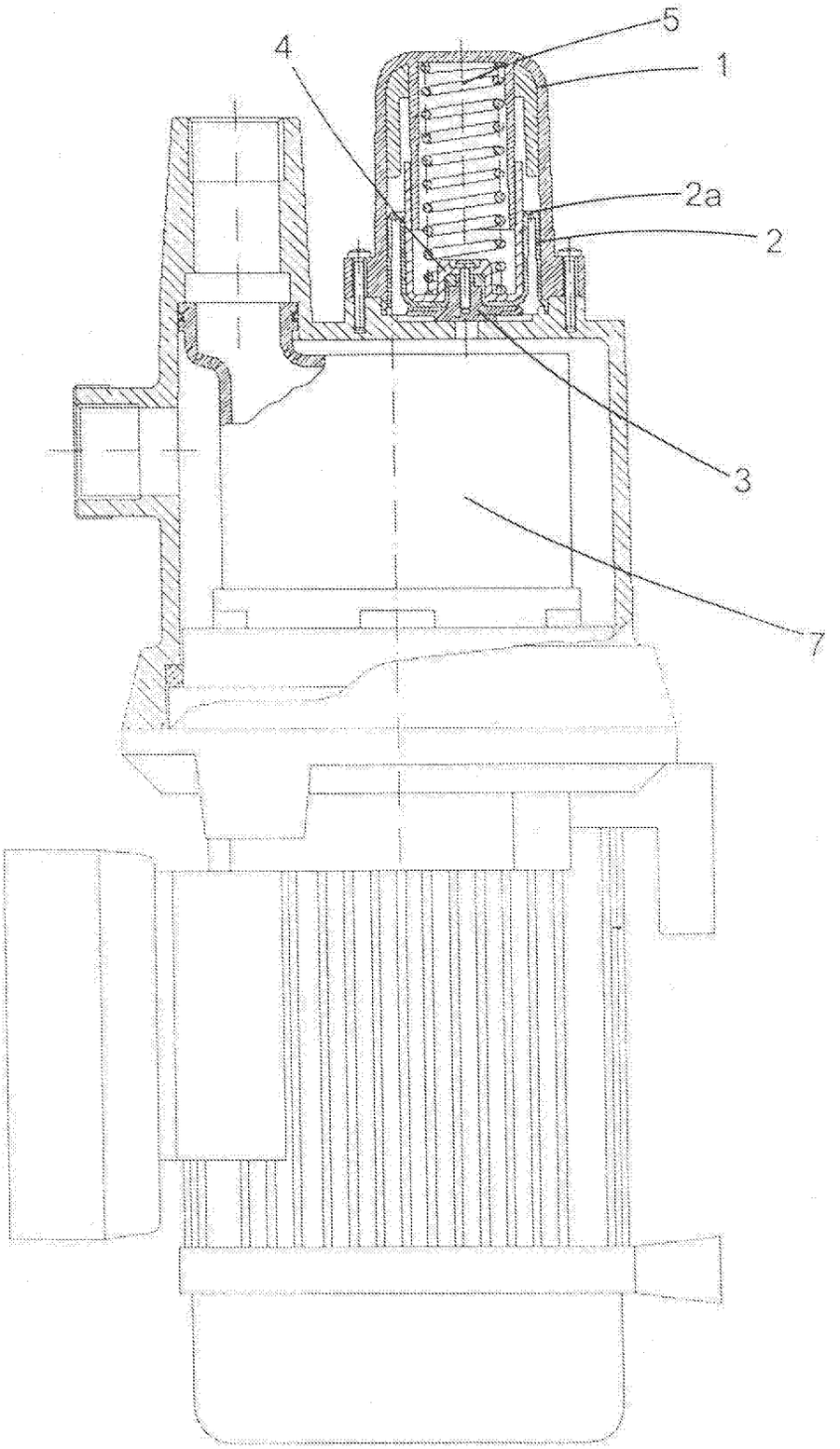


Fig.4



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EUROPEAN SEARCH REPORT

Application Number
EP 04 10 2387

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	US 5 727 529 A (TUCKEY ET AL) 17 March 1998 (1998-03-17) * figure 2 * * column 7, line 5 - line 10 * * column 1, line 14 - line 17 *	1,3 2	F15B1/16 F15B1/24
Y	EP 0 321 376 A (BANUS GARCIA, FERNANDO) 21 June 1989 (1989-06-21) * figure 1 * * column 3, line 61 - column 4, line 6 *	2	
A	DE 197 09 779 A1 (ITT MFG. ENTERPRISES, INC., WILMINGTON, DEL., US) 17 September 1998 (1998-09-17) * figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F15B
F02D
F04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 February 2005	Krikorian, O

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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