

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 670 968 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

10.06.1998 Bulletin 1998/24

(21) Application number: **92904126.7**

(22) Date of filing: **20.12.1991**

(51) Int Cl.⁶: **F15B 15/22**

(86) International application number:
PCT/SE91/00898

(87) International publication number:
WO 92/14934 (03.09.1992 Gazette 1992/23)

(54) **ADJUSTING MEANS FOR FLUID PRESSURE DEVICES**

EINSTELLEINRICHTUNG FÜR DRUCKFLÜSSIGKEITSSYSTEM

SYSTEME DE REGLAGE DESTINE A DES DISPOSITIFS A PRESSION HYDRAULIQUE

(84) Designated Contracting States:
DE FR GB

(30) Priority: **20.02.1991 SE 9100511**

(43) Date of publication of application:
13.09.1995 Bulletin 1995/37

(73) Proprietor: **AKTIEBOLAGET REXROTH MECMAN**
125 81 Stockholm (SE)

(72) Inventor: **HEDLUND, Staffan**
S-127 36 Skärholmen (SE)

(74) Representative: **Modin, Jan et al**
c/o Axel Ehner's Patentbyrå AB
Box 10316
100 55 Stockholm (SE)

(56) References cited:
DE-B- 1 054 845 **US-A- 604 253**
US-A- 3 122 063 **US-A- 3 442 178**
US-A- 3 559 535

EP 0 670 968 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

The present invention concerns a means for setting a piston movement parameter in a piston cylinder aggregate, which comprises a setting device being affected by a set screw for fluid flow regulation.

In previously known fluid pressure devices and particularly in pneumatic piston cylinder aggregates, it is necessary to perform a relatively lengthy procedure to achieve a desired cylinder performance as periodic time, piston speed, acceleration etc. In these devices sometimes very time consuming measurements and calculations must be undertaken to estimate e.g. the piston speed. It is therefore a demand for a device which in a simple manner allows the setting of desired piston speed in such an aggregate, allowing easy estimation of the periodic time, acceleration etc. This demand is particularly great in pneumatic piston cylinder aggregates with speed regulation and adjustable stroke end cushioning.

These objects are achieved by a device comprising the features at set forth in claim 1. When in a setting device essentially comprising an indicator member, which is readable against at least one reading mark, one of these members being placed onto the thereto adapted setting device, the two members are relatively adjustable to one another to achieve a distinct initial or zero position for the adjustment and thereafter fixable, possibility of very accurate direct adjustment of a piston movement parameter in a piston cylinder aggregate is achieved, and the effect of the manufacturing tolerance minimized.

A considerable advantage with the invention is that simple replaceability with maintained parameter values is allowed. If e.g. one of a number of cylinders of a machine brakes down, it is simply replaced with an equal cylinder, the setting means of which is set on the same value as that of the setting means of the broken down cylinder. Hereby very short replacement times with minimized adjustment is achieved. Any smaller deviations due to tolerances are quickly adjusted.

By the features of the claims 2-4, the setting possibilities are further simplified. A linear relation between the displacement of the valve body and the piston speed makes an even distribution of the indicator markings of the indicator member possible, as well as repeatability of the adjustment in turn after turn of the set screw.

By use of any of the further features according to claims 5 or 6, safe and simple indication of the position of the set screw is achieved also after turning of the same more than one turn. Thus great adjustment span is achieved. If a set screw with small pitch is used, the possibilities of achieving accuracy in the adjustment is increased.

The features of claims 7 and 8 define advantageous and simple adjustments of the respective members.

The invention will now be described in greater detail with reference to the appended drawings.

Fig. 1 is a central section through a part of a piston cylinder aggregate with an indicating device according to the invention.

Fig. 2a-2c is an exploded perspective view of the setting device of Fig. 1 with the associated indicator member.

Fig. 3 shows a first embodiment of the invention in a cylinder end plate.

Fig. 4 shows a second embodiment of the invention in a cylinder end plate.

Fig. 1 thus shows an indicator device according to the invention in connection with a cylinder end plate 7. An indicator member comprising an indicator ring 2 is placed onto the outer part of a set screw 1. On its outward surface (not shown) which is directed away from the cylinder end plate, the indicator ring 2 is provided with indicator markings e.g. in form of numerals (2.1 - 2.5, in Fig. 2a), which are readable against a reading mark in the form of a preferably fixed index (6 in Fig. 3), e.g. on the cylinder end plate surface, thereby indicating the rotational position of the set screw. A stepped reading ramp 5 is placed onto the cylinder end plate surface radially immediately outside the indicator ring 2. The height of the steps corresponds to the pitch of the set screw, whereby an indication of the rotational position of the set screw for an optional number of turns may be obtained by sighting or sensing with a finger.

The piston cylinder aggregate shown in Fig. 1 is a pneumatic cylinder with speed regulation and stroke end cushioning. This device which corresponds to the preamble of claim 1 is the subject of the applicant's own application SE-A-467424. The set screw 1 affects a valve body 12, which cooperates with two throttle openings 13, 14 of which the one 13 is arranged in a particular stroke end cushioning channel 21 and the other 14 in the outlet channel 22. Fig. 2a - 2c show the indicator ring 2 in connection with the setting device in an exploded perspective view, from which it is clear that the throttle openings 13, 14 are essentially rectangular. With this shape a linear relation is obtained between the piston speed and the axial displacement of the valve body 12 and thus the rotational displacement of the set screw 1.

Adjustment for achieving a distinct initial position, here zero position, is obtained as follows: The set screw 1 is screwed into its sleeve 9, until the valve body 12 contacts a stop collar 17, being fixed in the lower part of the sleeve 9. The flow through the throttle openings is now completely closed, and the speed of the piston 11 is zero. The indicator ring 2 is now placed onto the outer part of the set screw, while assuring that the numeral zero appears right in front of the reading index. Finally the indicator ring 2 is fixed, e.g. by tightening a locking screw in a threaded hole adapted for that purpose, in a per se known manner, or by letting an applied glue harden.

Fig. 3 shows a device similar to the one in Fig. 1 with an indicator member which also in this case com-

prises an indicator ring 2 being fixed onto the outer part of a set screw 1, in connection with a cylinder end plate 7, in which a valve body 12 being fixedly connected to the set screw 1 is indicated with dashed lines. On its outward surface the indicator ring 2 is provided with indicator numerals (2.1 - 2.5 in Fig. 2a) from 0 to 4. These numerals here correspond to the speeds 0; 0.1; 0.2; 0.3; 0.4; m/s. The relation between the piston speed and the displacement of a setting device is obtained by simple testing of suitable throttle opening areas. When the relation is linear as above, the indicator numerals are evenly rotationally distributed on the indicator ring. The lines 2.1 - 2.5 are read against the index from the side as well as straight from above.

To be able to read speeds in access of 0.5 m/s, which corresponds to an even turn of the set screw, the scale has been completed with a stepped reading ramp 5, which in this case comprises three steps with grades 0.5; 1.0; 1.5 m/s. This value is added to the value of the ring to obtain a true indication of the speed.

Fig. 4 shows a second embodiment of the invention in connection with a cylinder end plate 7. Also in this case the indicator member comprises an indicator ring 2 with indicator numerals from 0 - 4 on its outward surface, which are read against an index in the same manner as has been described above. To enable reading of the axial displacement of the setting device in access of one turn, the indicator ring 2 is further provided with a desired number of annular grooves or similar markings 16 distributed over its axial length, mutually spaced apart a distance corresponding to the pitch of the set screw. In the initial position, when the speed of the piston is zero, the setting device is screwed into its inner position, the indicator ring 2 at least with its main part being located within a cylindric recess 15 in the cylinder end plate. When the set screw 1 is then screwed out to partly open the throttle openings of the setting device, the indicator ring 2 will also be displaced axially outwards, whereby the annular grooves 16 or the like markings, will appear in correspondence to one, two or more screw turns out of the recess 15. Reading is simply achieved by sighting against an index applied beside the ring or along the wall of the cylinder end plate or the valve housing.

When the setting device comprises a reading ramp, annular grooves or the like for indicating axial displacement, the adjustment to obtain a distinct initial position may, if desired, be simply completed with axial adjustment in connection with the rotational adjustment.

The invention is not limited to the embodiments described above, but only to the scope of the following claims. The setting device may thus be used in other kinds of piston cylinder aggregates than the shown and does not need to be contained in a cylinder end plate. Nor does the setting device need to comprise a valve body of the kind described in connection with the figures. Also other valve designs may come into question, e.g. needle valves. The indicator member does not neces-

sarily have to be comprised of an indicator ring with outward indicator markings but may e.g. be comprised of a pointer cooperating with reading marks in the form of a fixed scale. This may be suitable particularly if the valve is a so called tap valve. The indicator member 2 may be manufactured from a suitable material, e.g. a synthetic material or metal and may be fixed to the set screw in a suitable manner, e.g. by a locking screw radially or axially, by glueing, soldering, stamping, shrinking, jolting or in any other way.

The reading mark(s) may be integral with the reading ramp, which further does not have to be stepped but may run continuously and possibly with a reading scale applied close to the indicator member. Further the indicator member may be integral with the set screw, the adjustment being achieved by applying/displacing the reading index for calibration against "the zero" of the indicator member. In this case the indicator member may be comprised of a point, a line or the like on the set screw and the reading marks of a scale which is in principle shaped as the indicator ring in Fig. 4a and which is adjustable and then fixable close to the setting device. The reading index may be applied onto the valve housing or the cylinder end plate by casting, punching, painting, stamping or by applying a body by glueing, screwing, soldering or in any other way. In case the reading index as well as the stepped reading ramp are fixed, these members may be made integral with the cylinder end plate/valve housing.

Both of the members may also be adjusted simultaneously, e.g. one axially and the other rotationally.

Finally the invention makes it possible to draw up simply readable tables or diagrams, over cylinder performance as periodic time, acceleration etc as functions of the read value. This considerably increases the competitiveness and applicability of products wherein the invention is used.

Claims

1. Device for setting a piston (11) movement parameter in a piston cylinder aggregate, comprising a setting device for fluid flow regulation which is actuated by a set screw (1), said setting device comprising two members, namely at least one reading mark (6), and one indicator body (2), which is readable against said reading mark or marks (6), the one of said members being applied onto and moveable together with the setting device, and the other member being arranged stationary close to the setting device, **characterized** in that the two members are relatively adjustable to one another independent from the position of the setting device so as to obtain a distinct initial position for the setting, and fixable after adjustment.
2. Device according to claim 1, said set screw (1) be-

ing connected to at least one valve body (12), which in cooperation with at least one throttle opening (13,14) throttles the outflow of pressure fluid from the piston cylinder aggregate, **characterized** in that the throttle opening or openings (13,14) are essentially rectangular for obtaining an essentially linear relation between the displacement of the valve body (12) and the piston (11) speed.

3. Device according to claim 1 or 2, **characterized** in that the indicator member (2) is comprised of an indicator ring with indicator markings and that the reading mark is comprised of an index. (6).

4. Device according to claim 3, **characterized** in that the indicator markings are applied on the outward surface of the indicator ring (2) and are comprised of rotationally distributed indicator numerals (2.1-2.5).

5. Device according to any of the claims 1-4, **characterized** in that the reading mark is comprised of a stepped reading ramp, located radially immediately outside the indicator member (2), the step height of which corresponding to the pitch of the set screw (1), the axial displacement of the set screw being readable against the reading ramp.

6. Device according to claim 3 or 4, **characterized** in that the indicator ring (2) comprises grooves or markings (16) around its envelope surface, the distance between two adjacent grooves or markings (16) corresponding to the pitch of the set screw (1), and the axial displacement of the set screw being indicated by said grooves or markings (16) being readable against an index applied beside the ring (2) or a wall of the cylinder end plate (7) or of the valve housing.

7. Device according to any of the claims 1-6, **characterized** in that the indicator member (2) is rotationally and/or axially adjustable and thereafter fixable onto the setting device.

8. Device according to any of the claims 1-7, **characterized** in that said reading mark(s) (6) is rotationally and/or axially adjustable and thereafter fixable close to the setting device.

9. Device according to any of the claims 1-8, **characterized** in that fixation after adjustment is achieved by glueing, screwing, soldering, jolting, stamping shrinking or in any other suitable manner.

Patentansprüche

1. Vorrichtung zum Einstellen eines Bewegungspara-

eters für einen Kolben (11) in einer Kolben-Zylinder-Gruppe mit einer Einstelleinrichtung zur Fluidflußregulierung, die durch eine Einstellschraube (1) betätigt wird, wobei die Einstelleinrichtung zwei Elemente aufweist, nämlich wenigstens eine Ablesemarke (6) und einen Anzeigekörper (2), der gegen die Ablesemarke oder die Marken (6) lesbar ist, wobei eines der Elemente an der Einstelleinrichtung angebracht und damit beweglich ist und das andere Element nahe bei der Einstelleinrichtung stationär angeordnet ist, **dadurch gekennzeichnet**, daß die zwei Elemente unabhängig von der Position der Einstelleinrichtung derart zueinander verstellbar sind, daß eine genaue Ausgangsposition für die Einstellung erhalten wird, die nach der Verstellung fixierbar ist.

2. Vorrichtung nach Anspruch 1, bei der die Einstellschraube (1) mit wenigstens einem Ventilkörper (12) verbunden ist, der im Zusammenwirken mit wenigstens einer Drosselöffnung (13, 14) das Ausströmen von Druckfluid aus der Kolben-Zylinder-Gruppe drosselt, **dadurch gekennzeichnet**, daß die Drosselöffnung oder die Öffnungen (13, 14) im wesentlichen rechteckig sind, um eine im wesentlichen lineare Beziehung zwischen der Verschiebung des Ventilkörpers (12) und der Geschwindigkeit des Kolbens (11) zu erhalten.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß das Anzeigeelement (2) aus einem Anzeigering mit Anzeigemarkierungen besteht und die Ablesemarke aus einem Index (6) besteht.

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet**, daß die Anzeigemarkierungen an der Außenfläche des Anzeigerings (2) angebracht sind und aus in Drehrichtung verteilten Anzeigeziffern (2.1-2.5) bestehen.

5. Vorrichtung nach einem der Ansprüche 1 - 4, **dadurch gekennzeichnet**, daß die Ablesemarke aus einer abgestuften Ableserampe besteht, die radial unmittelbar außerhalb des Anzeigeelements (2) angeordnet ist, wobei die Schritthöhe der Ganghöhe der Einstellschraube (1) entspricht und die axiale Verschiebung der Einstellschraube gegen die Ableserampe lesbar ist.

6. Vorrichtung nach Anspruch 3 oder 4, **dadurch gekennzeichnet**, daß der Anzeigering (2) Nuten oder Markierungen (16)) um seine einhüllende Fläche aufweist, wobei der Abstand zwischen zwei nebeneinanderliegenden Nuten oder Markierungen (16) der Ganghöhe der Einstellschraube (1) entspricht und die axiale Verschiebung der Einstellschraube durch die Nuten oder Markierungen (16) angegeben ist, die gegen einen neben dem Ring (2) oder

einer Wand der Zylinderendplatte (7) oder des Ventilgehäuses angebrachten Index zu lesen sind.

7. Vorrichtung nach einem der Ansprüche 1-6, **dadurch gekennzeichnet**, daß das Anzeigeelement (2) in Drehrichtung und/oder axial verstellbar und danach an der Einstelleinrichtung fixierbar ist. 5
8. Vorrichtung nach einem der Ansprüche 1-7, **dadurch gekennzeichnet**, daß die Ablesemarke (n) (6) in Drehrichtung und/oder axial verstellbar und danach nahe an der Einstelleinrichtung fixierbar ist/sind. 10
9. Vorrichtung nach einem der Ansprüche 1-8, **dadurch gekennzeichnet**, daß die Befestigung nach dem Verstellen durch Kleben, Verschrauben, Löten, Stauchen, Kaltschlagen, Schrumpfen oder auf jede andere geeignete Weise erreicht wird. 15 20

Revendications

1. Dispositif pour régler le paramètre de déplacement d'un piston (11) dans un ensemble de cylindre et piston, comprenant un dispositif de réglage pour réguler l'écoulement de fluide qui est actionné par une vis de réglage (1), ledit dispositif de réglage comprenant deux organes, à savoir au moins une marque de lecture (6), et un corps indicateur (2), dont les indications sont lues relativement à ladite marque de lecture ou auxdites marques de lecture (6), l'un desdits organes étant appliqué sur le dispositif de réglage et mobile avec celui-ci, et l'autre organe étant agencé fixement près du dispositif de réglage, caractérisé en ce que les deux organes sont adaptés à être réglés l'un par rapport à l'autre indépendamment de la position du dispositif de réglage de manière à obtenir une position initiale distincte pour le réglage, et adaptés à être fixés après le réglage. 25 30 35 40
2. Dispositif selon la revendication 1, ladite vis de réglage (1) étant reliée à au moins un corps de soupape (12), qui, en coopération avec au moins une ouverture d'étranglement (13, 14), étrangle l'échappement du fluide sous pression de l'ensemble de cylindre et piston, caractérisé en ce que la ou les ouvertures d'étranglement (13, 14) sont sensiblement rectangulaires pour obtenir une relation essentiellement linéaire entre le déplacement du corps de soupape (12) et la vitesse du piston (11). 45 50
3. Dispositif selon la revendication 1 ou 2, caractérisé en ce que l'organe indicateur (2) consiste en un anneau indicateur avec des indications et en ce que la marque de lecture consiste en un repère (6). 55
4. Dispositif selon la revendication 3, caractérisé en

ce que les indications sont appliquées sur la surface extérieure de l'anneau indicateur (2) et consistent en numéros indicateurs (2, 1 - 2,5) répartis en rotation.

5. Dispositif selon l'une quelconque des revendications 1 à 4, caractérisé en ce que la marque de lecture consiste en une rampe de lecture à gradins, située radialement, juste à l'extérieur de l'organe indicateur (2), la hauteur des gradins correspondant au pas de la vis de réglage (1), le déplacement axial de la vis de réglage pouvant être lu relativement à la rampe de lecture.
6. Dispositif selon la revendication 3 ou 4, caractérisé en ce que l'anneau indicateur (2) comprend des rainures ou marques d'indication (16) autour de sa surface d'enveloppe, la distance entre deux rainures ou marques d'indication (16) adjacentes correspondant au pas de la vis de réglage (1), et le déplacement axial de la vis de réglage étant indiqué par lesdites rainures ou marques d'indication (16) pouvant être lues relativement à un repère appliqué à côté de l'anneau (2) ou sur une paroi de la plaque d'extrémité de cylindre (7) ou du boîtier de soupape.
7. Dispositif selon l'une quelconque des revendications 1 à 6, caractérisé en ce que l'organe indicateur (2) est adapté à être réglé en rotation et/ou axialement puis à être fixé sur le dispositif de réglage.
8. Dispositif selon l'une quelconque des revendications 1 à 7, caractérisé en ce que ladite ou lesdites marques de lecture (6) sont adaptées à être réglées en rotation et/ou axialement puis à être fixées près du dispositif de réglage.
9. Dispositif selon l'une quelconque des revendications 1 à 8, caractérisé en ce que la fixation après réglage est effectuée par collage, vissage, brasage, refoulement, estampage, pose à chaud et retrait, ou d'une quelconque autre manière appropriée.



