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(54) Compact pneumatic cylinder

(57) A pneumatic cylinder of the type comprising a central body (10) defining a chamber (13) inside which an axially reciprocable piston (14) slides, and two closing head-pieces (11, 12) sealingly fixed to the respective ends of the central body (10); an inlet/outlet port (23, 24) for supplying and discharging the compressed air into/from the chamber (13) is provided into a protruding part (25, 26) on one side of the head-pieces (11, 12) which extends into a seating (27, 28) in a corresponding side wall portion of the central body (10).

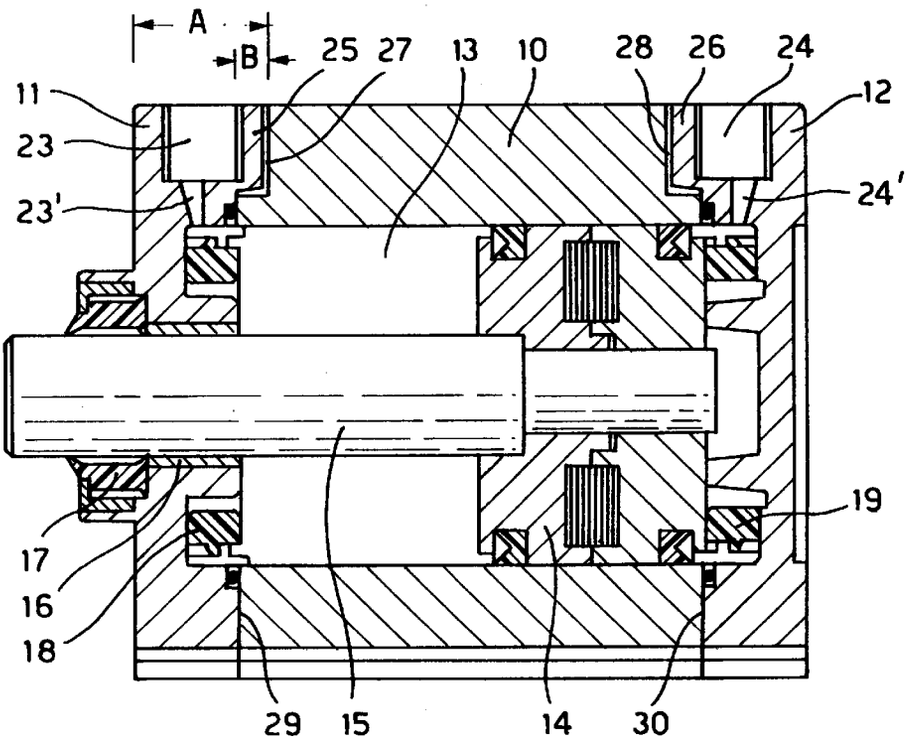

FIG. 3

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Description

The present invention relates to pneumatic actuators and in particular concerns a short-stroke cylinder comprising modular components, by means of which it is possible to change the stroke length while maintaining the overall longitudinal dimensions of a pneumatic cylinder of conventional type.

As is known, in the area of pneumatic cylinders, most manufacturers have adopted standard dimensions in order to comply with specific market and user requirements.

In particular, for short-stroke cylinders, in order to reduce as far as possible the longitudinal dimensions, the cylinder is made as a single body from a suitable tubular section which is cut to the desired length and on which then all the mechanical operations necessary for obtaining the air passages and for completing the cylinder itself are performed. Since in general the working stroke of the cylinder cannot be varied and since the ports for supplying and discharging the compressed air must have predetermined positions on the body, it is entirely impossible to modify or vary the structure of the actuator unless its overall dimensions are varied or modified, compared to a normal cylinder of standardized type.

All of this involves problems both from a manufacturing point of view, owing to the need to programming the production of the cylinders in the various standardized dimensions, and as regards management of the said production, owing to the necessity to satisfy unexpected requirements, unless to provide a warehouse with a suitable supply of cylinders in the various dimensions. Furthermore, each cylinder has to be suitably set-up for the necessary machining operations, for formation of the air passages and for the necessary seals at both ends thereof.

Nevertheless, it would be desirable to have pneumatic cylinders which retain standardized dimensions and which at the same time allow varied programming and management of production, making it possible to satisfy at any time unexpected requirements, without having to have large warehouse supplies available.

In order to partially satisfy these requirements, composable pneumatic cylinders have been proposed, in which the cylinder comprises a central barrel which can be obtained from a tubular section, and two closing head-pieces which are sealingly screw fastened against the ends of the same central barrel. Although the use of modular cylinders having separate head-pieces, is extremely advantageous from a production point of view in that it enables one to have head-pieces on which the necessary machining operations may be performed and with the seals required, it is difficult for the use of conventional head-pieces to be adapted to short-stroke or small-size cylinders in that the greater thickness of the conventional head-pieces, necessary for forming the compressed-air supply and discharge ports, is added to the length of the central barrel which must be necessary equal to the working stroke of the cylinder, thus increasing the overall dimensions of the same.

The object of the present invention is therefore to provide a composable pneumatic cylinder having a compact structure which allows one to form pneumatic cylinders of any length having separate head-pieces, while retaining standardized dimensions and the advantages of composable cylinders of conventional type.

The above has been made possible, according to the present invention, by providing each head-piece of the cylinder with a protruding part on one side in which the compressed-air supply and discharge port is formed, and in which this protrusion is seated in a cavity provided in a corresponding peripheral wall portion of the central tubular body of the cylinder, to correspondingly reduce the overall dimension of the cylinder while maintaining unchanged the piston-stroke.

In this way it is possible to manufacture with greater precision and care standardized head-pieces which in each case may be assembled on a central body having suitable longitudinal dimension so as to provide pneumatic cylinders of any desired and standardized length.

A cylinder according to the present invention will be illustrated hereinbelow, with reference to the example of the accompanying drawings, in which:

Fig. 1 is a perspective view of the cylinder;
Fig. 2 is a top view;
Fig. 3 is a longitudinal sectional view along the plane containing the axis of the cylinder;
Fig. 4 is an enlarged detail of Figure 1.

As shown, a pneumatic cylinder according to the present invention substantially comprises a central body 10 obtained from a tubular section of suitable cross-section, as well as two closing head-pieces 11 and 12 which together the body 10 define a chamber 13 of the cylinder, inside which a reciprocable piston 14 slides. An axially protruding piston rod 15 is fixed to the piston 14 and emerges in sealed manner from one of the head-pieces of the cylinder, for example the head-piece 11 provided with a guide bush 16 and a sealing gasket 17. References 18 and 19 in Figure 3 respectively denote, moreover, two elastically yielding annular members for damping the piston 14 at the end of the stroke, which are arranged in suitable seats in the closing head-pieces 11 and 12.

Each of the head-pieces 11 and 12 is sealingly fastened to the central body 10 by means of screws 20 which are screwed into axially aligned holes 21 and 22 of the head-pieces 11, 12 and the central body 10, as shown.

Each head-piece 11 and 12 is provided, on the upper side of the cylinder, with an internally threaded hole or port 23, 24 which continues into a passage 23' and 24' opening out into a corresponding side of the chamber 13 of the cylinder for supplying and discharging compressed air.

Unlike conventional cylinders, as can be seen in Figures 1, 2 and 3, each air inlet/outlet port 23 and 24, with the respective passage 23' and 24' for supplying and discharging the compressed air, is formed in correspondence of a respective rib portion 25 and 26 protruding from a corresponding side facing from the abutting surface of the head-piece 11 and 12, said rib portion being aligned with and seated in a corresponding cavity 27, 28 in a peripheral wall portion of the central body 10, opening on one side of respective abutting surface 29 and 30 between the head-piece 11,12 and the central body 10 of the cylinder. As shown in figure 2, the rib portions 25, 26 are orthogonally extending to the cylinder axis, for a length smaller than the thickness of the wall portion of the cylinder body 10 in which the seating cavities 27 and 28 have been provided.

From Figures 2 and 3 of the drawings it is clear that, as a result of providing the inlet/outlet ports 23 and 24 for the compressed-air in corresponding projecting parts of the head-pieces, extending on one side and beyond the abutment surfaces 29 and 30, so as be arranged in corresponding cavities 27 and 28 of the central body 10, it is possible to provide pneumatic cylinders comprising modular components having standardized dimensions of conventional cylinders, while retaining the advantages and the entire working stroke of the latter.

In fact, by comparing a conventional cylinder with the present invention, from Figures 2 and 3 it will be noted that a conventional head-piece should have a thickness A sufficient to allow the formation of the air port 23, which would be added to the entire length of the central body 10, corresponding to the working stroke.

Instead, as shown in said Figures, by providing the compressed-air supply and discharge ports 23, 24 at the rib portions 25 and 26 which extend over a distance B into corresponding cavities 27 and 28 of the central body 10, beyond the abutment surface 29 and 30, it is possible to obtain locally in the individual head-piece 11 and 12 a thickness of material sufficient for forming the aforementioned ports and at the same time reduce the overall dimensions of the said head-pieces, while keeping unchanged the length of the central body 10 and hence the stroke of the pneumatic cylinder thus provided.

By way of example, in a cylinder with a stroke of 25 mm which has a total length of 40 mm, the use of conventional head-pieces would have involved an unacceptable increase in the cylinder by about 8-10 mm; instead, according to the present invention, nevertheless it is possible to provide a short-stroke cylinder with an overall dimension of 40 mm, using head-pieces modified according to the present invention with all of the consequent and inherent advantages, from a production point of view, of a modular cylinder.

It is therefore understood that the above description and illustrations with reference to the accompanying drawings have been provided purely by way of an example of the innovative principles of the invention and that modifications or variations may be made as regards a single acting or double acting type of cylinder, its form and its general features, without thereby departing from the claimed invention.

Claims

1. Compact pneumatic cylinder of the type comprising an hollow central body (10) defining a cylinder chamber (13) having a longitudinal axis, a piston member (14) axially reciprocable in said chamber (13) and at least one closing head-piece (11, 12) sealingly fixed to an a butting surface at a respective end of the aforementioned central body (10), said head-piece (11, 12) comprising an inlet/outlet port (23, 24) for supplying and discharging compressed air opening out into said chamber (13) of the cylinder, and in which said piston member (14) comprises a piston rod (15) sealingly protruding from an aperture (16) of said head piece, characterized in that said head-piece (11, 12) comprises a rib portion (25, 26) on the side facing said abutting end surface (29, 30) of the cylinder body (10), said air inlet/outlet port (23, 24) being provided in correspondence of said rib portion (25, 26) of the head-piece (11, 12), and in that said rib portion (25, 26) is protruding into a seating cavity (27, 28) in a peripheral wall portion of the cylinder body (10), said cavity (27, 28) opening towards said abutting end surface (29, 30).

2. Compact pneumatic cylinder according to claim 1, characterized in that said rib portion (25, 26) is orthogonally extending to said cylinder axis, for a length smaller the thickness of said wall portion of the body (10) of the pneumatic cylinder.

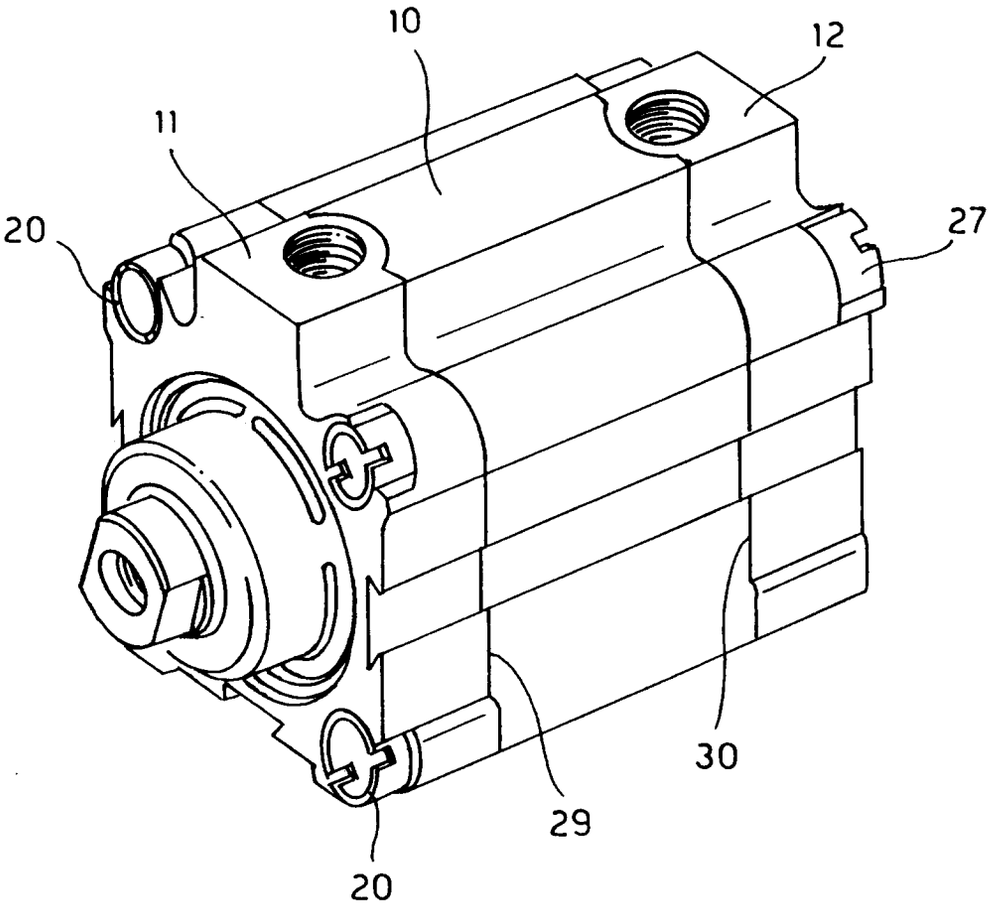

FIG. 1

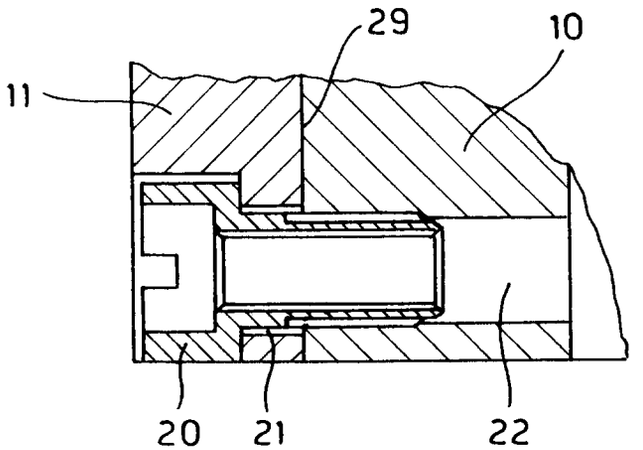

FIG. 4

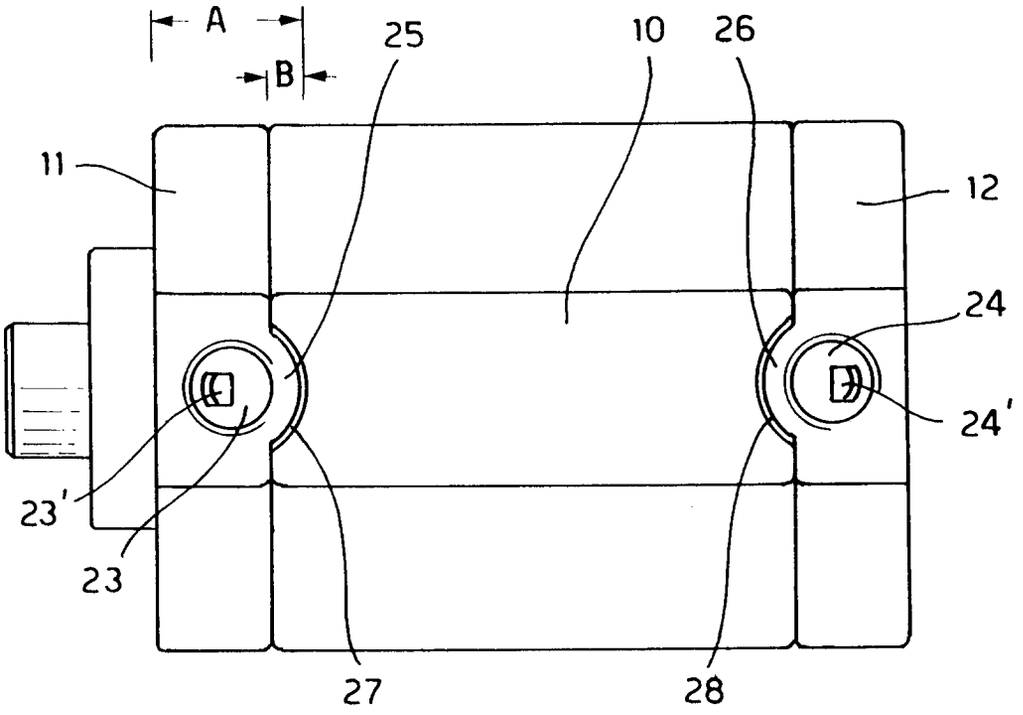
A
B
25
10
26
11
12
24
24'
23'
23
27
28

FIG. 2

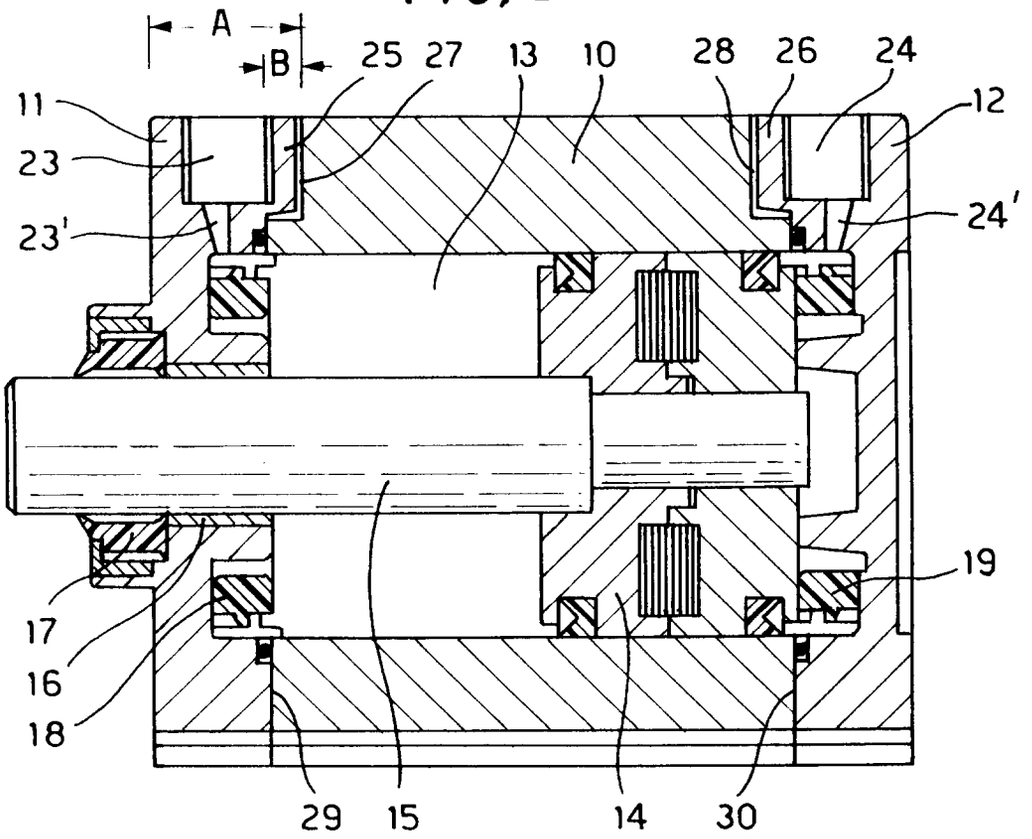
A
B
25
27
13
10
28
26
24
11
12
23
23'
24'
19
17
16
18
29
15
14
30

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 0632

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)
A	GB-B-2 020 746 (COMPAGNIE PARISIENNE D'OUTILLAGE A AIR) * page 1, line 8 - line 30; figure 1 *	1	F15B15/14
A	DE-A-40 41 992 (MANNESMANN) * column 2, line 15 - line 44; claim 6; figures 1,2 *	1,2	
A	EP-A-0 384 948 (FESTO) * column 2, line 2 - line 17; figure 1 *	1	
A	WO-A-94 00706 (REXROTH MECMAN) * claim 1; figure 1A *	1,2	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F15B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	6 October 1995	Thomas, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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