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(54) Pneumatic valve bank with electrical adaptor means

(57) A pneumatic valve bank comprising several fluid manifold elements (1a to 1f) arranged to one another in order to form at least one common inner supply channel (3) and at least one common inner exhaust channel (4a, 4b) extending lengthwise through the fluid manifold elements (1a to 1f) for supplying and discharging air to/from respective multiway valves, which are attached on respective mounting surfaces (5) of the fluid manifold elements (1a to 1f), wherein each fluid manifold element (1a to 1f) comprises an electronic channel (6) parallely arranged to the at least one supply channel (3) and the at least one exhaust channel (4a, 4b) for accommodating electrical adaptor means for connecting each multiway valve with a central control unit,
wherein said electrical adaptor means comprise at least one printed circuit board (12) held by a pair of guiding rails (16) inside the electronic channel (6), wherein at least one projecting part (13a; 13b) on the edge section (14a; 14b) of the printed circuit board (12) corresponds with a recess (15) arranged in the respective guiding rail (16) between neighbouring fluid manifold elements (1a, 1b; 1b, 1c; 1c, 1d; 1d, 1f) for axially fixing the printed circuit board (12) in the electronic channel (6).

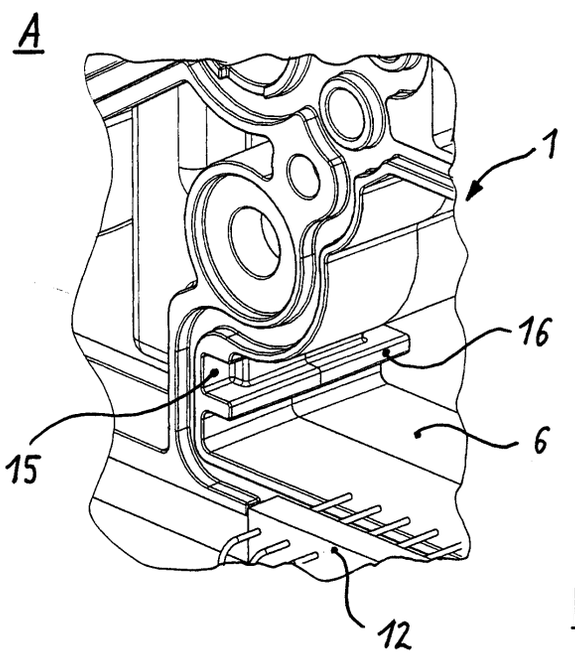

Fig.2

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Description

[0001] The present invention relates to a pneumatic valve bank comprising several fluid manifold elements arranged to one another in order to form at least one common inner supply channel and at least one common inner exhaust channel extending lengthwise through the fluid manifold elements for supplying and discharging air to/from respective multiway valves, which are attached on respective mounting surfaces of the fluid manifold elements, wherein each fluid manifold element comprises an electronic channel parallely arranged to the at least one supply channel and the at least one exhaust channel for accommodating electrical adaptor means for connecting each multiway valve with a central control unit.

Description of the related art

[0002] A valve bank according to the preamble of claim 1 is known from the DE 4343 958 A1. The valve bank comprises several fluid manifold elements for connecting respective multiway valves with pneumatic and electrical sources. The fluid manifold elements are attached one to another in order to form common channels extending lengthwise through the fluid manifold elements. On a mounting surface of the fluid manifold several openings of transverse channels are disposed which provide a connection to the common channels. Said openings correspond with respective openings of the multiway valve.

[0003] Furthermore, an electrical valve connector for controlling the multiway valve is disposed next to the fluid openings on the mounting surface. The electrical valve connector is a part of electrical adaptor means for connecting each multiway valve with a central control unit. Each fluid manifold element comprises an electronic channel for accommodating said electrical adaptor means. The electrical adaptor means comprise a connector arrangement with a female connector and a male connector in order to loop the control signal through the valve bank.

[0004] In order to fix the one-piece connector arrangement to the fluid manifold a separate screw is needed. The screw is accessibly via an opening of the electronic channel arranged on a side surface of the fluid manifold. Through the opening dirt or water can enter the electronic channel.

[0005] It is an object of the present invention to provide a valve bank which offers in contrast of the prior art electrical adaptor means which are ease of assemble inside a closed electronic channel.

Summary of the invention

[0006] The object is obtained in a valve bank of the above mentioned kind by using the features of the characterizing portion of claim 1. Thus the invention provides electrical adaptor means comprising at least one printed circuit board held by a pair of guiding rails inside the electronic channel, wherein at least one projecting part on the edge section of the printed circuit board corresponds with a recess arranged in the respective guiding rail between neighbouring fluid manifold elements for axially fixing the printed circuit board in the electronic channel.

[0007] Thus, the solution according to the present invention integrates the fixing means directly in the electrical adaptor which is positive fitted to the fluid manifold without any separate fixing means.

[0008] Advantageously, one projecting part is arranged on both parallel edge sections of the printed circuit board in order to realize a rugged positioning of the circuit board inside the electronic channel.

[0009] According to a preferred embodiment of the invention the printed circuit board comprises a female connector and a male connector in order to connect further printed circuit boards one to another or to the central control unit. Advantageously, the printed circuit board comprises several strip conductors for electrically connecting the female connector with the male connector in order to loop the electrical signals through the electronic channel in an easy manner. Furthermore, the printed circuit board may comprise a valve connector extending to the mounting surface of the fluid manifold for electrically connecting at least one solenoid of the multiway valve which is attached to said mounting surface.

[0010] According to a preferred embodiment of the invention the printed circuit board comprises bus electronic means in order to decode bus signals transmitted from a central control unit directly inside the electronic channel. Thus, a separate control unit for decoding bus signals and other electronically operations on the valve bank is not needed.

[0011] Advantageously, one printed circuit board extends through the electronic channels of at least two neighbouring fluid manifold elements in order to minimize the number of printed circuit boards which are require in order to install the electrical connection. Thus, a preassembled unit may provided by attaching least two fluid manifold elements, e.g. by at least one separate screw or another suitable connecting element.

Brief description of the drawings

[0012] The invention will be further described by way of examples with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of a sub-assembled valve bank with several fluid manifold elements and electrical adaptor means,

Fig. 2 shows a guiding rail section inside an electronic channel as detail A of Fig. 1, and

Fig. 3 is a perspective view of parts for a preassembled unit.

Detailed description of the drawings

[0013] The fluid manifold arrangement according to Fig. 1 form a base of a pneumatic valve bank. Several fluid manifold elements 1a to 1f are arranged to one another attached by three tie rods 2a to 2c. In the mounted state all fluid manifold elements 1a to 1f form one common inner supply channel 3 and two common inner exhaust channels 4a, 4b extending lengthwise through the whole valve bank for supplying and discharging air to/from respective - not shown - multiway valves. The multiway valves are attached on respective mounting surfaces 5 of the fluid manifold elements 1a to 1f wherein transverse channels correspond with the corresponding multiway valve.

[0014] Furthermore, each fluid manifold element 1a to 1f comprises an electronic channel 6 parallely arranged to the common channels 3, 4a and 4b. The electronic channel 6 is provided for accommodating electrical adaptor means for connecting the multiway valves with a - also not shown - central electronic control unit. The electronic channel 6 is disposed next to a first side surface 8 of each fluid manifold element 1a to 1f wherein at least one opening 9 is arranged on the neighbouring mounting surface 5 extending perpendicular to said side surface 8. Furthermore, each fluid manifold element 1a to 1f comprises two delivery ports 10a and 10b disposed on a second side surface 11 arranged opposite to the first side surface 8.

[0015] At one end of the fluid manifold arrangement a port unit 7 is provided for electrical and pneumatically connecting of the valve bank with the - not shown - central electronic control unit and a pneumatic source.

[0016] The electrical adaptor means comprise a printed circuit board 12. The printed circuit board 12 comprise projecting parts 13a and 13b which are arranged on both parallel middle edge section 14a and 14b of the printed circuit board 12.

[0017] According to the detailed view of Fig. 2 said projecting parts 13a and 13b correspond with a recess 15 arranged in a respective guiding rail 16 of the electronic channel 6 for axially fixing the printed circuit board 12. Such a recesses 15 are arranged on both flat sides of the fluid manifold element 1. Thus, the printed circuit board 12 is held along the pair of guiding rails 16 inside the electronic channel 6.

[0018] According to the embodiment of Fig. 3 one printed circuit board 12 extends through the electronic channels 6 of two neighbouring fluid manifold elements 1a and 1b in order to form a preassembled unit. The preassembled unit is provided by attaching both fluid manifold elements 1a and 1b with a separate screw 17 wherein the circuit board 12 is fixed in the guiding rails 16a and 16b of the electronic channel 6.

[0019] The printed circuit board 12 comprises a female connector 18 and a male connector 19 in order to connect further printed circuit boards of further preassembled units one to another and to the - not shown - central control unit. Therefore the printed circuit board 12 comprises several strip conductors for electrically connecting the female connector 18 with the male connector 19. Furthermore, the printed circuit board 12 comprises two valve connectors 20a and 20b extending to the corresponding mounting surfaces 5a and 5b of the fluid manifolds 1a and 1b respectively for electrically connecting solenoids of the - not shown - multiway valves which are attached to said mounting surface 5a and 5b.

Reference signs

[0020]

1	fluid manifold element
2	tie rod
3	supply channel
4	exhaust channel
5	mounting surface
6	electronic channel
7	port unit
8	first side surface
9	opening
10	delivery port
11	second side surface
12	circuit board
13	projecting part
14	edge section
15	recess
16	guiding rail
17	screw
18	female connector
19	male connector
20	valve connector

Claims

1. A pneumatic valve bank comprising several fluid manifold elements (1a to 1f) arranged to one another in order to form at least one common inner supply channel (3) and at least one common inner exhaust channel (4a, 4b) extending lengthwise through the fluid manifold elements (1a to 1f) for supplying and discharging air to/from respective multiway valves, which are attached on respective mounting surfaces (5) of the fluid manifold elements (1a to 1f), wherein each fluid manifold element (1a to 1f) comprises an electronic channel (6) parallel arranged to the at least one supply channel (3) and the at least one exhaust channel (4a, 4b) for accommodating electrical adaptor means for connecting each multiway valve with a central control unit,
characterized in that said electrical adaptor

means comprise at least one printed circuit board (12) held by a pair of guiding rails (16) inside the electronic channel (6), wherein at least one projecting part (13a; 13b) on the edge section (14a; 14b) of the printed circuit board (12) corresponds with at least one recess (15) arranged in the respective guiding rail (16) between neighbouring fluid manifold elements (1a, 1b; 1b, 1c; 1c, 1d; 1d, 1f) for axially fixing the printed circuit board (12) in the electronic channel (6).

2. A pneumatic valve bank according to Claim 1, **characterized in that** one projecting part (13a; 13b) is arranged on both parallel edge sections (14a and 14b) of the printed circuit board (12).

3. A pneumatic valve bank according to Claim 1 or 2, **characterized in that** the printed circuit board (12) comprises a female connector (18) and a male connector (19) in order to connect further printed circuit boards (12) one to another or to the central control unit.

4. A pneumatic valve bank according to Claim 3, **characterized in that** the printed circuit board (12) comprises several strip conductors for electrically connecting the female connector (18) with the male connector (19) in order to loop the electrical signals through the electronic channel (6).

5. A pneumatic valve bank according to Claim 1, **characterized in that** the printed circuit board (12) comprises at least one valve connector (20) extending to the mounting surface (5) of the fluid manifold (1) for electrically connecting at least one solenoid of the multiway valve which is attached to said mounting surface (5).

6. A pneumatic valve bank according to Claim 1, **characterized in that** the printed circuit board (12) comprises bus electronic means in order to decode bus signals transmitted from the central control unit directly inside the electronic channel (6).

7. A pneumatic valve bank according to Claim 1, **characterized in that** one printed circuit board (12) extends through the electronic channels (6) of at least two neighbouring fluid manifold elements (1a, 1b; 1b, 1c; 1c, 1d; 1d, 1f) in order to minimize the number of printed circuit boards (12) which are required for installing the electrical connection.

8. A pneumatic valve bank according to one of the preceding Claims, **characterized in that** a preassembled unit (Fig. 3) is provided by attaching at least two fluid manifold elements (1a, 1b) by at least one separate screw (17).

9. A pneumatic valve bank according to one of the preceding Claims, **characterized in that** the electronic channel (6) is arranged next to a first side surface (8) of the fluid manifold element (1) wherein at least one opening is disposed on the neighbouring mounting surface (5) extending perpendicular to said side surface (8).

10. A pneumatic valve bank according to one of the preceding Claims, **characterized in that** the fluid manifold element (1) comprises at least one delivery port (10a, 10b) disposed on a second side surface (11) arranged opposite to the first side surface (8).

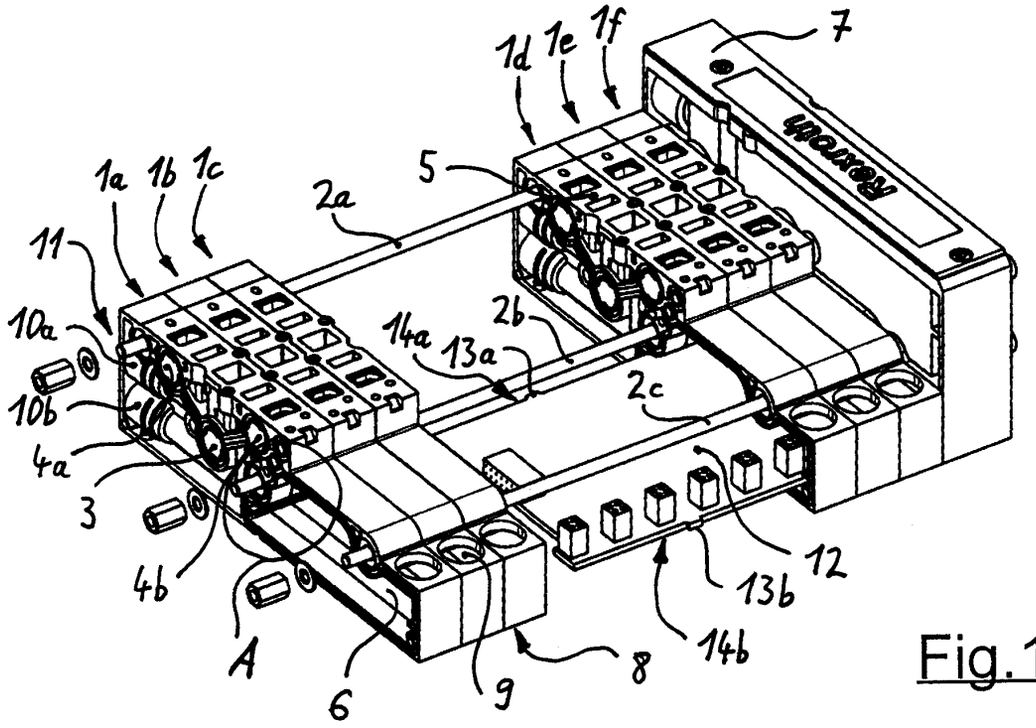
1a
1b
1c
1d
1e
1f
2a
2b
2c
3
4a
4b
5
6
7
8
9
10a
10b
11
12
13a
13b
14a
14b
A
Rexroth

Fig.1

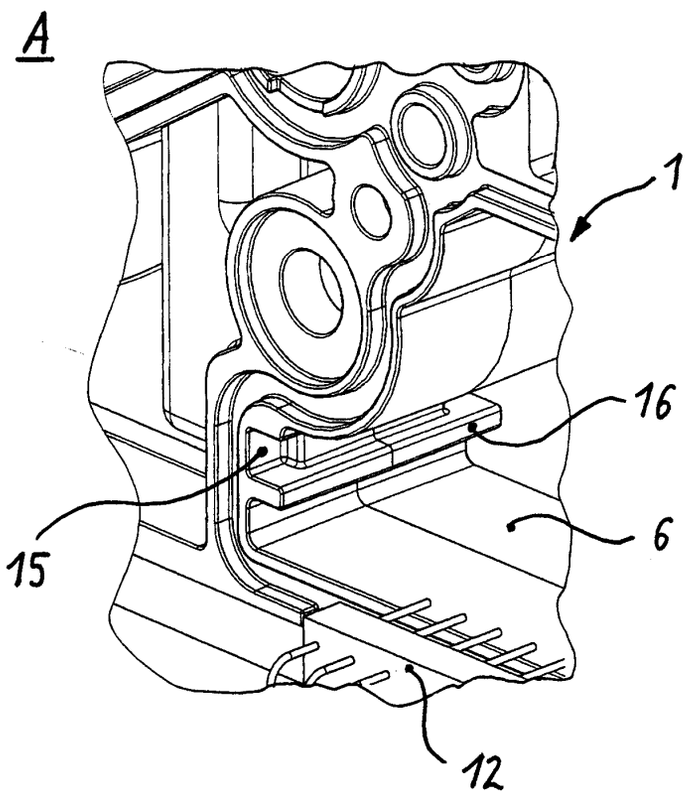
A
1
15
16
6
12

Fig.2

Fig.3