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(54) **Multiple subbase for air distribution to pneumatic valves**

Sammelanschlussplatte für Druckluftverteilung zu Ventilen

Système modulaire pour la distribution de l'air pour des soupapes pneumatiques

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(56) References cited:
EP-A- 0 389 777 **DE-A- 4 004 834**
DE-A- 4 232 628

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Description

The present invention relates to a multiple subbase, for the distribution of compressed air to a set of pneumatic valves according to the preamble of claim 1 and known from EP-A-0 389 777, which may be obtained by simple machining operations from an extruded section bar in aluminium or another material suitable for its construction and use. More particularly the invention is aimed at a multiple subbase which can be made from an extruded section bar both in the form of a single block and component elements, obtained by simple cutting operations from a same section bar.

Multiple subbases made both by casting and from an extruded section bar, in a single block or in modular sections which can be variously assembled one to the other, are generally known and commercially available.

In general, known subbases have a solid structure body in which tubular ducts are formed for supplying and discharging pressurised air respectively, as well as the necessary passages for connection to the individual electropneumatic valves which are assembled on each occasion on the subbase.

When traditional subbases are used in electropneumatic subsystems for supplying and distributing compressed air to equipments or to peripheral delivery points, there is the serious problem of noise from the exhausts of the various electropneumatic valves which cause a considerable noise pollution in the work place. The use of exhaust ducts with relatively small flow passage sections and the impossibility of adopting suitable noise reducing systems in traditional subbases, often accompany the risk of clogging of the ducts and malfunctioning of the subbase and of the pneumatic valves related thereto.

The main object of the present invention is therefore to provide a subbase for electropneumatic valves which is suitable for reducing the problems of noise pollution in traditional subbases.

A further object of the present invention is to provide a subbase of the kind mentioned above, which is economical to manufacture and relatively low in weight, as well as provided with large air exhaust ducts, without thereby increasing the overall dimensions of the subbase itself.

Yet a further object of the invention is to provide a multiple subbase as referred above, which can be made in one block or in modular component elements from a same extruded section bar.

The objects referred above can be achieved by means of a multiple subbase having the features of the claim 1.

An embodiment of a multiple subbase according to the invention and further features of the same, shall be made clear from the following description with reference to the accompanying drawings, in which:

Fig. 1 is a prospective view of a multiple subbase ac-

ording to the invention;

Fig. 2 is a side view of the multiple subbase of figure 1;

Fig. 3 is an enlarged sectional view along line 3-3 of figure 2, in which the position of some ducts has been slightly modified for a better representation;

Fig. 4 is a cross sectional view of a closure head, along line 4-4 of figure 2;

Fig. 5 is a cross sectional view along line 5-5 of figure 4;

Fig. 6 is a plan view of a seal which is disposed between contiguous modular elements of the subbase;

Fig. 7 is a cross sectional view of the seal along line 7-7 of figure 6;

Fig. 8 is a sectional view of the seal along line 8-8 of figure 6;

Fig. 9 is an enlarged detail which illustrates the arrangement of the seal of figure 6 between two contiguous modular elements of the manifold.

With reference for the time being to figures 1 to 4, we shall describe the general and innovative features of a multiple subbase according to the invention. The subbase, denoted as a whole by reference 10, comprises a hollow body 11 obtained from an extruded section bar which is cut to the appropriate dimensions. The body 11 of the subbase can be made either in the form of a single block or composed of a plurality of modular elements, as schematically indicated by the sectioning lines 12 in figures 1 and 2. The body 11 of the subbase is provided with an upper flat surface 11' on which electropneumatic valves 13 (Figure 2) are appropriately attached and which form part of a pneumatic system for the supply of compressed air from a single supply source (not shown) towards user points or equipment.

The subbase 10 comprises an air feeding central duct 14 longitudinally extending for the entire length of the subbase to form a sort of air distributor for the supply of compressed air to the various pneumatic valves 13, through respective supply ports or passages 15 which open towards the upper flat surface 11' of the subbase.

The subbase 10 also comprises at least one, and preferably two lateral exhaust ducts 16 and 17 which extend parallel to and on both sides of the central duct 14 for the entire length of the subbase. Each of said exhaust ducts 16 and 17, as clearly indicated by the sectional view of figure 3, has a cross sectional area which is comparatively larger than the cross sectional area of the compressed air supply duct 14 in order to reduce the problems of clogging at the same time lightening the structure of the subbase without jeopardising its solidity. This is achieved by means of an appropriate distribution of voids in the body of the subbase, not only to form large exhaust ducts, which in practice avoid the problems of clogging, but also to allow the adoption of appropriate noise reduction means at the exhaust ports for

the individual pneumatic valves, as explained further on.

Finally 18 and 19 in figure 3 denote separate exhaust ducts for the pilot valves which actuate the main pneumatic valves.

The various pneumatic valves are connected to the user points by means of respective branched of passages 20, 21 which on one side open onto the upper surface 11' of the subbase, while on the other side they lead to fittings 26, 27 which connect the user points, via ducts 24 and 25 obtained by means of suitable cartridges air-tightly fitted in the body 11 of the subbase. Moreover 34 and 35 denote the exhaust ports for the valves, which open onto the surface 11' for attachment of the valves 13, and towards the corresponding air exhaust ducts 16, 17 respectively.

The subbase 10 has at each end a closure head member 28 appropriately fastened by screws to the body 10 and provided with connectors 29, 30, 31, 32 and 33 for the various ducts for the supply and discharge of air in and from the subbase.

As shown in the section in figure 3, the air supply duct 14 and exhaust ducts 16, 17 are substantially defined by flat walls or portions of flat walls which allow optimum distribution of the void and of the solid parts, permitting a compact and solid, yet at the same time lightweight, structure of the subbase. More precisely, the central duct 14 for the supply of the compressed air has a cross section with a substantially rectangular shape, whose main axis develops orthogonally to the flat surface 11' for attachment of the pneumatic valves.

The central duct 14 for supplying pressurised air to the various pneumatic valves 13 must be calculated with a sufficient cross sectional area for guaranteeing the maximum flow rate of air required for the subbase, reducing refilling losses to a minimum. Nevertheless, unlike traditional subbases, the subbase according to the invention is provided with exhaust ducts 16, 17 which are large in size, having an area of their cross section which is considerably larger than that of the central duct 14 for supplying pressurised air. Indicatively, the two lateral exhaust ducts 16, 17 must have an area of their cross section which is equal to or greater than double the area of the cross section of the central duct 14 for supplying air. In the example illustrated the area of the lateral ducts is equal to approximately four times that of the central duct 14. The use of exhaust ducts with large dimensions, in combination with an extruded section bar, provides considerable advantages and improved features compared to subbases obtained by traditional technologies.

In fact, as referred at the beginning, traditional subbases are penalised by the loud noise generated by the valves during discharge, a noise which can only be dampened marginally or minimally. According to the present invention it has however been found that the noise is considerably reduced by applying filter means or appropriate noise-dampening means directly inside the air exhaust ducts, near or at the exhaust ports of the

valves as they form the greatest source of noise.

In this respect, according to the invention, each exhaust duct 16 and 17, on the side turned towards the plane 11' for attachment of the pneumatic valves, opens towards a noise dampening chamber 16' and 17' respectively for housing an air filtering member 36, 37 or another suitable noise dampening means, which extends parallel throughout the length of the duct itself. In this way each filtering member 36, 37 is positioned at the exhaust ports 34, 35 of the valves, that is to say at or near the zone of maximum noise generation. In this way direct communication between the air outlets of the various pneumatic valves and the exhaust ducts 16, 17 of the subbase is avoided.

Therefore, as shown in the section of figure 3, each exhaust duct 16, 17, in addition to being made with a large section for the passage of air flows, in its upper part, the one facing the plane 11' for assembly of the valves, has an additional chamber 16' and 17' respectively for inserting a substantially continuous filtering member, consisting for example of a set of side by side positioned small plates or a bar in a synthesised material which extends for the whole subbase.

The configuration and the arrangement of each filtering member 36, 37 may vary in relation to what is shown nevertheless, advantageously, each filtering member 36, 37 may be housed removably by providing in each duct 16, 17 appropriate support means for the filtering members, consisting for example of projections 38 and 39 which extend inside each channel, as shown. Optionally, one of the projections, for example projection 38, may be made with a C-shaped configuration during the extrusion of the section bar, to allow the passage of suitable tie rods in the case wherein the subbase is obtained by composing several modular units 12, as specified at the beginning. Therefore, in the case of an enbloc subbase, filters 36 and 37 will be used consisting substantially of bars of a length equal to that of the subbase itself, whereas in the case of subbases made with modular units, individual filters 36 and 37 have to be provided, having the same length as each module of the subbase.

Each subbase, be it constructed enbloc or in several component modules, is provided with end heads 28 for joining to external pipes. An embodiment of an end head 28 is shown in figures 4 and 5 of the accompanying drawings.

As shown by the section of figure 4, each head 28 is closed by a front wall in which the various connecting holes are formed, and has an external outline which is identical to that of the body of the subbase. Each head 28 also has, on the side intended to come into contact with the opposite end of the subbase, cavities 40, 41, 42, 43 and 44 which adapt substantially to the shape and dimensions of the air supply and exhaust ducts 14, 16, 17, 18 and 19 of the subbase. Each cavity of the head 28 also communicates with the connecting holes for the passage of air, denoted by 14a, 16a, 17a, 18a

and 19a respectively in figures 4 and 5.

In order to improve the features of quietness of the subbase and reduce further the noise generated by the exhausts of the valves, inside the cavities 40 and 41 relating to the two exhaust ducts 16 and 17 each head 28 is provided with a filtering element 40a (only one is shown) for a further dampening of noise. The filtering element 40a follows substantially the boundaries of the chamber 40, having a recess 40b at the position of the C-shaped projection 38 for the possible passage of tie rods inside the subbase. In this way two levels of noise dampening are obtained; moreover the entire subbase, complete with end heads, has a "clean" outer appearance and profile without external tie rods or projections of any type.

Referring now to figures 6 to 9, we will describe a further feature of the subbase according to the invention, particularly suitable in the case wherein the subbase is performed from the combination of two or more modular elements 12. In the case of a subbase having several component elements, a suitable seal has to be placed between one element and the next one in order to avoid air leakages in the ducts intended to carry pressurised air, such as the supply duct 14 and any ducts 18 and 19 for the pilot valves.

In order to ensure suitable sealing of the pressurised ducts, without having to construct seats for housing the seals, which would necessarily require machining operations and an increase in production costs, according to a further feature of the invention, use is made in combination with the components of the subbase of a special seal 45, shown in figure 6, which adapts to the internal and external outline of the extruded section from which the individual modules 21 of the subbase were taken. The seal is therefore provided with openings 114, 116, 117, 118 and 119 at the location of the various ducts of the subbase. In order to ensure ideal airtightness, and to make the internal pressure of the fluid contribute to improving the airtightness, the seal 45 at the edges of the holes 114, 118 and 119, intended to carry pressurised fluid, is provided with enlarged annular lips 46 bordered by plane and slanting lateral walls, which diverge and slightly protrude inwards in the duct. The lip 46 also extends between the adjacent bodies 12a and 12b of two adjoining modular elements of the subbase with an annular band 47 of increased thickness compared to the thickness of the seal 45. In this way, when the various modular elements of the subbase are brought together and clamped closely one to the other by means of suitable internal tie rods, the annular lip 46 and the annular band 47 will be strongly compressed, thus ensuring efficient airtightness. This will also be aided by the squashing of the projecting part of the lip 46 against the inside walls of the duct 14 by the same pressurised air which flows into the ducts of the subbase. Finally, in order to ensure perfect centring of the seal in relation to the adjacent subbase modules, as shown in figure 6 and in the detail of figure 8, at the two openings 116, 117

relating to the air exhaust ducts, the seal 45 may be provided with cross-fins 48 projecting on one or both sides along specific portions of the edges of the openings 116 and 177 referred to previously.

From what has been said and shown, it is therefore clear that a multiple subbase has been provided for the distribution of compressed air to systems of pneumatic valves, suitable for construction both in a single block and with component elements, which is characterised by the presence of suitable means for abating noise, by a new design and its extreme simplicity and economical construction, in addition to a high degree of reliability.

In the case shown reference has been made to a subbase with a specific design, provided with two air exhaust ducts. However it is clear that the design and the configuration of the extruded profile may also vary in relation to what is shown. Furthermore, other modifications and variants may be made; for example the joints 26 and 27 for connection to user points, instead of being formed on only one side of the subbase or of the component elements whereof a subbase is composed, may be formed on both sides, in positions which are aligned or which alternate one with the other, according to specific needs.

The intent therefore is that what has been said and shown, that is to say what has been referred previously with reference to the accompanying drawings, has been given purely by way of example and does not limit the invention.

Claims

1. A multiple subbase for the compressed air distribution to pneumatic valves, the subbase comprising a hollow body (11) having an upper surface (11') for the attachment of valves (13);
an air supply duct (14) and at least one exhaust duct (16, 17), which extend longitudinally to the body (11) of the subbase, as well as branched-off passages which open via corresponding supply and exhaust ports (15, 34, 35; 24, 25) onto the upper surface (11') of the subbase for the connections of the individual pneumatic valves (13) to the supply (14) and the exhaust ducts (16, 17), and for connection to the user points respectively,
characterised in that said subbase comprises an extruded section body (11) provided with at least air one exhaust duct (16, 17) having a wide flow section area, larger than the flow section area of the air supply duct (14), and in that said exhaust duct (16, 17), at the exhaust port side of the valves (13), comprises noise dampening air filter means (36, 37).
2. A subbase according to claim 1, characterised in that said air filter means (36, 37) for noise dampening are arranged in a noise dampening chamber (16', 17') parallel to and opening towards said ex-

haust duct (16, 17) of the subbase.

3. A subbase according to the previous claims, characterised in that between said exhaust duct (16, 17) and the noise dampening chamber (16', 17') internal projections (38, 39) are provided to define a seat means for supporting said air filtering means (36, 37). 5
4. A subbase according to the previous claim, characterised in that at least one (38) of said projections is C-shaped for the passage of internal assembly tie rods. 10
5. A subbase according to claim 1, characterised in that said air supply (14) and exhaust ducts (16, 17) are provided with flat walls along a substantial part of their outline. 15
6. A subbase according to claim 1 or 5, characterised in that the cross-sectional area of the exhaust ducts (16, 17) is at least double that of the cross-sectional area of the air supply duct (14). 20
7. A subbase according to claim 1, wherein the subbase comprises end closure heads (28) provided with connectors (14a, 16a, 17a) for connecting the ducts (14, 16, 17) of the subbase to external pipes, characterised in that said end closure head of the subbase, at each air exhaust connector (16a, 17a), comprises a supplementary air filtering means (40a) for noise dampening. 25 30
8. A subbase according to claim 1, characterised by comprising a single block extruded section body (11). 35
9. A subbase according to claim 1, characterised in that said body comprises a plurality of modular single extruded section elements (12), tightly fitted side by side. 40
10. A subbase according to claim 9, wherein a seal member (45) is provided between adjacent modular elements (12) of the subbase, characterised in that said seal member (45), at each position of the duct for the pressurised air (14, 16, 17), comprises an opening (114, 116, 117) provided with an enlarged annular lip (46) partially projecting inside the duct (14, 16, 17). 45 50
11. A subbase according to claim 10, characterised in that said annular lip (46) is provided with diverging flat walls. 55
12. A subbase according to claim 11, characterised in that said annular lip (44) extends with an annular band portion (47) having a thickness greater than

that of the remaining portion of the seal (45).

Patentansprüche

1. Mehrfachgrundplatte für die Verteilung komprimierter Luft an pneumatische Ventile, wobei die Grundplatte versehen ist mit einem Hohlkörper (11) mit einer oberen Fläche (11') zur Befestigung von Ventilen (13);
einer Luftzufuhrleitung (14) und wenigstens einer Entleerungsleitung (16, 17) die sich im Körper (11) der Grundplatte longitudinal erstrecken, sowie abgezwigte Kanäle, die über entsprechende Zufuhr- und Entleerungsanschlüsse (15, 34, 35; 24, 25) in die obere Fläche (11') der Grundplatte münden, um die einzelnen pneumatischen Ventile (13) mit der Zufuhrleitung (14) bzw. mit den Entleerungsleitungen (16, 17) bzw. mit Benutzerpunkten zu verbinden,
dadurch gekennzeichnet, daß die Grundplatte einen Strangpreßabschnittskörper (11) enthält, der mit wenigstens einer Entleerungsleitung (16, 17) mit weiter Strömungsquerschnittsfläche, die größer als die Strömungsquerschnittsfläche der Luftzufuhrleitung (14) ist, versehen ist, und daß die Entleerungsleitung (16, 17) auf der Entleerungsanschlußseite der Ventile (13) eine Geräuschkämpfungsluftfiltereinrichtung (36, 37) enthält.
2. Grundplatte nach Anspruch 1, dadurch gekennzeichnet, daß die Luftfiltereinrichtungen (36, 37) zur Geräuschkämpfung in einer Geräuschkämpfungskammer (16', 17') in der Weise angeordnet sind, daß sie zur Entleerungsleitung (16, 17) der Grundplatte parallel sind und in diese münden.
3. Grundplatte nach den vorangehenden Ansprüchen, dadurch gekennzeichnet, daß zwischen der Entleerungsleitung (16, 17) und der Geräuschkämpfungskammer (16', 17') interne Vorsprünge (38, 39) vorgesehen sind, die eine Sitzeinrichtung zum Halten der Luftfiltereinrichtung (36, 37) definieren.
4. Grundplatte nach dem vorangehenden Anspruch, dadurch gekennzeichnet, daß wenigstens einer (38) der Vorsprünge C-förmig ist, um den Durchgang interner Montageverbindungsstangen zu ermöglichen.
5. Grundplatte nach Anspruch 1, dadurch gekennzeichnet, daß die Luftzufuhrleitung (14) und die Entleerungsleitungen (16, 17) längs eines wesentlichen Teils ihres Umrisses mit flachen Wänden versehen sind.
6. Grundplatte nach Anspruch 1 oder 5, dadurch gekennzeichnet, daß die Querschnittsfläche der Ent-

leerungsleitungen (16, 17) wenigstens doppelt so groß wie die Querschnittsfläche der Luftzufuhrleitung (14) ist.

7. Grundplatte nach Anspruch 1, wobei die Grundplatte Endverschlußköpfe (28) enthält, die mit Verbindern (14a, 16a, 17a) zur Verbindung der Leitungen (14, 16, 17) der Grundplatte mit äußeren Rohren versehen sind, dadurch gekennzeichnet, daß der Endverschlußkopf der Grundplatte bei jedem Luftentleerungsverbinder (16a, 17a) eine zusätzliche Luftfiltereinrichtung (40a) zur Geräuschkämpfung enthält. 5
8. Grundplatte nach Anspruch 1, gekennzeichnet durch einen einzelnen Block eines Strangpreßabschnittskörpers (11). 10
9. Grundplatte nach Anspruch 1, dadurch gekennzeichnet, daß der Körper mehrere modulare einzelne Strangpreßabschnittelemente (12) enthält, die eng nebeneinander angeordnet sind. 15
10. Grundplatte nach Anspruch 9, wobei zwischen benachbarten modularen Elementen (12) der Grundplatte ein Dichtungselement (45) vorgesehen ist, dadurch gekennzeichnet, daß das Dichtungselement (45) an jeder Position der Druckluftleitung (14, 16, 17) eine Öffnung (114, 116, 117) aufweist, die mit einer vergrößerten ringförmigen Lippe (46) versehen ist, die teilweise in die Leitung (14, 16, 17) vorsteht. 20
11. Grundplatte nach Anspruch 10, dadurch gekennzeichnet, daß die ringförmige Lippe (46) mit auseinanderlaufenden flachen Wänden versehen ist. 25
12. Grundplatte nach Anspruch 11, dadurch gekennzeichnet, daß die ringförmige Lippe (46) durch einen ringförmigen Bandabschnitt (47) verlängert ist, dessen Dicke größer als diejenige des übrigen Abschnitts der Dichtung (45) ist. 30

Revendications

1. Embase multiple servant à la distribution d'air comprimé à des vannes pneumatiques, ladite embase comprenant un corps creux (11) avec une surface supérieure (11') destinée à la fixation de vannes (13), un conduit (14) d'admission d'air et au moins un conduit d'échappement (16, 17), qui s'étendent longitudinalement par rapport au corps (11) de l'embase, ainsi que des passages dérivés qui s'ouvrent, par des orifices correspondants (15, 34, 35 ; 24, 25) d'admission et d'échappement, sur la surface supérieure (11') de l'embase en vue du raccordement des vannes pneumatiques individuelles (13) aux 45

conduits d'admission (14) et d'échappement (16, 17) et en vue du raccordement avec des points d'utilisation respectifs, caractérisée en ce que ladite embase comprend un corps profilé extrudé (11), comportant au moins un conduit (16, 17) d'échappement d'air qui a une grande section d'écoulement, supérieure à la section d'écoulement du conduit (14) d'admission d'air, et en ce que ledit conduit d'échappement (16, 17) comprend, du côté des orifices d'échappement des dites vannes (13), des moyens (36, 37) formant filtre à air qui amortissent le bruit.

2. Embase selon la revendication 1, caractérisée en ce que lesdits moyens (36, 37) formant filtre à air destinés à amortir le bruit sont placés dans une chambre (16', 17') d'amortissement du bruit qui est parallèle audit conduit d'échappement (16, 17) de l'embase et qui s'ouvre vers ce dernier. 30
3. Embase selon les précédentes revendications, caractérisée en ce que, entre ledit conduit d'échappement (16, 17) et la chambre (16', 17') d'amortissement du bruit, sont formées des protubérances internes (38, 39) qui définissent un moyen d'appui destiné à supporter lesdits moyens (36, 37) formant filtre à air. 35
4. Embase selon les précédentes revendications, caractérisée en ce que l'une au moins (38) desdites protubérances a la forme d'un C pour permettre le passage de tirants intérieurs d'assemblage. 40
5. Embase selon la revendication 1, caractérisée en ce que ledit conduit (14) d'admission d'air et lesdits conduits d'échappement (16, 17) ont des parois plates sur une partie importante de leur contour. 45
6. Embase selon la revendication 1 ou 5, caractérisée en ce que la section des conduits d'échappement (16, 17) est au moins le double de celle du conduit (14) d'admission d'air. 50
7. Embase selon la revendication 1, dans laquelle l'embase comprend des capots (28) de fermeture d'extrémité dotés de connecteurs (14a, 16a, 17a) servant à raccorder les conduits (14, 16, 17) de l'embase à des tuyaux extérieurs, caractérisée en ce que ledit capot de fermeture d'extrémité de l'embase comprend, au niveau de chaque connecteur (16a, 17a) d'échappement d'air, un moyen supplémentaire (40a) de filtrage d'air pour amortir le bruit. 55
8. Embase selon la revendication 1, caractérisée en ce qu'elle comprend un unique corps profilé extrudé (11), monobloc.
9. Embase selon la revendication 1, caractérisée en ce

que ledit corps comprend une pluralité d'éléments profilés extrudés(12), modulaires, étroitement fixés côte à côte.

10. Embase selon la revendication 9, dans laquelle un élément d'étanchéité (45) est placé entre les éléments modulaires (12) adjacents de l'embase, caractérisée en ce que ledit élément d'étanchéité (45) comprend, en chaque position de conduit d'air sous pression (14, 16, 17), une ouverture (114, 116, 117) dotée d'une lèvre annulaire (46) élargie qui dépasse partiellement à l'intérieur du conduit (14, 16, 17).
11. Embase selon la revendication 10, caractérisé en ce que ladite lèvre annulaire (46) a des parois plates divergentes.
12. Embase selon la revendication 11, caractérisé en ce que ladite lèvre annulaire (46) se prolonge par une partie formant bande annulaire (47) qui a une épaisseur plus importante que la partie restante du joint (45).

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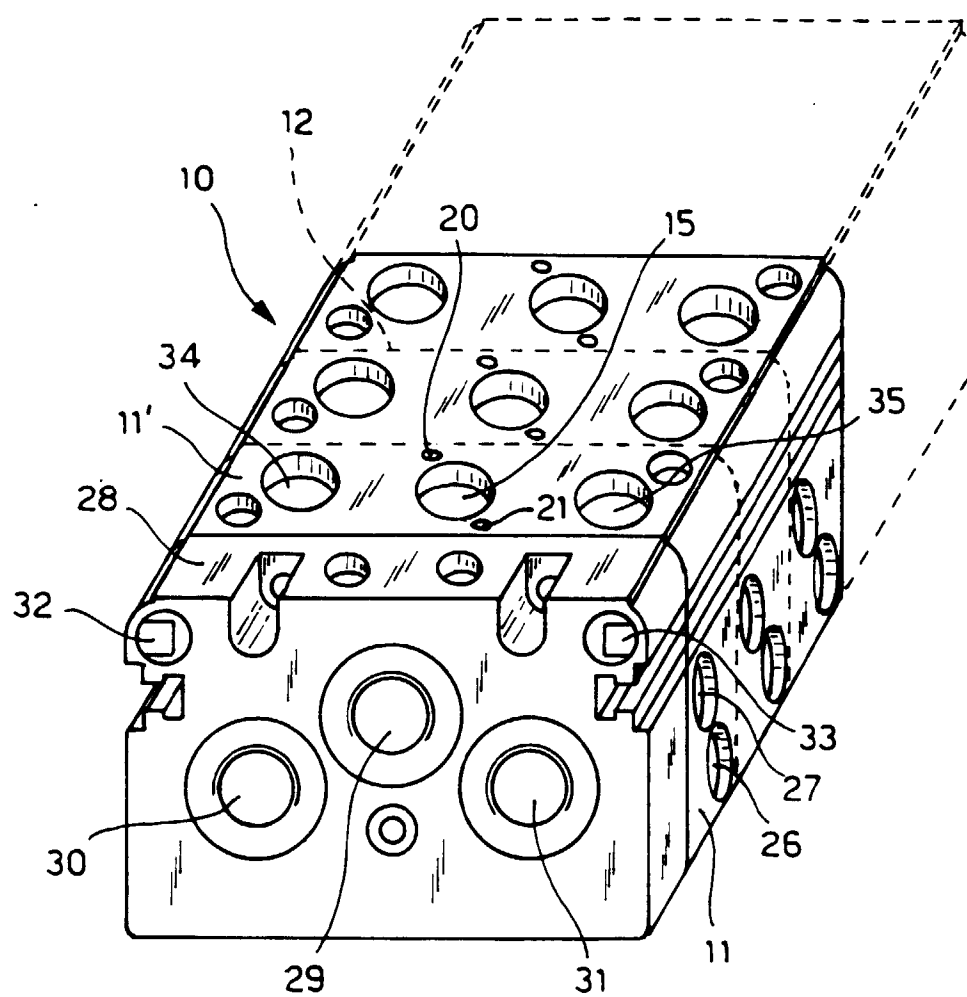


FIG. 1

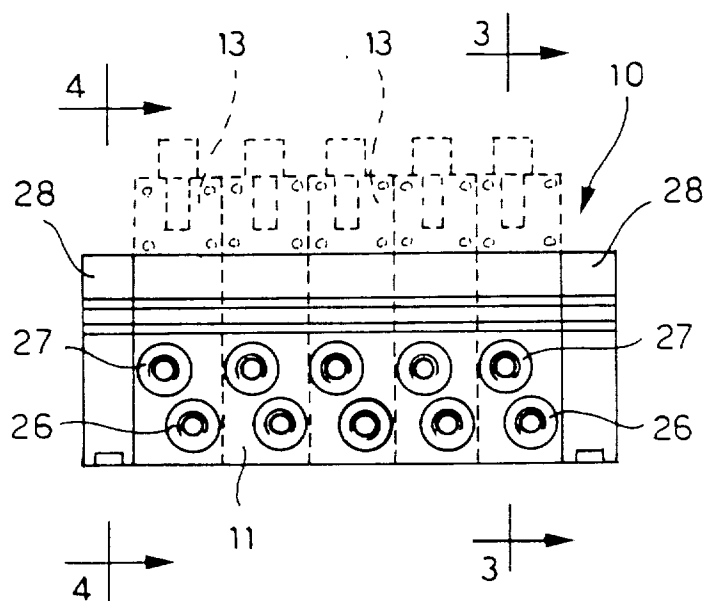


FIG. 2

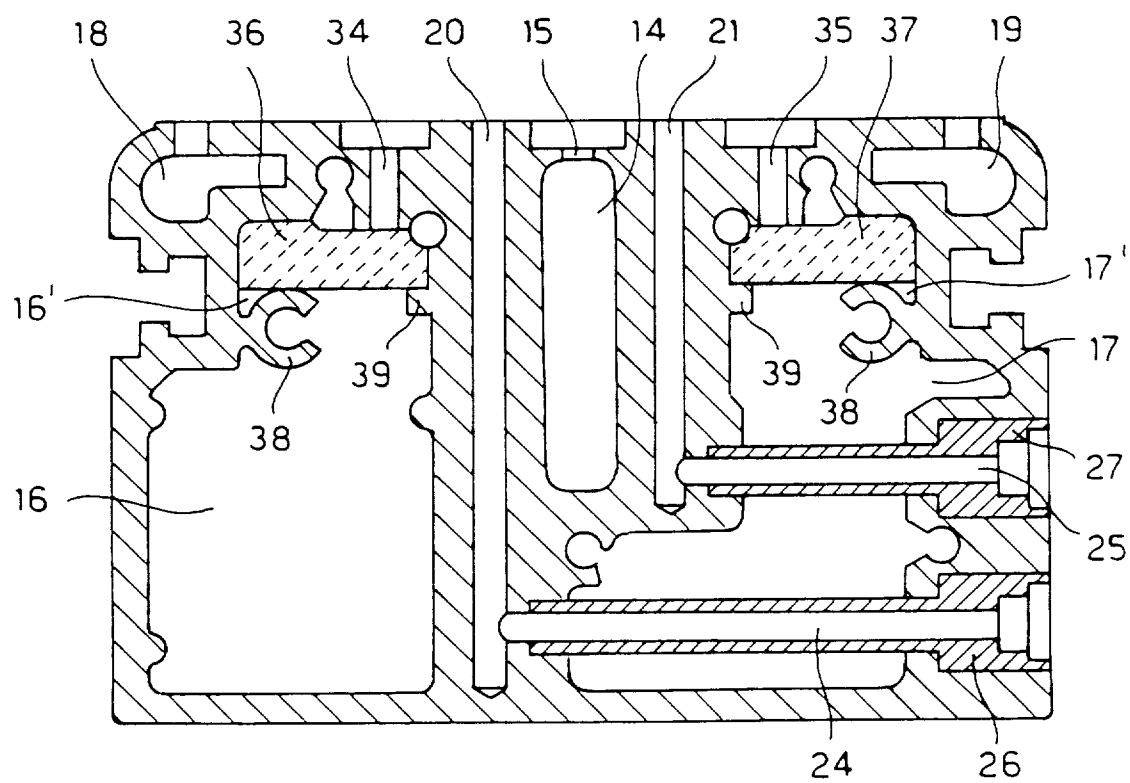
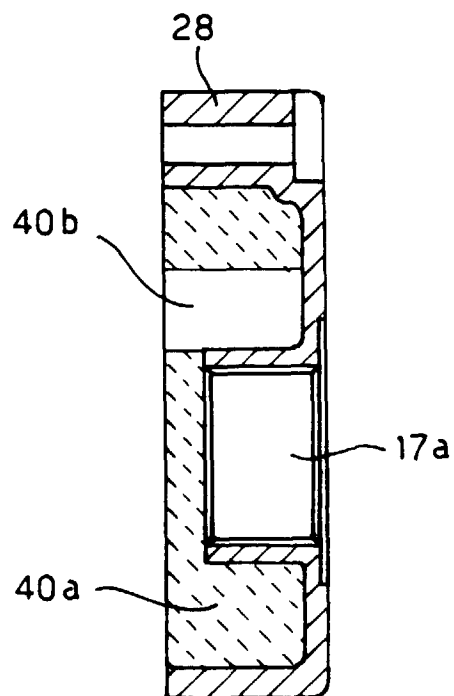
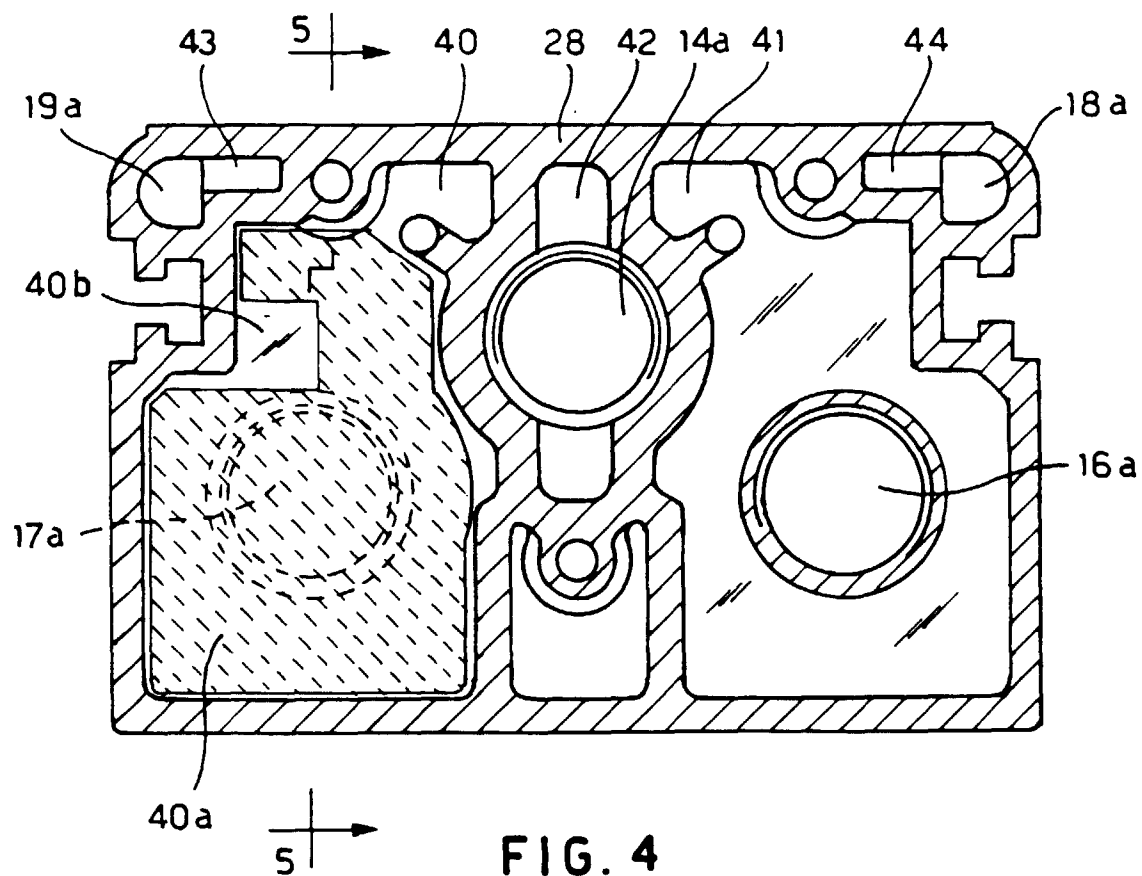


FIG. 3



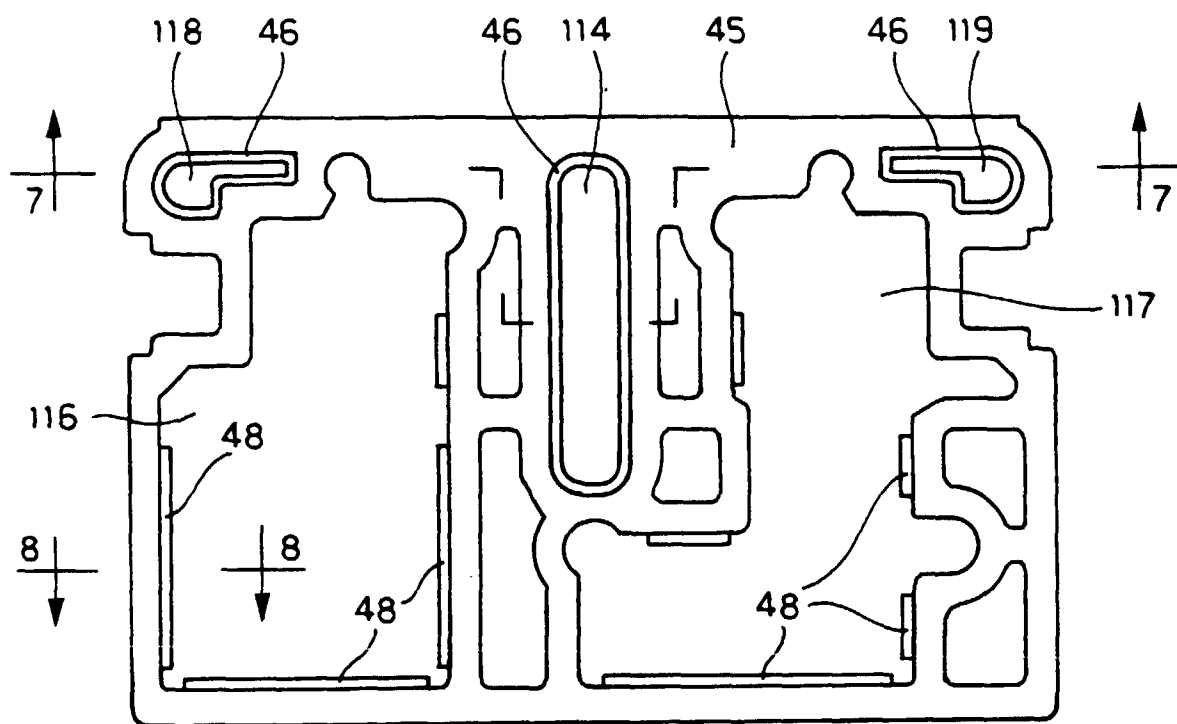


FIG. 6

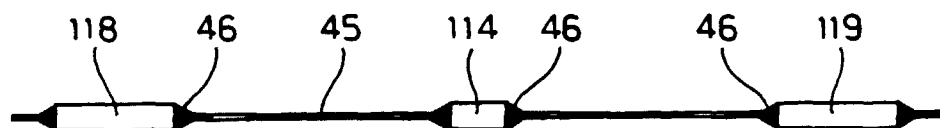


FIG. 7

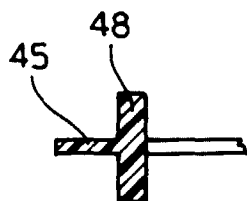


FIG. 8

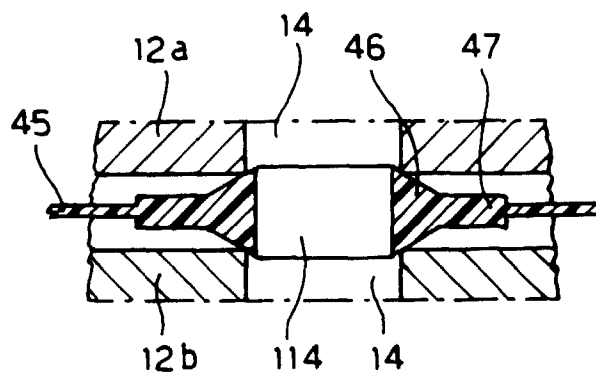


FIG. 9