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(71) Applicant: **Las Navas Garcia, José Maria**
E-28210 Madrid (ES)

(72) Inventor: **Las Navas Garcia, José Maria**
E-28210 Madrid (ES)

(74) Representative: **Toro Gordillo, Ignacio Maria**
Viriato, 56
28010 Madrid (ES)

(54) Multiple activation hydraulic system

(57) An electric motor (3) rotating in one or the other direction moves the piston (6) of a basic hydraulic cylinder (7) in one or the other direction, namely to provoke the exit of the fluid against a spring (8) bias, or the intake towards such spring through a single conduit (11) which branches into a series of conduits (20), one of which ends at a hydraulic fluid supply reservoir (13), while all the remaining conduits end at their relevant activation hydraulic cylinders (21), the pistons (22) of which have an activating rod (24) that is driven to the outside against a spring (23) bias, each conduit having an electric valve (15), (16), (17), (18) and (19) and all these valves being controlled, alike the basic hydraulic group (1), by a microprocessor that receives signals from the devices to be controlled, thus automatically giving raise to the propulsion or retraction of any one of the activating rods (24), whenever a variation in the relevant device parameter so requires.

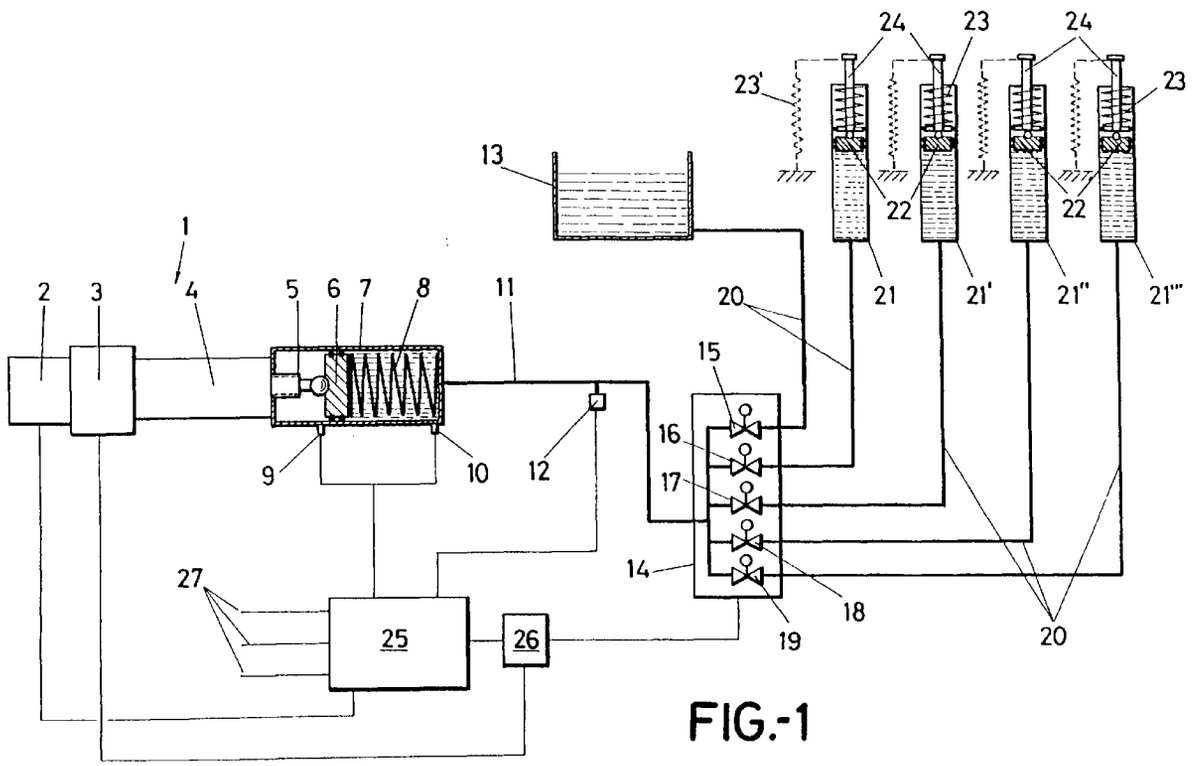

FIG.-1

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Description

SUBJECT OF THE INVENTION

This present invention refers to an activation hydraulic system with which it is feasible to establish control of a series of devices, such as, for instance, to keep conveniently controlled a number of parameters in a process, i.e. speed, temperature, etc., based on the intermittent activation of such parameter controlling devices.

BACKGROUND OF THE INVENTION

It is frequently required, in industrial processes, to establish a control on a number of parameters, such as, for instance, said process temperature, that should be kept within a given range, to which end heat sources are used which connect themselves when the temperature descends below a preestablished minimum limit and disconnect themselves when the maximum limit is surpassed. In cases like this, the heat generating source may be an electric heater that connects/disconnects itself according with signals received from a sensor.

Within the multiple solutions known to carry on the necessary conditioning, in cases such as the above, as well as in a infinite number of assumptions of different types, it consists in using hydraulic systems which, obviously, have a mechanic activation as their final result.

The known hydraulic systems common denominator is centered, up to now, on the fact that they require a double circuit in order to move the relevant activating piston forward and backward.

To this end and in a more specific manner, the system now being proposed is structured around a hydraulic group which, lacking the classical compressor, is capable of pushing or absorbing the hydraulic fluid with an exact volume control towards a single exit conduit branched in as many conduits as elements or devices should be activated, plus a complementary conduit related with a hydraulic fluid reservoir, each of the above conduits being assisted by an electrically controlled valve regulated, as the basic hydraulic group itself, by a microprocessor based on the program established therein.

The basic hydraulic group is in the form of a cylinder the piston of which travels inside it towards the single output conduit, against the bias of a spring and activated by a motor duly controlled by a microprocessor and through a rotary pulse generator coder and limit switches fitted on the cylinder itself, which determine the piston prearranged limit positions. In this manner and according with the orders generated by the microprocessor, the opening and closing of the electric valves will be established in regard with the operation to be performed, and the travel or return will take place in the concrete and specific magnitude required for the activation or deactivation of the mechanism associated with the conduit to be performed in the control phase.

It is obvious that actual time is allotted in the microprocessor to every conduit in order that control conditions on each of it be homogeneous.

Each of these conduits, also materialized in a single conduit, ends in turn in an activating hydraulic cylinder, the piston of which is moved to push by the hydraulic fluid, while its retraction takes place automatically, by means of return springs when the relevant electric valve keeping the pressure in its staunch chamber opens.

Obviously, the microprocessor should also be connected to the devices to be controlled in order to permanently receive information in regard with the parameters to control these in a more effective manner.

DESCRIPTION OF THE DRAWINGS

To complement the description above made and in order to aid in comprehending the invention's characteristics, this present specifications are accompanied, forming an integrating part thereof, by one only sheet of drawings on which, with an illustrative non-limitative character and on its only figure, has been schematically represented a multiple activation hydraulic system embodied according with this invention's subject matter and with a practical embodiment in which said system controls or may control four independent devices.

PREFERRED EMBODIMENT OF THE INVENTION

In viewing the drawing, it can be seen that the hydraulic system being proposed is structured around a basic hydraulic group, generally referenced as (1), in which a cylinder (7) participates, inside which moves a piston (6) thus exclusively defining a hermetically closed hydraulic chamber, on a side of the piston, having one single conduit (11), said chamber housing a spring (8) tending to the volumetric increase thereof by means of the piston (6) movement in opposition to the exit conduit (11), while said piston (6) travel in the opposite direction takes place by means of a screw (5) or any other adequate transmission means, from a motor (3) conveniently fixed on the cylinder (7) with the co-operation of a common mount (4), said screw acting on the piston (6) by means of a sliding coupling such as, for instance, a spherical support allowing said screw to rotate in regard with the piston, and motor (3) being controlled by a microprocessor (25) through a power source (26) and a rotary pulse generator coder (2).

A pair of limit switches (9) and (10), conveniently positioned on the main cylinder (7), allow controlling the piston (6) limit positions and, from them, control its travel with full precision, based on the pulses supplied by the rotary coder (2).

The single exit conduit (11) branches in a number of conduits (20), through one of which it leads to a hydraulic fluid reservoir (13), while the remaining conduits, the number of which is variable, lead to the various

mechanisms to be driven or controlled and terminate in relevant hydraulic cylinders (21), (21'), (21"), (21"'), each of these conduits (20) being assisted by an electric valve (15), (16), (17), (18) and (19), integrated in a group of valves (14) also controlled by the microprocessor (25) through a power source (26).

Every activating hydraulic cylinder (21) has an exclusive feeding conduit (20), as stated above, inside it being positioned a piston (22) which defines an also single staunch chamber on one side of it, the hydraulic fluid receiver, while on the other side is placed the return spring (23), as well as the rod (24) that, by protruding to the outside of the cylinder (21) constitutes the activation means upon its relevant device. Besides, it has been previewed that with the internal return spring (23) it may optionally co-operate an external return spring (23') which will aid in evacuating.the fluid existing in the cylinder (21) when, after opening the relevant electric valve, the fluid should return to the main cylinder (7) or either to the refilling reservoir (13).

A pressure sensor (12) installed in the main line (11) supplies information to the microprocessor (25) in regard with the proper operation of the activation cylinders (21), namely by detecting an overpressure due to an obstruction or a pressure loss due to a hydraulic fluid leak.

The microprocessor (25) is assisted, as well, by a series of wires (27) allowing to perform a series of complementary functions such as loading a program, making a piston (22) to manually move in one or the other direction, detecting such pistons (22) positions, receiving information from the devices being controlled, etc.

According with the above discussed embodiment, the system function is as follows:

In a first assumption, a given program has been loaded in the microprocessor's (25) PROM memory to control the speed and temperature with cylinders (21) and (21') , while cylinders (21") and (21"') will be controlled manually.

Initially, the control program is not activated, the piston (6) is at its farthest withdrawal position in order to have the maximum fluid available and should cylinder (21") be manually brought back by means of a signal (27), valves (15) and (18) will open to allow said piston withdrawal, while should it be intended to make the opposite maneuver, that is a maneuver to push forward the same piston, the computer will activate the motor (3) making the piston run forward (6) and sending fluid towards the piston (21") and raising it, in which case the valve (18) will be open and the valve (15) will be closed. When the propelling signal is halted, the valve (18) closes, the valve (15) opens and the motor makes the piston (6) to withdraw to receive fluid from the reservoir (13) up to the limit point detected by the limit switch (9), and at that time the motor (3) will stop and the valve (15) will close.

In case the microprocessor (25) is instructed by means of a control (27) signal, the cylinders' (21) and (21') servocontrol, then the valve (15) opens to return the excess fluid to the reservoir (13) and to position the piston (6) at an intermediate point. Since only one hydraulic cylinder may be controlled at a time, should it be required to control more than one, valves (16-19) will open or close depending on which mechanism is to be controlled at every time, according with the priorities preset in the microprocessor (25) through the relevant program. Depending on the requirements for a response it will switch from a control device to another, in each case receiving signals (27) to keep the parameters to be controlled such as speed, temperature, etc., within the required limits, activating the motor in one or the other direction.

Should at a given moment be required to manually withdraw a piston (21"), the control function will be interrupted, depending on the program priorities, the valves (16) and (17) will close and the valves (18) and (15) will open, allowing the piston to withdraw to return fluid to the reservoir (13). This manual function may be shared with the control function in order to avoid a loss of control of the device for an extended period of time.

In case it is required to manually advance the piston (21"), the microprocessor (25) will decide whether or not it requires fluid from the reservoir (13), driving back and filling the cylinder (7).

As it has been discussed above, whenever it is required to simultaneously control several devices, since control at every time can only be made on one of them, control time will be split up establishing a sequential control in such a way that when a conduit (20) is at an operative situation all others will be momentarily halted.

It is not deemed necessary to make any wider description for any expert in this art to understand the scope of the invention and the advantages arising therefrom.

Materials, shape, size and layout of all elements may be susceptible of modification, providing this do not imply any alteration of the invention's essentiality.

Terms in which this specification has been written should be taken at all times in their widest non-limitative sense.

Claims

1. st.- Multiple activation hydraulic system that having been designed to control some given parameters such as speed, temperature, etc., corresponding to several devices being independent among them, is essentially characterized by the fact that it is structured around a basic hydraulic group (1), able to drive and absorb hydraulic fluid through a single conduit (11) which branches into a plurality of conduits (2), one of which is connected to a hydraulic fluid supplying reservoir (13), while the remaining conduits, being variable in number, end at their relevant hydraulic cylinders (21), (21'), (21"), (21"') driving the relevant devices to be controlled, having

been previewed that every conduit (20) will be assisted by an electric valve (15), (16), (17), (18) and (19) . which constitute a valve group (14) controlled by a microprocessor (25) that regulates in turn the basic hydraulic group (1) as well, according a series of signals received from both the hydraulic system itself and from the devices to be controlled.

2. nd.- Multiple activation hydraulic system, in accordance with claim 1st, wherein said basic hydraulic group (1) is composed of a cylinder (7) inside which travels a piston (6) determining a staunch chamber in permanent communication with the hydraulic fluid single conduit (11), a chamber in which has been laid a spring (8) which tends to bias the piston (6) in the sense of a volumetric increase of the hydraulic chamber wherein it is housed, while said piston is activated, on the opposite side and against said spring (8) by means of a motor (3) assembled on a mount (4) being also common to the cylinder (7), a motor the output axle of which is materialized in a screw (5) that moves axially inside the cylinder, having been previewed that said motor (3) shall be controlled by the microprocessor (25) through a rotary pulse generator coder (2).

3. rd.- Multiple activation hydraulic system, in accordance with the above mentioned claims, characterized by the fact that the basic hydraulic group (1) and more specifically the cylinder (7) that participates therein, has a pair of limit switches (9) and (10) that establish the limit points previewed for the piston (6) that travels inside said cylinder (7), and supplying information in regard with the piston position to the microprocessor (25) combined with the rotary pulse generator code (2).

4. th.- Multiple activation hydraulic system, in accordance with the above mentioned claims, characterized by the fact that in the single conduit (11) assisting the basic hydraulic group (1) is set a pressure sensor (12) that also provides information to the microprocessor (25) concerning with-the pressure existing at a given time in said conduit (11).

5. th.- Multiple activation hydraulic system, in accordance with claim 1st, characterized by the fact that every hydraulic cylinder (21), (21'), (21"), (21"') that activates the relevant device has a piston (22) defining in its inside a staunch chamber to which the hydraulic fluid flows through the relevant conduit (20) and in opposition to which, said piston (22) is extended by a rod (24) protruding to the outside of it and constitutes the activating element itself, having been previewed that every piston (22) will be assisted by a return spring (23) set inside the cylinder (21) itself, and, optionally, by another return spring (23') set outside the cylinder (21) itself, so that the bias of this or these springs shall be enough to empty the relevant hydraulic chamber towards the reservoir (13) when the valve is opened (15) and simultaneously opening the valve (16), (17), (18) or (19) corresponding to such hydraulic cylinder (21), (21'), (21") or (21"').

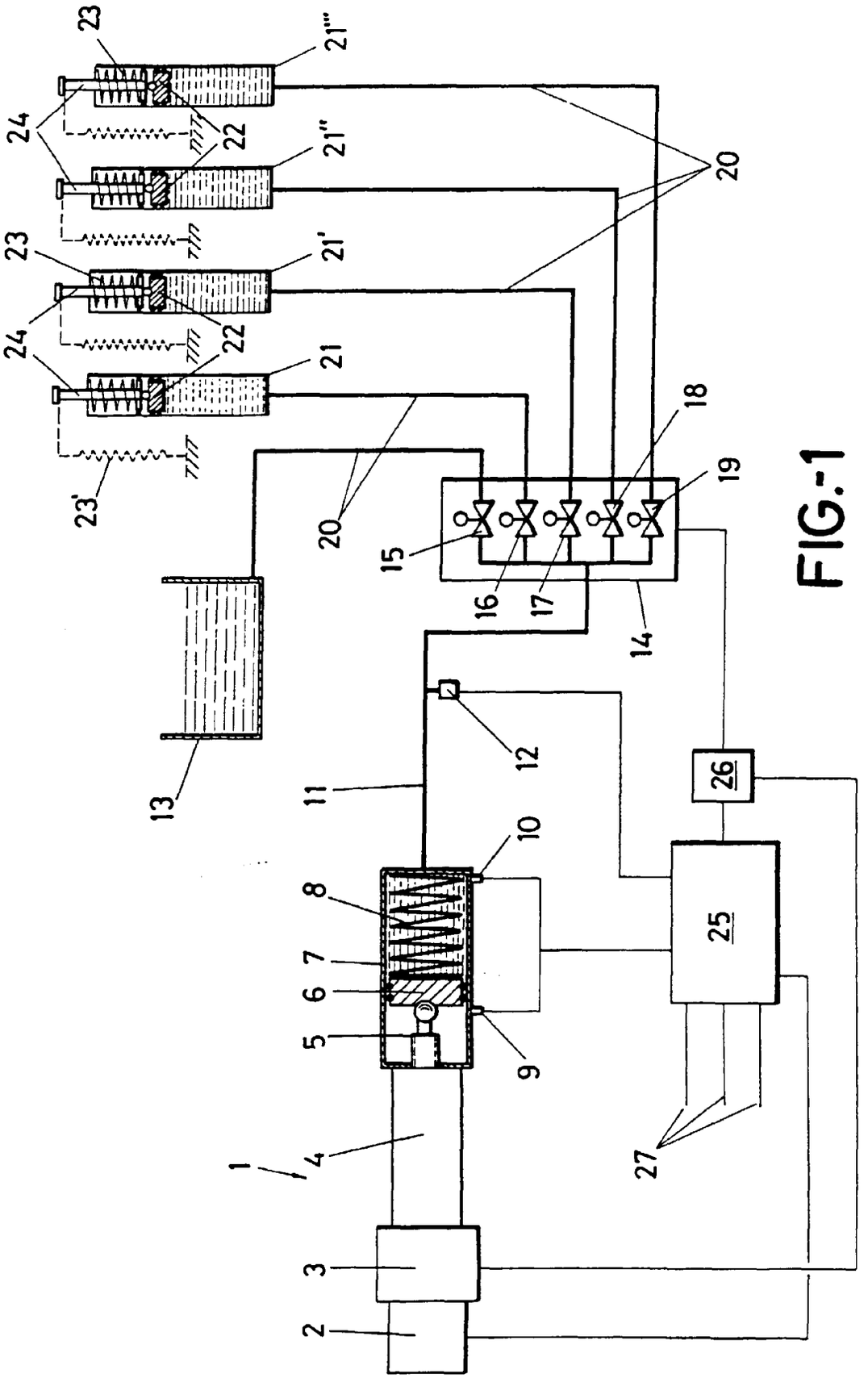
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FIG.-1

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EUROPEAN SEARCH REPORT

Application Number
EP 97 50 0010

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.6)
X	GB 2 240 836 A (LINDE AG) 14 August 1991 * page 5, line 12-26 * * page 7, line 5-15; figure *	1	F15B21/08 F15B11/16
A	---	2,3	
X	GB 2 265 995 A (BARMAG BARMER MASCHF) 13 October 1993 * figures 1-3 *	1,4	
A	---	1-3	
	EP 0 275 968 A (HYDROMATIK GMBH) 27 July 1988 * figure *		
A	---	2,3	
	WO 92 10685 A (BARMAG BARMER MASCHF) 25 June 1992 * figures 1,2 *		
A	---	5	
	PATENT ABSTRACTS OF JAPAN vol. 005, no. 068 (M-067), 8 May 1981 & JP 56 020808 A (SANYO KIKI KK), 26 February 1981, * abstract *		TECHNICAL FIELDS SEARCHED (Int.Cl.6) F15B F16K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	12 May 1997	Pöll, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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