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(54) **A COMPRESSOR**

VERDICHTER

COMPRESSEUR

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Description

[0001] This invention relates to a compressor wherein a suction muffler minimizes the noise generated during the refrigeration cycle by the refrigerant.

[0002] In refrigerators, cooling is achieved by circulating a refrigerant in a cycle that generally consists of a condenser, which transfers the heat out, a pressure reducer used to regulate the pressure, an evaporator absorbing the heat and a compressor. In the compressors used in the afore-mentioned cycle, suction mufflers are utilized whereby the refrigerant used to achieve the cooling reaches to the cylinder block without being heated and the noise that might be generated by the refrigerant is prevented. The suction muffler is generally manufactured from plastic material and located either on the cylinder head or between the cylinder head and the valve plate. The refrigerant- sucked, reaches-a cylinder block-by- passing- through a muffler wherein its portion forming the suction manifold is placed inside the cylinder head. In the meantime it is necessary to minimize the noise at different frequencies generated.

[0003] In the current state of the art, in the United States Patent Documents US5101931 or EP 0 027 311 A, a description is given of a muffler minimizing the noise wherein its two chambers are connected by a tube.

[0004] In the current state of the art, in the United States Patent Document US5341654, a description is given of a muffler minimizing the noise at different frequencies by means of its two chambers, which have inlets with different diameters.

[0005] The aim of the present invention is the realization of a compressor comprising a suction muffler whereby the noise that is generated by the refrigerant is minimized.

[0006] The compressor designed to fulfill the objectives of the present invention is illustrated on the attached figures where:

Fig. 1 - is a cross-sectional view of a compressor.

Fig.2 - is a perspective view of a suction muffler.

Fig.3 - is a schematic representation of a suction muffler comprising an attenuation conduit and three muffler chambers.

Fig.4 - is a schematic representation of a suction muffler comprising an attenuation conduit and two muffler chambers.

Fig.5 - is a schematic representation of a suction muffler comprising three attenuation conduits and three muffler chambers.

Fig.6 - is a schematic representation of a suction muffler with several guides at the inlet and outlet openings and comprising three attenuation conduits and two muffler chambers.

Fig.7 - is a schematic representation of a suction muffler comprising two attenuation conduits which connect different chambers to each other and, four muffler chambers.

[0007] Elements shown on figures are numbered as follows:

- | | | |
|----|-----|------------------------------------|
| | 1- | Compressor |
| 5 | 2- | Cylinder |
| | 3- | Cylinder head |
| | 4- | Suction muffler |
| | 5- | Valve plate |
| | 6- | Muffler outlet opening |
| 10 | 7- | Aperture |
| | 8- | Muffler head |
| | 9- | Suction opening |
| | 10- | Flow pipe |
| | 11- | Guiding member |
| 15 | 12- | Muffler chamber |
| | 13- | Attenuation conduit |
| | 14- | Flow pipe inlet opening |
| | 15- | Flow pipe outlet opening |
| | 16- | Attenuation conduit inlet opening |
| 20 | 17- | Attenuation conduit outlet opening |

[0008] In household appliances, preferably in cooling devices, the circulation of the refrigerant used to realize the cooling, is achieved by means of a compressor (1).

25 **[0009]** The compressor (1) comprises a cylinder (2) which provides the pumping of the refrigerant in it, a cylinder head (3) located on the cylinder (2), through which the refrigerant that is sucked and discharged is circulated, a valve plate (5) on which the cylinder head (3) is placed, a suction muffler (4) preferably made of plastic material, which ensures that the refrigerant with reduced acoustical energy circulated inside it reaches the cylinder block without being heated and that the noise which might be generated by the refrigerant is prevented.

30 **[0010]** The suction muffler (4) comprises a muffler head (8) whereby the muffler (4) is attached to the cylinder head (3), a muffler outlet opening (6) located above the muffler head (8) and providing the refrigerant to pass to the cylinder (2), at least two muffler chambers (12) having different volumetric resonance frequencies to achieve acoustic attenuation at different frequencies, wherein acoustical energy is reduced, a suction opening (9) permitting the refrigerant to enter through, a flow pipe (10) preferably with quadrangular cross-section, placed across the suction opening (9) and the muffler outlet opening (6) and, the ends of which open to different muffler chambers (12), an aperture (7) on the flow pipe (10), at least one attenuation conduit (13) preferably with circular cross-section, wherein its portions in the muffler chambers which its inlet and outlet openings communicate with, have different cross-sectional areas and whereby the connection between the muffler chambers (12) is accomplished and acoustical energy is bypassed.

35 **[0011]** The flow pipe (10) comprises a flow pipe inlet opening (14) located across the suction opening (9) and a flow pipe outlet opening (15) located across the muffler outlet opening (6).

[0012] The attenuation conduit (13), which communi-

cates the muffler chambers (12) by connecting them, comprises an attenuation conduit inlet opening (16), which, extending to one of the muffler chambers (12), which is closer to the suction outlet opening (6) and, attenuating the sound waves at undesired frequencies by the cross-sectional area (A5) thereof and; an attenuation conduit outlet opening (17) with a different cross-sectional area (A6) than that of the attenuation conduit inlet opening (16).

[0013] The cross-sectional area which the flow passes through, continuously increases downstream, from the suction opening (9) on the suction muffler (4) to the suction outlet opening (6), in order to minimize the factors which would retard the flow of the refrigerant and would reduce thermodynamic efficiency of the suction muffler (4) by causing pressure losses. Thereby, it is minimized that the uniform flow is disturbed due to the reductions in the cross-section, to the boundary layer conditions or, while passing by inclined or bent regions. For this reason, cross-sectional area (A1) of the suction opening (9) outside the muffler chamber (12), is smaller than that (A2) of the flow pipe inlet opening (14), and cross-sectional area (A3) of the flow pipe outlet opening (15) is smaller than that (A4) of the muffler outlet opening (6) inside the muffler chamber (12).

[0014] In another application of the present invention, the suction muffler (4) comprises a muffler chamber (12) communicating with the suction opening (9), a second muffler chamber (12) with a different volumetric resonance frequency communicating with the muffler outlet opening (6), a third muffler chamber (12) with a different volumetric resonance frequency located between the two other muffler chambers (12) and an attenuation conduit (13) communicating with the third and second muffler chambers (12) (Fig. 3).

[0015] In another application of the present invention, the suction muffler (4) comprises a muffler chamber (12) communicating with the suction opening (9), a second muffler chamber (12) with a different volumetric resonance frequency communicating with the muffler outlet opening (6) and, an attenuation conduit (13) communicating with the first and second muffler chambers (12) (Fig. 4).

[0016] In one application of the present invention, the suction muffler (4) comprises a first muffler chamber (12) communicating with the suction opening (9), a second muffler chamber (12) with a different volumetric resonance frequency communicating with the muffler outlet opening (6), a third muffler chamber (12) with a different volumetric resonance frequency than that of the two other muffler chambers (12) and which is located between the first and the second muffler chambers (12) and, three attenuation conduits (13) which communicate with the third and second muffler chambers (12) and having different cross-sectional areas thereby minimizing the noise at different frequencies (Fig. 5).

[0017] In another application of the present invention; the suction-muffler (4) comprises one or more guiding

members (11) extending from the suction opening (9) to the first muffler chamber (12) whereby the refrigerant sucked is routed to the flow pipe (10) and the refrigerant in the flow pipe (10) is routed to the muffler outlet opening (6) (Fig. 6).

[0018] In another application of the present invention, the suction muffler (4) comprises a first muffler chamber (12) communicating with the suction opening (9), a second muffler chamber (12) with a different volumetric resonance frequency communicating with the muffler outlet opening (6), a third and fourth muffler chambers (12) with different volumetric resonance frequencies and which are located between the first and the second muffler chambers (12), an attenuation conduit (13) communicating with the third and second muffler chambers (12), and another attenuation conduit (13) communicating with the second and fourth muffler chambers (12) and having different cross-sectional areas than that of the other one thereby minimizing the noise at different frequencies (Fig. 7).

[0019] By means of the application in accordance with the present invention, during the circulation of the refrigerant it is achieved to minimize the noise generated by increasing the performance of the compressor (1).

Claims

1. A compressor (1) comprising a suction muffler (4) whereby the refrigerant reaches to a cylinder block without being heated and the noise that might be generated by the refrigerant is prevented, and including a muffler head (8), whereby the muffler (4) is attached to a cylinder head (3), a muffler outlet opening (6) located above the muffler head (8) and providing the refrigerant to pass to a cylinder (2), at least two muffler chambers (12) having different volumetric resonance frequencies to achieve acoustic attenuation at different frequencies, wherein acoustical energy is reduced, and a suction opening (9) for permitting the refrigerant to enter there through, and **characterized by** a suction muffler (4) comprising a flow pipe (10) placed across the suction opening (9) and the muffler outlet opening (6) and the ends of which open to different muffler chambers (12), an attenuation conduit (13) between the muffler chambers (12) used to bypass the acoustical energy and to minimize the noise at desired frequencies wherein the inlet (16) and outlet (17) openings of said attenuation conduit (13) which communicate with said muffler chambers, have different cross-sectional areas.
2. A compressor (1) as described in Claim 1, **characterized by** a suction muffler (4), which communicates the muffler chambers (12) by connecting them, comprising an attenuation conduit (13) with an attenuation conduit inlet opening (16) which, extending

to one of the muffler chambers (12), which is closer to the suction outlet opening (6) and, attenuating the sound waves at undesired frequencies by the cross-sectional area (A5) thereof and; an attenuation conduit outlet opening (17) with a different cross-sectional area (A6) than that of the attenuation conduit inlet opening (16).

3. A compressor (1) as described in any of the above Claims, **characterized by** a suction muffler (4) comprising an aperture (7) on the flow pipe (10).
4. A compressor (1) as described in any of the above Claims, **characterized by** a suction muffler (4) comprising a flow pipe (10) with a flow pipe inlet opening (14) located across the suction opening (9) and a flow pipe outlet opening (15) located across the muffler outlet opening (6).
5. A compressor (1) as described in any of the above Claims, **characterized by** a suction muffler (4) comprising one or more guiding members (11) extending from the suction opening (9) to the first muffler chamber (12) whereby the refrigerant sucked is routed to the flow pipe (10) and the refrigerant in the flow pipe (10) is routed to the muffler outlet opening (6).

Patentansprüche

1. Kompressor (1), umfassend einen Ansaugdämpfer (4), wodurch Kühlmittel einen Zylinderblock erreicht, ohne erwärmt zu werden, und ein Geräusch, das durch das Kühlmittel erzeugt werden könnte, unterdrückt wird, aufweisend einen Dämpferkopf (8), wodurch der Dämpfer (4) an einem Zylinderkopf (3) befestigt ist, eine Dämpferauslassöffnung (6) oberhalb des Dämpferkopfes (8), die vorsieht, dass das Kühlmittel zu einem Zylinder (2) gelangt, wenigstens zwei Dämpfungskammern (12) mit unterschiedlicher volumetrischer Resonanzfrequenz, um eine akustische Abschwächung bei unterschiedlichen Frequenzen zu erreichen, wobei akustische Energie reduziert wird, und eine Ansaugöffnung (9), um zuzulassen, dass das Kühlmittel dadurch hindurchtritt, **dadurch gekennzeichnet, dass** der Ansaugdämpfer (4) eine Durchlaufleitung (10) umfasst, die an der Ansaugöffnung (9) und der Dämpferauslassöffnung (6) angeordnet ist, und deren Enden sich jeweils zu unterschiedlichen Dämpfungskammern (12) hin öffnen, und einen Abschwächungskanal (13) zwischen den Dämpfungskammern (12), der dazu dient, die akustische Energie umzuleiten und das Geräusch auf gewünschte Frequenzen zu reduzieren, wobei eine Einlassöffnung (16) und eine Auslassöffnung (17) des Abschwächungskanals (13) mit den Dämpferkammern in Verbindung stehen und unterschiedliche Querschnitte aufweisen.

2. Kompressor (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ansaugdämpfer (4), der mit den Dämpfungskammern (12) in Verbindung steht, indem er eine Verbindung zwischen diesen herstellt, den Abschwächungskanal (13) mit der Einlassöffnung (16) umfasst, die sich zu einer der Dämpfungskammern (12) erstreckt, die näher an der Dämpferauslassöffnung (6) angeordnet ist, und durch ihren Querschnitt (A5) die Schallwellen unerwünschter Frequenz abschwächt, und mit der Auslassöffnung (17), die einen anderen Querschnitt (A6) als die Einlassöffnung (16) aufweist.
3. Kompressor (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Ansaugdämpfer (4) eine Öffnung (7) an der Durchlaufleitung (10) umfasst.
4. Kompressor (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Ansaugdämpfer (4) die Durchlaufleitung (10) mit einer Durchlaufleitungseinlassöffnung (14) umfasst, die an der Ansaugöffnung (9) angeordnet ist, und mit einer Durchlaufleitungsauslassöffnung (15), die an der Dämpferauslassöffnung (6) angeordnet ist.
5. Kompressor (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Ansaugdämpfer (4) ein oder mehrere Führungselemente (11) umfasst, die sich von der Ansaugöffnung (9) zu der ersten Dämpfungskammer (12) erstrecken, wodurch das angesaugte Kühlmittel durch die Durchlaufleitung (10) geleitet wird, und das Kühlmittel in der Durchlaufleitung (10) zu der Dämpferauslassöffnung (6) geleitet wird.

Revendications

1. Compresseur (1) comprenant un aspirateur coupe bruit (4) par lequel le réfrigérant arrive à un block de cylindre qui n'a pas été chauffé et le bruit qui pourrait être produit par le réfrigérant est empêché, et incluant une tête coupe bruit (8) par lequel l'aspirateur coupe bruit (4) est lié à la tête du cylindre (3), une ouverture de sortie de coupe bruit (6) placée au-dessus de la tête coupe bruit (8) et assurant le passage du réfrigérant au cylindre (2), au moins deux chambres coupe bruit (12) ayant différentes fréquences de résonance volumétrique pour assurer l'atténuation acoustique sur différentes fréquences, dans lesquelles l'énergie acoustique est réduite, et une ouverture d'aspirateur (9) pour permettre au réfrigérant d'y entrer, et **caractérisé par** un aspirateur coupe bruit (4) comprenant une ligne de flux (10) placée entre l'ouverture d'aspirateur (9) et l'ouverture de sortie de coupe bruit (6), et qui se donne au bout de ces ouvertures sur de différentes chambres coupe

bruit (12), un conduit d'atténuation (13) entre les chambres coupe bruit (12) utilisées pour réduire l'énergie acoustique et pour minimiser le bruit aux fréquences désirées, dans lesquelles les ouvertures d'entrée (16) et de sortie (17) dudit conduit d'atténuation (13) communiquant avec lesdites chambres coupe bruit ont différents espaces d'échantillon. 5

2. Compresseur (1) selon la revendication 1, **caracté-**
risé par un aspirateur coupe bruit (4) qui a une com- 10
munication avec les chambres coupe bruit (12) en
liant celles-ci entre elles, comprenant un conduit
d'atténuation (13) avec une ouverture d'entrée (16)
qui s'étend jusqu'à l'une des chambres coupe bruit
(12), à celle qui se trouve au plus près de l'ouverture 15
de sortie de l'aspirateur de coupe bruit (6), et qui
diminue les ondes de son aux fréquences non dési-
rées par l'espace d'échantillon (A5) de ladite
chambre ; une ouverture de sortie (17) sur le conduit
d'atténuation, laquelle ayant un espace différent 20
d'échantillon (A6) de celui qui se trouve à l'ouverture
d'entrée (16) du conduit d'atténuation.

3. Compresseur (1) selon l'une quelconque des reven-
dications ci-dessus, **caractérisé par** un aspirateur 25
coupe bruit (4) comprenant une ouverture (7) sur la
ligne de flux (10).

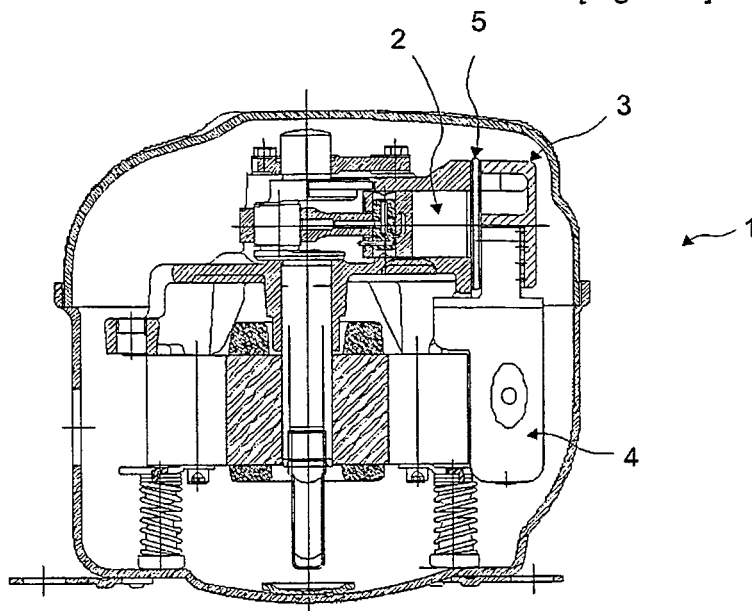
4. Compresseur (1) selon l'une quelconque des reven-
dications ci-dessus, **caractérisé par** un aspirateur 30
coupe bruit (4) comprenant une ligne de flux (10)
avec une ouverture d'entrée (14) placée à côté de
l'ouverture de l'aspirateur (9) et une ouverture de
sortie (15) placée à côté de l'ouverture de sortie de
l'aspirateur de coupe bruit (6). 35

5. Compresseur (1) selon l'une quelconque des reven-
dications ci-dessus, **caractérisé par** un aspirateur
coupe bruit (4) comprenant un ou plusieurs éléments
de guidage (11) allant de l'ouverture de l'aspirateur 40
(9) à la première chambre coupe bruit (12) par les-
quels le réfrigérant aspiré est orienté vers la ligne de
flux (10) et le réfrigérant qui se trouve dans la ligne
flux (10) est orienté vers l'ouverture de sortie de l'as-
pirateur de coupe bruit (6). 45

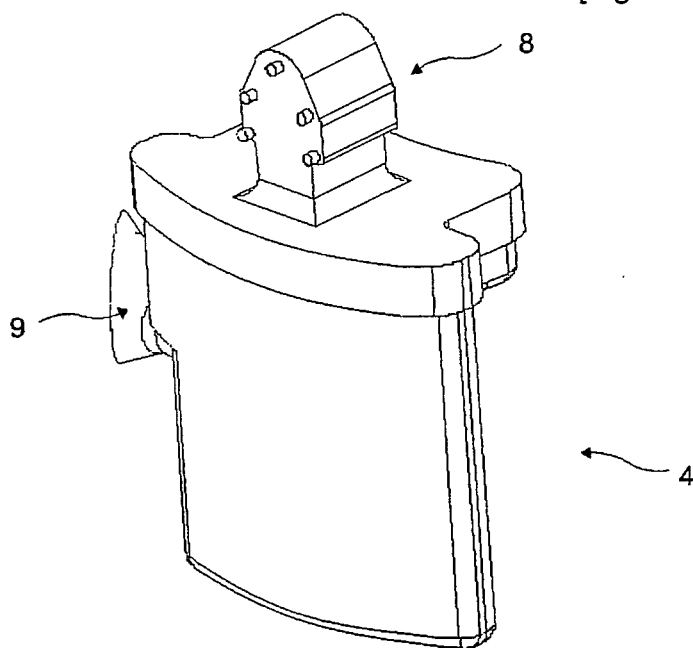
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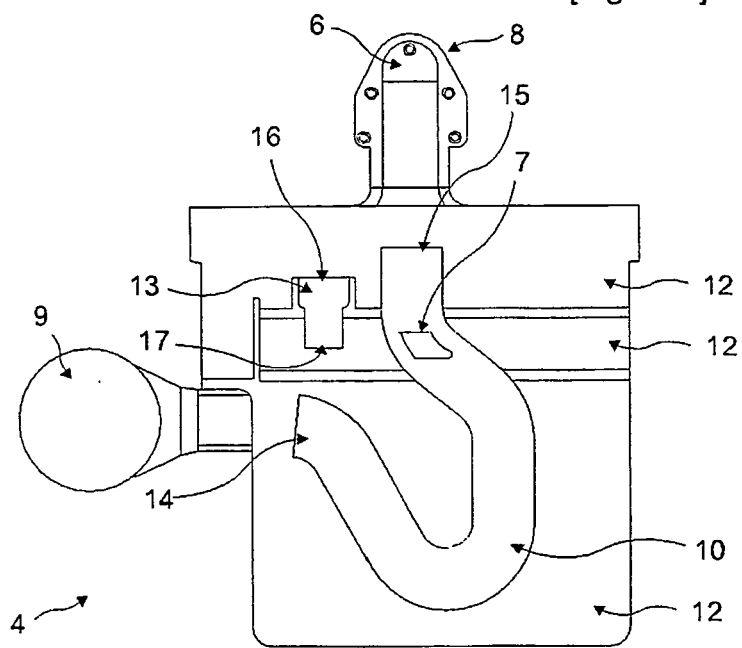
[Fig. 001]



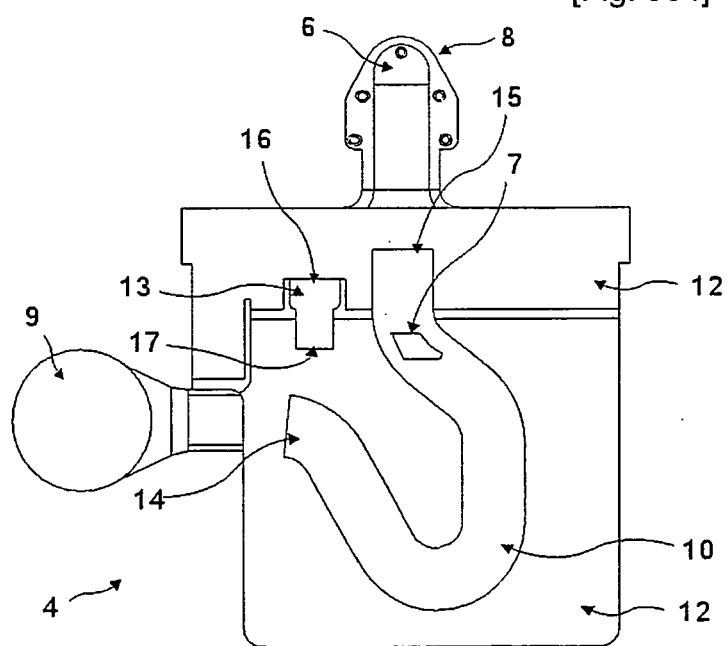
[Fig. 002]



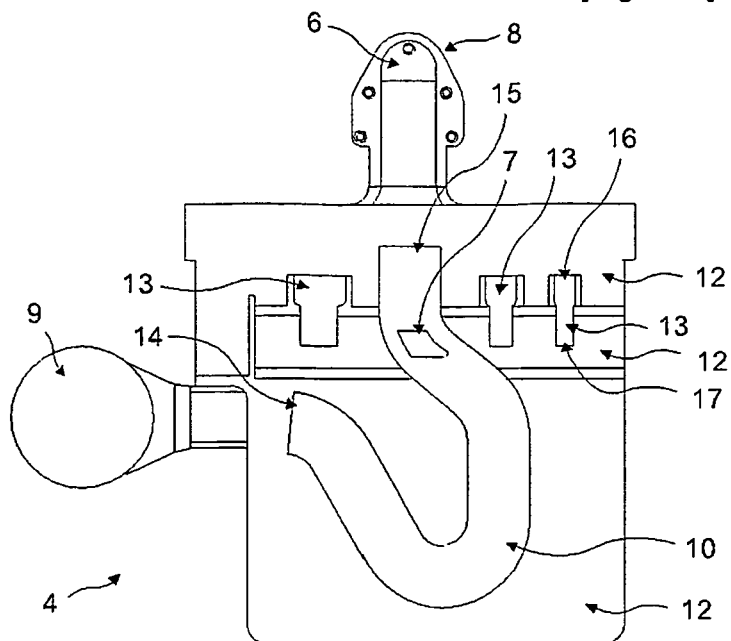
[Fig. 003]



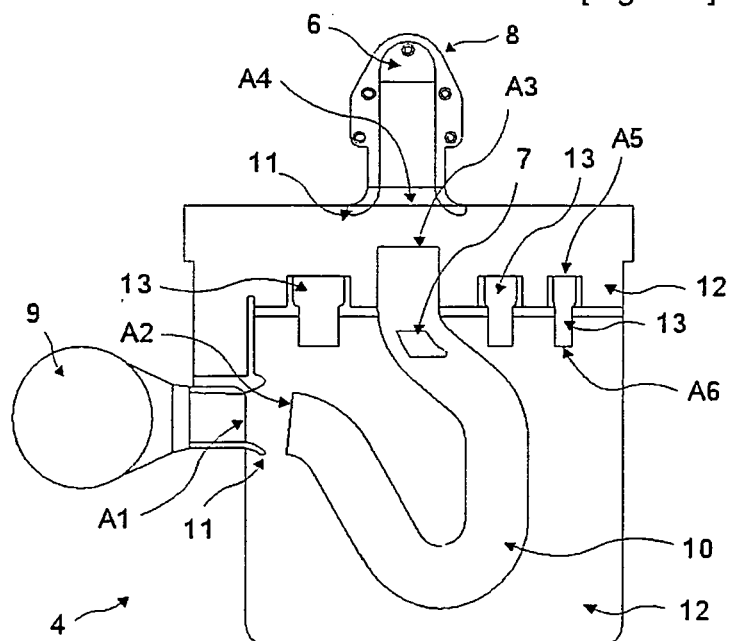
[Fig. 004]



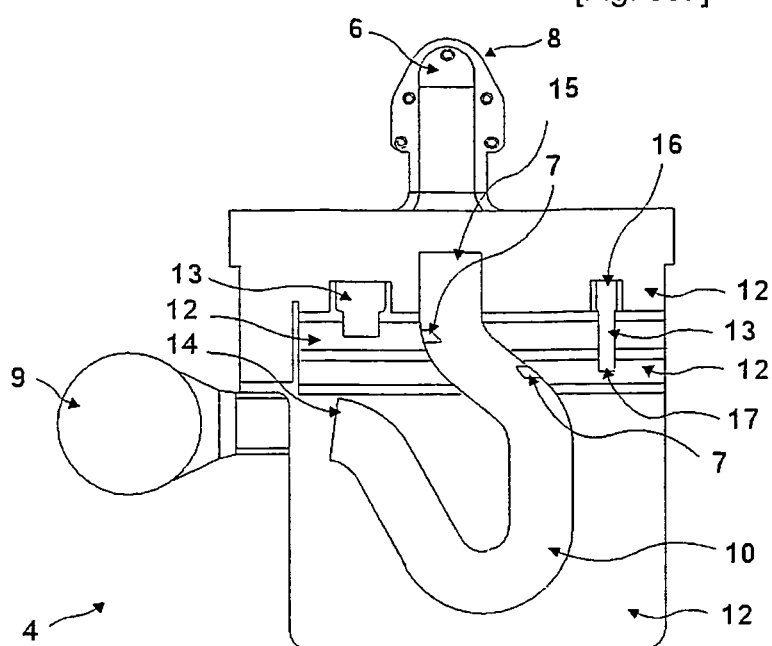
[Fig. 005]



[Fig. 006]



[Fig. 007]



REFERENCES CITED IN THE DESCRIPTION

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