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(54) Hydraulic force-multiplying actuator

(57) An hydraulic force-multiplying actuator is disclosed comprising adjustable pneumatic reaction means (60) adapted to exert a constant reaction pressure and to perform a constant-force stroke, and supplied by compressed-air supplying ducts (52); the actuator further comprises a shoulder (50) for the oil in the working area, and at least one element (11) adapted to prevent the pad of the reaction means (60) from rotating.

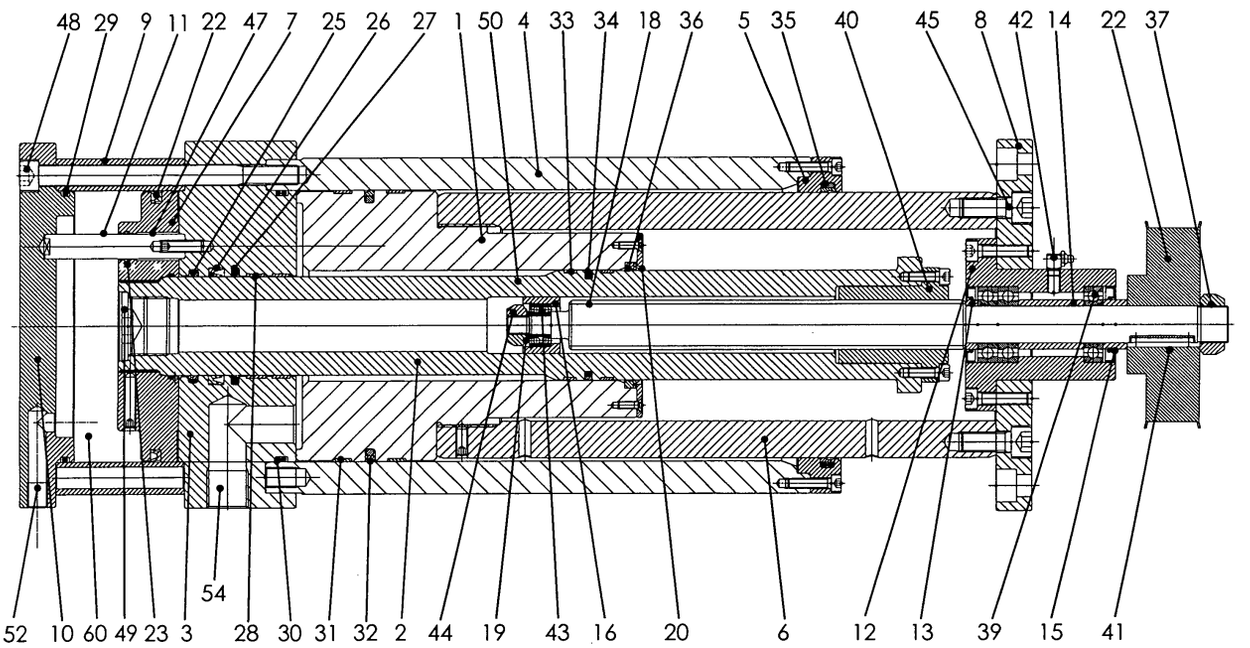

Fig. 1

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Description

[0001] The present invention refers to an hydraulic force-multiplying actuator.

[0002] Different types of actuators are known in the art, both of the electromechanical and of the hydraulic types. These latter ones have recently provided a better solution from the point of view of increasing the force with variable multiplication ratios upon their dimensioning. An example of a known actuator allows obtaining multiplication ratios that vary from at least two up to a maximum of five times the recirculating screw reaction. It is thereby possible to use screws into a constructive range of standard sizes and loads and parking and operating brakes that are sized even only for 1/5 of the maximum provided force. This type of electro-hydromechanical force-intensifying actuator has the further advantage of being of a construction shape that is not unlike the shape of an hydraulic cylinder and it is able to replace this latter one without excessive modifications in the existing machine structures.

[0003] However, the above-described actuator has two substantial types of problems: first of all, it is equipped with an actuating spring, which does not show a constant reaction pressure, but rather a pressure accumulation and therefore does not perform a constant-force stroke, and after a time tends to lose its own functionalities: moreover, its replacement, in case of need, forces the whole actuator to be disassembled, with obvious problems of times and costs. Secondly, such actuator allows realising multiplication ratios that are not greater than five, which are of a limited application in the field of existing machines.

[0004] Object of the present invention is solving the above prior-art problems, by providing an hydraulic force-multiplying actuator that is not equipped with a spring but with an air piston, that provides a constant reaction pressure and performs a constant stroke; such arrangement with an adjustable pneumatic piston further allows doing without the oleodynamic unit that was one of the limits of the previous actuator.

[0005] A further object of the present invention is providing an actuator of the above-mentioned type that allows obtaining multiplication ratios that are up to 25, that are much more suitable for nowadays applications on machines.

[0006] The above and other objects and advantages of the invention, as will appear from the following description, are obtained by an hydraulic actuator as claimed in Claim 1. Preferred embodiments and non-trivial variations of the present invention are claimed in the dependent Claims.

[0007] The present invention will be better described by some preferred embodiments thereof, given as a non-limiting example, with reference to the enclosed drawings, in which the single Figure 1 thereof shows a side cross-sectional view of the currently-preferred embodiment of the multiplying actuator of the present invention. As shown in Fig. 1, the hydraulic actuator of the present invention substantially comprises, as its major feature, adjustable pneumatic reaction means 60 that are composed of a compressed-air piston supplied through a duct 52 and that operates on the actuator body in order to exert a constant reaction pressure and to perform a constant-force stroke. Such pneumatic piston 60 replaces the spring that was commonly used in known actuators of this type.

[0008] The actuator of the invention is further equipped with a shoulder 50 in the working area, such shoulder 50 allowing the operating oil (supplied through the duct 54) to operate in a gradual increase in the working area in order to speed-up and improve the actuator operability.

[0009] Moreover, the actuator of the invention can be equipped, differently from known actuators, with at least one element 11 that is adapted to prevent the pad of the reaction means 60 from rotating: in practice, such elements 11 are two and are composed of rotation-preventing studs.

[0010] As shown in detail in Fig. 1, the actuator then comprises, in a known way, normal component parts that are, in detail, the following ones: a pad 1, a stem 2, an head 3, a liner 4, a liner flange 5, a pad support 6, a stem flange 7, a multiplying flange 8, a pneumatic liner 9, a pneumatic head 10, a spindle 12, a spacer 13, an internal spacer 14, a lower spacer 15, a bearing capsule 16, a recirculation screw 18, a screw spacer 19, a padded flange 20, a driven pulley 21, a "n-pur" 22, a "nipsl 310" 23, a 4312 O-ring 24, a "pt1" 25, a "t 20" 26, an "oms - mr" 27, a guiding band 31, an "omk-e" 32, a guiding band 33, an "omk-e" 34, a "pt1" 35, a "pu6" 36, a ring nut 37, a corteco 38, a slanted bearing 39, a scroll 40, a tongue 41, a greaser 42, a slanted bearing 43, a front ring nut 44, a 4762 TCEI - ISO screw 45, pitted bushes 47, screws 48 and a plug 49.

[0011] The actuator of the invention finds its most efficient application in the field of pressings, and in particular in the field of material forming and cutting, without having to use screws and toggles and allowing to perform both workings in a single operation.

Claims

1. Hydraulic force-multiplying actuator, **characterised in that** it comprises adjustable pneumatic reaction means (60) adapted to exert a constant reaction pressure and to perform a constant-force stroke, said reaction means (60) being supplied by compressed-air supplying ducts (52).

2. Actuator according to Claim 1, **characterised in that** it is further equipped with a shoulder (50) in its working area, said shoulder (50) allowing the operating oil to operate with a gradual increase in the working area.

3. Actuator according to Claim 1 or 2, **characterised in that** it is further equipped with at least one element (11) adapted to prevent the pad of the reaction means (60) from rotating.

4. Actuator according to Claim 3, **characterised in that** said elements (11) are two and are composed of rotation-preventing studs.

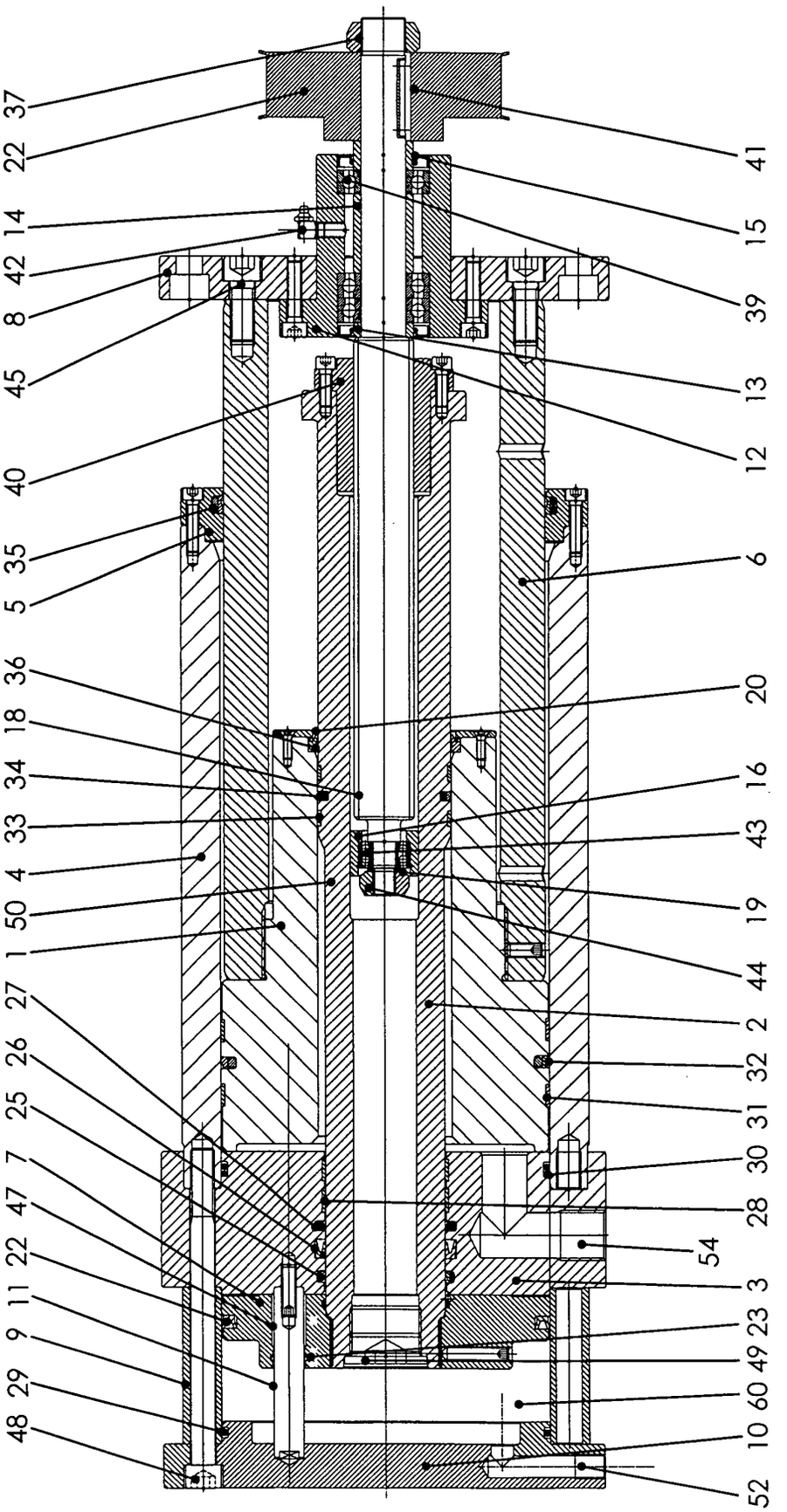
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Fig. 1