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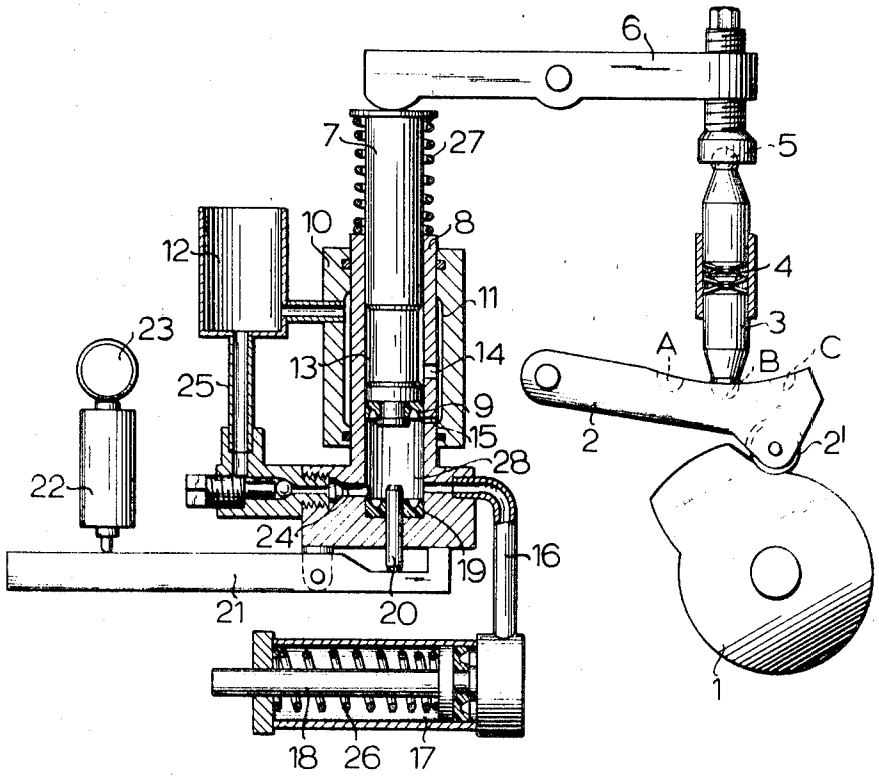

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HYDROMECHANIC CONTROLS FOR AUTOMATIC MACHINE TOOLS AND MORE PARTICULARLY FOR AUTOMATIC LATHES

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ABSTRACT OF THE DISCLOSURE

An open hydraulic-mechanic system for controlling automatic machine tools such as automatic lathes. The system comprises a hydraulic medium reservoir which is open to the surrounding atmosphere and a feed line containing a control piston such that when the control piston is in its withdrawn position the hydraulic medium has access to the pressure chamber of the control cylinder through the wall of the control cylinder via a recess in the control piston.

BACKGROUND AND OBJECTS

The present invention relates to a hydromechanical control for automatic machine tools and more particularly for automatic lathes, in which a control cam acts upon the control piston of the hydraulic medium via a lever gear.

With automatic controls both the merely mechanical and the closed hydraulic systems as well as a combination of both systems are already known.

An essential drawback of the mechanical system is that transmission from the control cam to the machine unit to be controlled is comparatively complicated unless both are directly adjacent. In addition, the variations in lengths from the cold to the warm machine unfavorably affect the exact dimensioning of the work.

In closed hydraulic systems, movement in the case of cam control is only to be limited by stops. Even in this system expansion due to heat is unfavorable.

It is the main object of the present invention to provide a hydromechanical control of the type described above which, in the presence of a simple design, will not be subject to unfavorable effects resulting from variations of length or variations of volume respectively, which is adapted to be protected against overloads, and which moreover permits returning of the piston into its original or out position without any adjustments in the case of damages such as tool or machine breakage.

Within the scope of a solution of this problem the present invention provides for the hydraulic medium a reservoir which is open towards the surrounding air and has a feed line towards the cylinder containing the control piston so that, with the control piston in its withdrawn position, the hydraulic medium, on the side not facing the pressure side of the piston, has access to the pressure chamber of the control cylinder with the control piston in its withdrawn position through the wall of the control cylinder via an opening of the control piston which is connected to the reservoir.

This measure results, in a way, in an open hydraulic-mechanical system in which the effective volume of the hydraulic medium is compensated in that, in the neutral position, there is a connection between the pressure chamber of the control cylinder and the reservoir. Losses due to leakage of the hydraulic pressure medium are also compensated and do not interfere with exact transmission.

Any effects resulting from heating of the hydraulic pressure medium are greatly eliminated.

Preferably, the connection opening to the pressure chamber has a comparatively small diameter only. This is favorable in that the connection opening does not result in any remarkable empty stroke of the control piston.

More particularly, design may be such that the housing comprising the control cylinder is provided with a longitudinal chamber at the control cylinder which is connected to the reservoir containing the hydraulic medium and that the longitudinal chamber is provided with a connection through an opening in the wall of the control cylinder with a longitudinal chamber formed by a recess of the control piston on the side not facing the pressure chamber of the control cylinder and that the pressure chamber of the control cylinder is provided with a connection with the longitudinal chamber of the housing which is located at the withdrawn position of the control piston.

It is recommended to provide an overload protection in the bottom of the pressure chamber in the form of a piston pin adapted to be displaced against a return movement of the hydraulic medium in which case the end of the piston pin projecting from the pressure chamber is designed to act upon a disconnector resulting in immediate stopping, if, from any reason whatsoever, the system will be subject to excess pressure or inadmissibly high pressure respectively or if the control piston will be advanced too far.

The return force may be adjustable, even fine adjustment will be possible using a weight or a spring.

The arrangement exerting the return force may be in the form of a double armed lever, one arm of which acting upon the pin and the other arm being loaded by a force or weight and acting upon a limit switch.

According to the present invention a possible relief of the system will be achieved by providing a direct connection to the reservoir for the hydraulic medium at he pressure chamber of the control cylinder which connection may be established in cases of necessity.

This means of relief is favorable in that the working piston may be returned independently into its original or neutral position by opening the connection to the reservoir. This may be useful if control and working pistons, for instance, due to tool or machine breakage, are not in their original positions, because it will not be necessary to return the control piston via the control cam into its original position. After the connecting relief bore has been closed in the neutral position, the former extent of movement of the working piston is resumed in the new working cycle without additional manipulation.

Practcally, for the return of the working piston and consequently of the control piston a return force acting upon the working piston is provided in the form of a spring.

The present invention may be used advantageously for the transmission of forces and movements in automatic mechanisms and specifically in automatic lathes.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying single drawing shows a diagrammatic example of an embodiment according to the present invention.

DETAILED DESCRIPTION OF THE DRAWING

The cam disc 1 which acts upon the swivelling lever 2, serves to produce the control movement. The lever 2 is provided with a roller 2' for the attack of the disc 1. The lever 2 transfers its movement to a tappet 3. It is provided with three points of attack A, B, and C for a contact with the end of the tappet, by means of which a

change in the transmission ratio is achieved. Depending upon the point of contact the transmitted movement will be smaller or greater. A spring element **4** may be provided in the tappet to produce an excess pressure for clamping operations. Via an adjustment screw **5** the tappet **3** acts upon a lever **6** one end of which acting upon the control piston **7**. The control piston **7** is provided in a control cylinder **8** and adapted to be displaced in the latter. At the immersing end of the control piston **7** a packing **9** has been provided.

The control cylinder **8** is located in a housing **10**. A chamber **11** surrounding the control cylinder **8** is established between the ends of the housing **10**. The chamber **11** is connected with the pressure oil reservoir **12** the top of which is open. A recess **13** is provided at the control piston in front of its pressure end, said recess being connected through the bore **14** in the wall of the control cylinder with the longitudinal chamber **11**. A second bore **15** connects the pressure chamber **28** of the control cylinder with the chamber **11** when the control piston **7** is withdrawn or is in its original position respectively. In the original position of the piston **7** pressure oil is free to flow into the pressure chamber **28**. The bore **15** has a small diameter only and is located closely below the packing **9** in the original position of the piston **7**. When the control piston **7** is displaced, the packing **9** seals the pressure chamber **28** off against the longitudinal chamber **11** when overrunning the bore **15** and presses the pressure oil via the line **16** into the working piston **17**. In the working cylinder there is the working piston **18** which is displaced towards the outside in an exactly reversed relationship between control piston surface and the working piston surface. The pressure oil acts as a rigid transmission element. Since after completion of a working cycle the next cycle starts again in the original position with the control piston, the pressure oil is able to level up prior to the star of a new cycle. In the bottom of the control cylinder **8** there is a piston pin **20** which is sealed by the packing **19**. The piston pin **20** is supported on one end of a pivoted lever **21** the other arm of which is loaded, corresponding to the desired safety, with the working pressure which may occur increased by an additional safety load. The extend may be adjusted very exactly by means of a spring or a weight. In the case of any excess pressure resulting from a fault in the system the piston pin is moved towards the outside and presses upon one arm of the lever **21**. The lever **21** swivels and, by this movement, actuates a limit switch **22** and the coupling **23** to suddenly interrupt the cycle.

Near the bottom of the control cylinder another second bore **24** has been provided for pressure oil discharge. Normally this bore is closed. If it should however be necessary due to tool or machine breakage and the control piston **7** and the working piston **18** not being within their neutral positions, to return the working piston **18** independently into its neutral position for adjustment, the pressure oil discharge opening **24** is opened so that pressure oil may flow into the reservoir **12** via the return line **25** without returning the control piston **7** via the control cam **1**. The working piston **18** is withdrawn into its neutral position by means of the pressure spring **26**. After the bore **24** has been closed in the neutral position, the former extent of movement of the working piston is resumed in the new working cycle without any additional manipulation.

The spring **27** is responsible for the return of the control piston **7**.

I claim:

1. A hydromechanical control mechanism for controlling a pressurized flow to a working piston comprising:

(a) a control cam,

(b) a control piston controlled by said control cam via a lever gear,

(c) said control piston being positioned within a control cylinder containing a hydraulic medium in a pressure chamber therein,

(d) a liquid reservoir open to the surrounding air,

(e) said reservoir being connected to said control cylinder at a point determined by the location of the working surface of said control piston when it is at its withdrawn position,

(f) a piston pin positioned in the bottom of said pressure chamber and having one end subjected to said hydraulic medium therein, and

(g) the other end of said piston projecting outwardly from said pressure chamber and cooperating with means for stopping the control mechanism when said piston pin is moved outwardly by an excess in pressure in said pressure chamber.

2. A mechanism as defined in claim **1** wherein said stopping means includes means for varying the pressure on said other end of the piston pin.

3. A mechanism as defined in claim **1** wherein said stopping means includes a lever having a pair of arms, wherein said piston pin acts on one arm, the other arm cooperating with a limit switch.

4. A mechanism as defined in claim **1** including a direct connection means between said pressure chamber and said liquid reservoir adjacent the bottom of said pressure chamber, and means therein for opening said connection means when a predetermined pressure is reached in said pressure chamber.

References Cited

UNITED STATES PATENTS

1,062,580	5/1913	Bollée	60—54.5X
2,343,962	3/1944	Dodson	60—54.5X
2,396,392	3/1946	Schreck	123—90E
2,602,434	7/1952	Barnaby	60—54.5X
2,882,685	4/1959	Carlsen et al.	60—54.5
3,140,586	7/1964	Joelson	60—54.5
2,092,721	9/1937	Arter	60—54.5X
2,595,775	5/1952	De Wrangell	60—54.5X

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