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(54) A HERMETIC MOTOR-DRIVEN COMPRESSOR UNIT FOR REFRIGERATING CIRCUITS

HERMETISCHE MOTORVERDICHTEREINHEIT FÜR KÜHLKREISLÄUFE

COMPRESSEUR HERMETIQUE A MOTEUR POUR CIRCUITS DE REFRIGERATION

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Description

The present invention relates to a hermetic motor-driven compressor unit for refrigerating circuits and the like including, in a hermetic housing, a reciprocating compressor and its electric motor with a pack of plates, in which the compressor includes a cylinder with a valve plate fixed against an end face of the cylinder and a manifold fixed in turn against the valve plate, in which the end of the valve plate nearest the electric motor includes a projecting end portion, and in which an intake silencer, in the form of a hollow body of plastics material, is fixed to a front face of the projecting end portion on the same side as the manifold, an intake header chamber being disposed on the opposite side of the end portion and communicating with the interior of the hollow body by means of through holes in the end portion.

A motor-driven compressor unit of this type is known from the document WO 86/02703. In this unit, the intake header chamber is constituted by a cavity in the cast iron of the cylinder block near the cylinder. The cavity is closed by the projecting end portion of the valve plate. The silencer is constituted by a hollow body of plastics material which is fixed to the projecting end portion of the valve plate by tubular pins which are snap-engaged in corresponding holes in the end portion and which also establish communication between the interior of the silencer and the header chamber.

Amongst other things, this known arrangement enables the unit constituted by the valve plate, its manifold and the silencer to be preassembled fairly easily and also subsequently to be fitted fairly easily onto the block and its cylinder.

In the known solution, the formation of the intake header chamber in the block involves a certain expense which it would be desirable to reduce. Moreover, this solution is not beneficial to the performance of the compressor, since the fluid taken gains unwanted heat as it contacts the metal surface of the header chamber.

An object of the invention is to provide a hermetic motor-driven compressor unit of the type in question, in which the arrangement of the intake system is not only just as advantageous from the point of view of its assembly but which also improves the performance of the compressor.

Another object of the invention is to achieve better silencing of the compressor with the same arrangement of the intake system.

According to the invention, these objects are achieved by means of a motor-driven compressor unit of the type mentioned at the beginning, characterised in that a space defined between the cylinder and the pack of plates of the electric motor is open towards the projecting end portion of the valve plate, in that the intake header chamber is constituted by a second hollow body of plastics material which acts as a further silencer, is housed in the space, is in contact neither with the cylinder nor with the pack of plates, and is fixed to the end portion, in that the manifold is divided internally into a delivery compartment and an intake compartment, of which the latter contains a valved intake opening in the valve plate and a communication hole in the plate, and in that the second hollow body has an outlet which communicates with the intake compartment through the communication hole.

By virtue of this concept, the header chamber defined by the second hollow body is thermally insulated from the hot metal parts of the motor-driven compressor, to the benefit of its performance. The spaces in the two hollow bodies together attenuate the noise better since, with suitable dimensions, they can constitute cavities which are resonant in two different frequency bands and which together can attenuate a wider range of frequencies than would be the case with only one resonant cavity, even of a greater volume, such as that of the prior document mentioned above.

The unit constituted by the valve plate, the manifold and the two silencer bodies according to the invention is suitable for preassembly and subsequent fitting onto the compressor block by methods just as easy as those of the prior art mentioned above.

The intake compartment of the manifold preferably contains a half-shell of plastics material which is open towards the valve plate and the walls of which are spaced from the corresponding internal surfaces of the compartment so as to be thermally insulated.

This achieves the twofold advantage that performance is further improved, since the fluid in the manifold is also thermally insulated, and that a third space is created and, with suitable dimensions, can constitute a third cavity which is also resonant in a different frequency band from the others so that an even wider overall frequency range is attenuated than is the case with two cavities.

A further advantage of the arrangement according to the invention consists of the fact that the fluid taken in follows a labyrinthine path from the first hollow body to the second and then into the manifold before it reaches the interior of the cylinder through the intake valve, thus improving the separation of the drops of liquid entrained in the gas.

Further characteristics of the invention will become clear from a reading of the detailed description which follows with reference to the appended drawings which illustrate a preferred embodiment by way of non-limiting example, and in which;

Figure 1 is a sectioned, partial elevational view of a motor-driven compressor unit according to the invention,

Figure 2 is a partial cross-section taken substantially on the line II-II of Figure 1,

Figure 3 is an exploded perspective view of the head unit of the compressor,

Figure 4 is an internal view of the head unit, taken on the arrow IV-IV of Figure 1, and

Figure 5 is an internal view of the manifold.

With reference to Figures 1 and 2, a motor-driven compressor unit includes a hermetic housing, generally indicated 10. The housing 10 houses a motor-driven compressor, generally indicated 12. The motor-driven compressor 12 includes an electric motor, generally indicated 14 and a positive-displacement compressor, generally indicated 16.

The pack of stator plates of the motor 14 is indicated 18. The block or casing of the compressor 16, indicated 20, is fixed above the pack of stator plates 18.

The rotor of the electric motor 14 is indicated 22 and its hollow vertical shaft is indicated 24. The upper end of the shaft 24 has a crank 25 which is connected by means of a connecting rod 26 to a piston 28 which is slidable horizontally in a cylinder 30.

The cylinder 30 is formed in the block or casing 20 which may be of cast iron.

The head end of the cylinder 30 has a flat end face 32.

A head unit 34 which will now be described with particular reference to Figures 3 and 4, is fixed to the end face 32 by screws.

In known manner, the head unit 34 includes seals which, for simplicity, are neither shown nor described.

The head unit 34 includes, amongst other things, a valve plate 36, the structure of which is the same as, or similar to that of the document WO 86/02703. The plate 36 includes an end portion 38 which projects at its end nearest the electric motor 14 (downwardly in Figures 1 and 2). A space 40 defined between the cylinder 30 and the pack of plates 18 (Figure 1) is open towards the projecting end portion 38, which faces it.

A hollow manifold 42, for example, of light alloy, is fixed against the outer face of the valve plate 36. The manifold 42 does not extend over the projecting end portion 38.

An intake silencer 44 with an intake opening 45 is fixed to the front face of the end portion 38 immediately below the manifold 42. The silencer 44 is constituted by a hollow, shaped element moulded from plastics material.

A further shaped, hollow body 46 of the same plastics material, fixed to the face of the end portion 38 opposite that with the silencer 44, acts both as an intake header chamber and as a second silencer.

Level with the two bodies 44 and 46, the end portion 38 has a pair of through-holes 48. Corresponding tubular split pins 50 integral with the hollow body 44 extend through the holes 48. One of the pins is also visible at 50 in Figure 1. The pins 50 are snap-engaged in corresponding holes 52 in the other body 46, thus fixing the two bodies 44 and 46 together and to the end portion 38 of the valve plate 36 and also establishing communication between the cavities of the two bodies 44 and 46.

The second silencer or hollow body 46 has an outlet constituted by a tubular appendage 56 which extends through a corresponding through-hole 58 in the valve plate 36 to communicate with the interior of the manifold 42.

With reference in particular to Figure 5, the manifold 42 has an internal cavity which is open towards the valve plate 36 and which is divided by a central partition 60 into a delivery compartment 62 and an intake compartment 64.

The delivery compartment 62 communicates with the interior of the cylinder 30 (Figure 1) by means of a delivery valve, generally indicated 66 in Figure 3, which in turn communicates in a conventional manner, not shown, with a delivery silencer 70.

The duct defined by the tubular appendage 56 opens, by means of the through-hole 58, into the intake compartment 64.

The valve plate 36 has a valved intake opening 68 which communicates with the interior of the cylinder 30 by means of a plate obturator 70 (Figure 4) . The obturator 70 is formed by blanking in a plate 72 associated with the "internal" face of the valve plate 36. This plate 72 is not shown in Figure 3 since it belongs to the prior art.

A half-shell 74 of plastics material is preferably inserted in the intake compartment 64 of the manifold 42. The peripheral walls of the half-shell 74 are shaped according to the cross-section of the compartment 64 and are spaced from the peripheral surfaces of the compartment 64 by external ribs 76. The end wall of the half-shell 74 is also spaced from the end surface of the compartment 64 by corresponding ribs 78. The half-shell 74 is thus thermally insulated from the metal surfaces of the manifold 42.

As already stated at the beginning, as well as helping to improve the performance of the compressor by virtue of its thermal insulation from the metal manifold 42, the half-shell 74 also constitutes a third silencer disposed downstream in the series of silencers 44, 46 and 74, so as to increase to a maximum the range of frequencies in which the noise of the compressor is attenuated during intake as a result of the suitable dimensioning of the resonant cavities of the individual silencers.

Claims

1. A hermetic motor-driven compressor unit for refrigerating circuits and the like including, in a hermetic housing (10), a reciprocating compressor (16) and its electric motor (14), in which the compressor (16) includes a cylinder (30) with a valve plate (36) fixed against an end face (32) of the cylinder (30) and a manifold (42) fixed in turn to the valve plate (36), in which the end of the valve plate (36) nearest the electric motor (14) includes a projecting end portion

(38), and in which an intake silencer (44), in the form of a hollow body of plastics material, is fixed to a front face of the projecting end portion (38) on the same side as the manifold (42) , an intake header chamber being disposed on the opposite face of the end portion (38) and communicating with the interior of the hollow body (44) by means of through-holes (48) in the end portion (38), characterised in that a space (40) defined between the cylinder (30) and the pack of plates (18) of the electric motor (14) is open towards the projecting end portion (38) of the valve plate (36), in that the intake header chamber is constituted by a second hollow body (46) of plastics material which acts as a further silencer, is housed in the space (40), is in contact neither with the cylinder (30) nor with the pack of plates (18), and is fixed to the end portion (38), in that the manifold (42) is divided internally into a delivery compartment (62) and an intake compartment (64), of which the latter contains a valved intake opening (68) in the valve plate (36) and a communication hole (58) in the plate, and in that the second hollow body (46) has an outlet (56) which communicates with the intake compartment (64) through the communication hole (58).

2. A motor-driven compressor unit according to Claim 1, characterised in that the intake compartment (64) of the manifold (42) contains a half-shell (74) of plastics material which is open towards the valve plate (36) and the walls of which are spaced from the corresponding internal surfaces of the compartment so as to be thermally insulated.

3. A motor-driven compressor unit according to Claim 1 or Claim 2, characterised in that the two hollow bodies (44, 46) of plastics material are fixed together and to the projecting end portion (38) of the valve plate (36) by tubular pins (50) which project from one of the bodies, extend through the through-holes (48) in the end portion (38) and are snap-engaged in corresponding holes (52) in the other body, the pins (50) also constituting communication ducts between the cavities of the two bodies (44, 46).

Patentansprüche

1. Hermetische Motorverdichtereinheit für Kühlkreisläufe u.dgl., welche in einem hermetischen Gehäuse (10) einen Kolbenkompressor (16) und dessen elektrischen Motor (14) aufweist, wobei der Kompressor (16) einen Zylinder (30) mit einer an der Stirnfläche (32) des Zylinders (30) befestigten Ventilplatte (36) und mit einem seinerseits an der Ventilplatte (36) befestigten Verteiler (42) aufweist, wobei das näher beim elektrischen Motor gelegene Ende der Ventilplatte (36) einen vorspringenden Endbereich (38) aufweist und wobei ein Einlaß-Schalldämpfer (44) in Form eines hohlen Körpers aus Kunststoff an der Vorderfläche des vorspringenden Endbereiches (38) auf der gleichen Seite wie der Verteiler (42) befestigt ist und eine Einlaß-Sammelkammer an der gegenüberliegenden Seite des Endbereiches (38) angeordnet ist, welche mit dem Inneren des hohlen Körpers (44) über Durchtrittsöffnungen (48) im Endbereich (38) kommuniziert, dadurch gekennzeichnet, daß sich ein zwischen dem Zylinder (30) und dem Stapel der Platten (18) des elektrischen Motors (14) festgelegten Raumes (40) zum vorspringenden Endbereich (38) der Ventilplatte (36) hin öffnet, daß die Einlaß-Sammelkammer von einem als ein weiterer Schalldämpfer wirkenden zweiten hohlen Körper (46) aus Kunststoff gebildet wird, im Raum (40) aufgenommen ist, weder in Berührung mit dem Zylinder (30) noch mit dem Stapel von Platten (18) steht und am Endbereich (38) befestigt ist, daß der Verteiler (42) innen in eine Auslaßkammer (62) und eine Einlaßkammer (64) unterteilt ist, deren letztere eine mit einem Ventil versehene Einlaßöffnung (68) in der Ventilplatte (36) und eine Verbindungsöffnung (58) in der Platte umfaßt, und daß der zweite hohle Körper (46) einen Auslaß (56) besitzt, der mit der Einlaßkammer (64) über die Verbindungsöffnung (58) kommuniziert.

2. Motorverdichtereinheit nach Anspruch 1, dadurch gekennzeichnet, daß die Einlaßkammer (64) des Verteilers (42) eine Halbschale (74) aus Kunststoff enthält, welche in Richtung der Ventilplatte (36) geöffnet ist und deren Wände zur thermischen Isolierung von den entsprechenden inneren Oberflächen der Kammer beabstandet sind.

3. Motorverdichtereinheit nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die beiden hohlen Körper (44,46) aus Kunststoff aneinander und an dem vorspringenden Endbereich (38) der Ventilplatte (36) befestigt sind, wobei sich rohrförmige Stifte (50), die aus einem der Körper herausragen, durch die Durchtrittsöffnungen (48) im Endbereich (38) erstrecken und in entsprechende Öffnungen (52) des anderen Körpers eingeschnappt werden, und wobei die Stifte (50) auch die Verbindungsrohrleitungen zwischen den Hohlräumen der beiden Körper (44,46) bilden.

Revendications

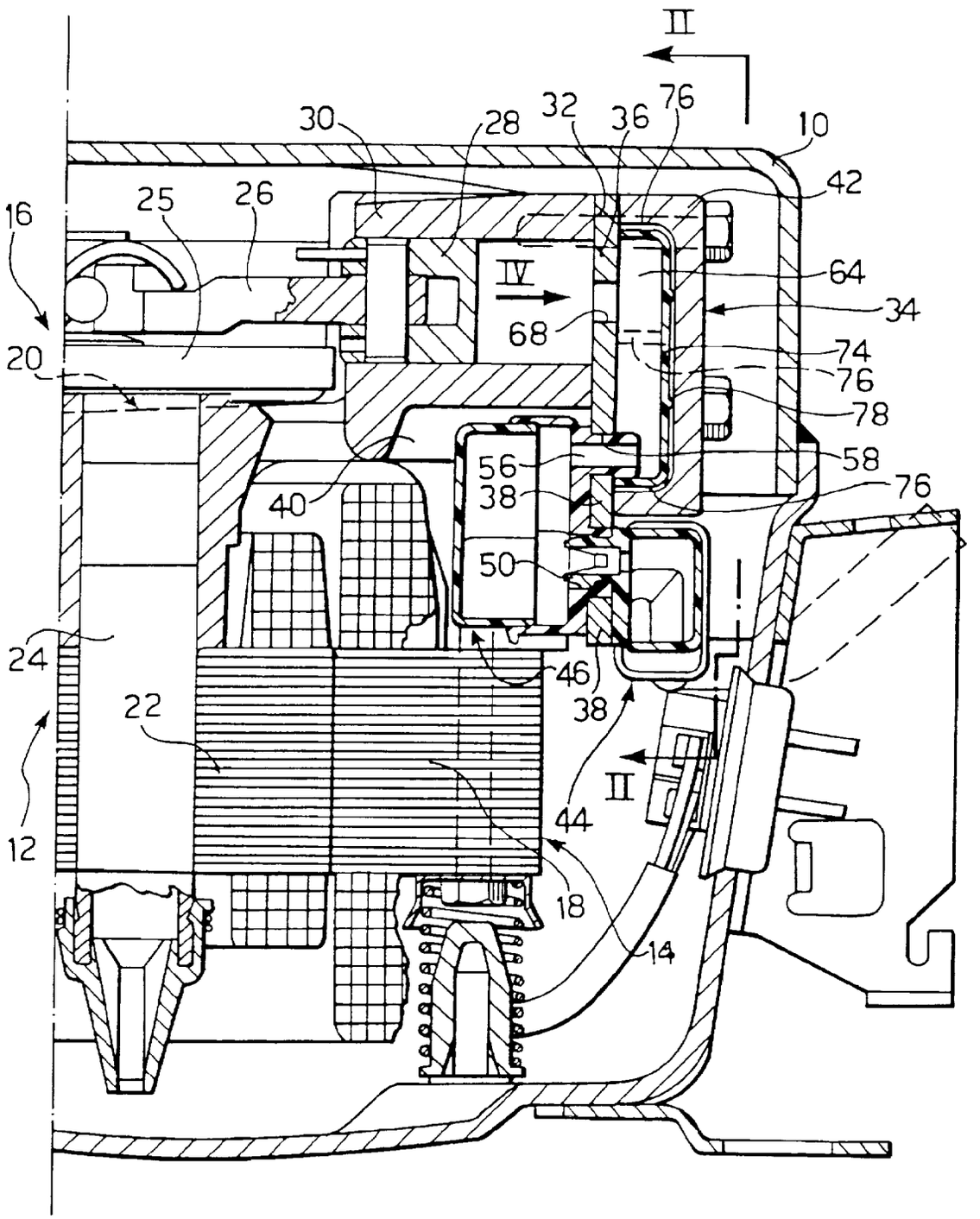
1. Ensemble de compresseur hermétique à moteur pour circuits de réfrigération et analogues, comprenant, dans une enveloppe hermétique (10), un compresseur (16) à mouvement alternatif et son moteur électrique (14), ensemble dans lequel le compres-

seur (16) comprend un cylindre (30) muni d'une plaque porte-valve (36) fixée contre une face terminale (32) du cylindre (30) et un collecteur-distributeur (42) fixé à son tour à la plaque porte-valve (36), dans lequel l'extrémité de la plaque porte-valve (36) située la plus près du moteur électrique (14) comprend une partie terminale saillante (38), et dans lequel un silencieux d'admission (44), sous la forme d'un corps creux en matière plastique, est fixé à une face avant de la partie terminale saillante (38) sur le même côté que le collecteur-distributeur (42), une chambre collectrice d'admission étant disposée sur la face opposée de la partie terminale (38) et communiquant avec l'intérieur du corps creux (44) au moyen de trous traversants (48) ménagés dans la partie terminale (38), caractérisé en ce qu'un espace (40) défini entre le cylindre (30) et le paquet de tôles (18) du moteur électrique (14) est ouvert en direction de la partie terminale saillante (38) de la plaque porte-valve (36), en ce que la chambre collectrice d'admission est constituée par un second corps creux (46) en matière plastique qui agit comme un autre silencieux, est logé dans l'espace (40), n'est en contact ni avec le cylindre (30) ni avec le paquet de tôles (18), et est fixé à la partie terminale (38), en ce que le collecteur-distributeur (42) est divisé intérieurement en un compartiment de décharge (62) et un compartiment d'admission (64), ce dernier contenant une ouverture d'admission (68) à valve dans la plaque porte-valve (36) et un trou de communication (58) ménagé dans la plaque, et en ce que le second corps creux (46) comporte une sortie (56) qui communique avec le compartiment d'admission (64) par le trou de communication (58).

2. Ensemble de compresseur à moteur selon la revendication 1, caractérisé en ce que le compartiment d'admission (64) du collecteur-distributeur (42) contient une demi-enveloppe (74) en matière plastique qui est ouverte en direction de la plaque porte-valve (36) et dont les parois sont espacées des surfaces internes correspondantes du compartiment de manière à être isolées thermiquement.

3. Ensemble de compresseur à moteur selon la revendication 1 ou la revendication 2, caractérisé en ce que les deux corps creux (44, 46) en matière plastique sont fixés l'un à l'autre ainsi qu'à la partie terminale saillante (38) de la plaque porte-valve (36) par des axes tubulaires (50) qui font saillie d'un des corps, s'étendent à travers les trous traversants (48) ménagés dans la partie terminale (38) et sont engagés élastiquement dans des trous correspondants (52) ménagés dans l'autre corps, les axes (50) constituant aussi des conduits de communication entre les cavités des deux corps (44, 46).

FIG. 1


II
30
28
32
36
76
10
42
16
25
26
IV
64
34
68
74
20
76
78
56
58
38
76
40
50
24
46
38
22
II
44
12
18
14

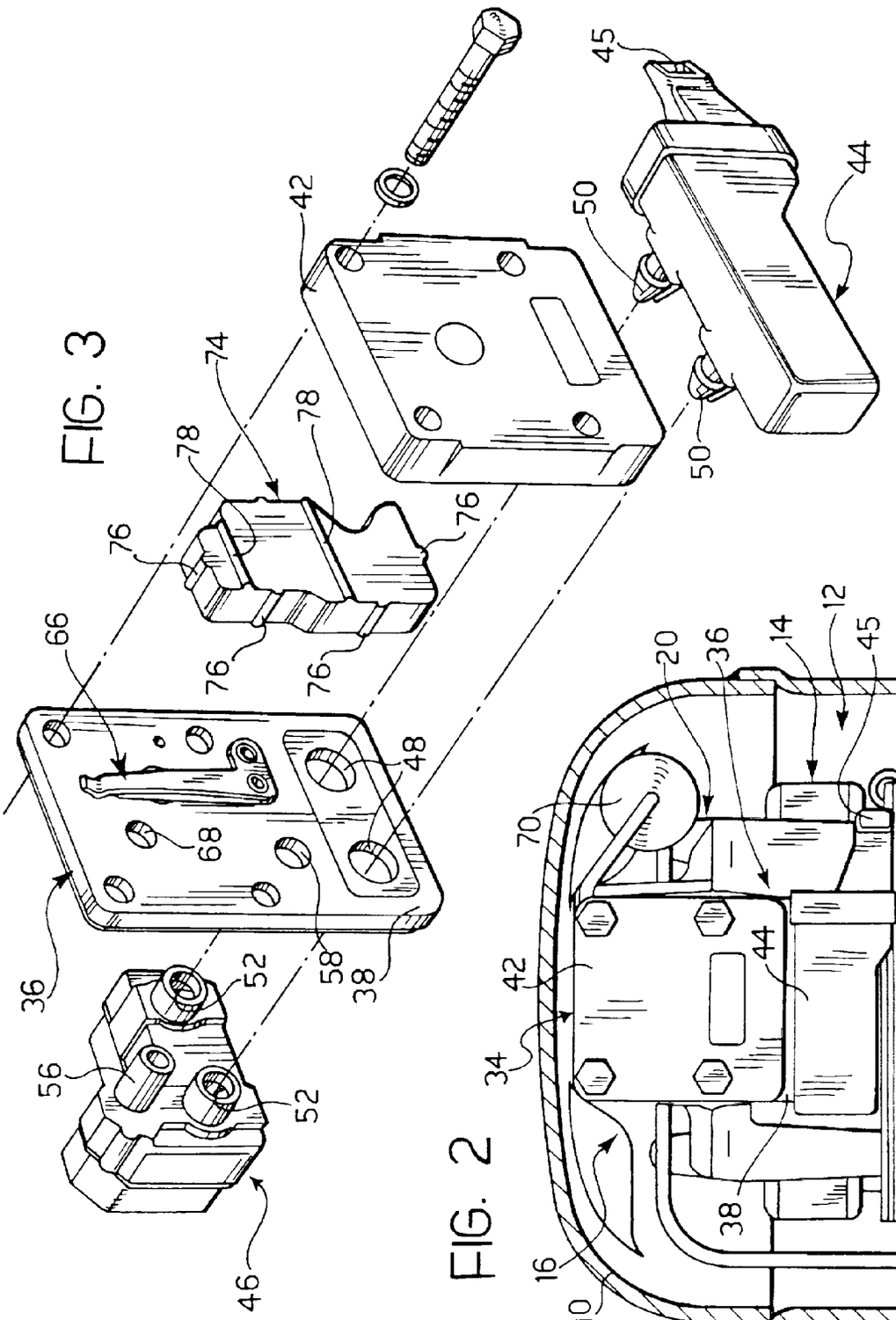

45
44
42
50
74
78
76
66
48
68
36
52
58
38
56
46

FIG. 3

12
14
45
18
20
36
70
42
44
34
38
16
10

FIG. 2

FIG. 4

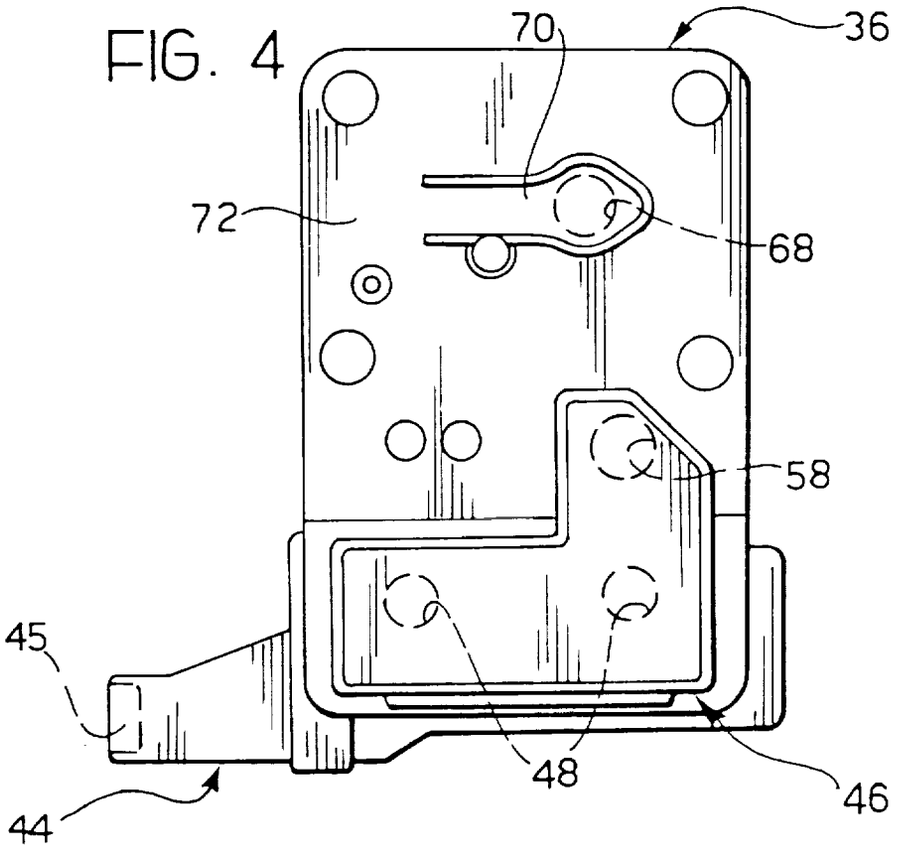


FIG. 5

