

12

EUROPEAN PATENT APPLICATION

21 Application number: **87830268.6**

51 Int. Cl.4: **F 24 F 1/02**

22 Date of filing: **15.07.87**

30 Priority: **18.07.86 IT 8255786 18.07.86 IT 8255886**
29.07.86 IT 8256286

43 Date of publication of application:
27.01.88 Bulletin 88/04

84 Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

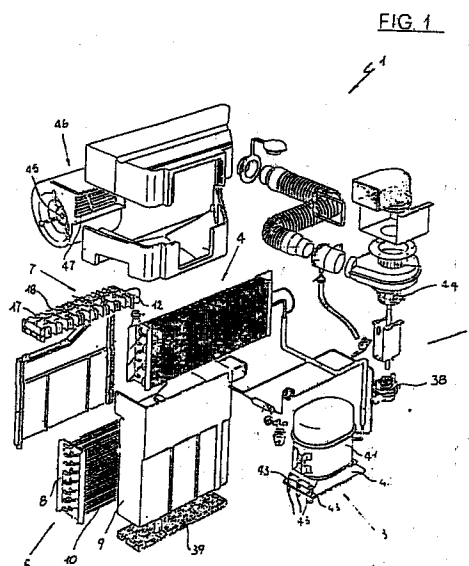
71 Applicant: **DE' LONGHI S.P.A.**
Via L. Seitz 47
I-31100 Treviso (IT)

72 Inventor: **De' Longhi Giuseppe**
vicolo Rovero 1
I-31100 Treviso (IT)

74 Representative: **Rapisardi, Mariacristina, Dr. Proc.**
STUDIO TECNICO LEGALE RAPISARDI Largo V Alpini 15
I-20145 Milano (IT)

54 **Mobile air-conditioning apparatus.**

57 The mobile air-conditioning apparatus comprises a supporting framework (2) for means (3) for compressing a refrigerating fluid which are associated with means (4) for the evaporation of the refrigerating fluid and are connected to means (5) for the condensation thereof communicating with said compression means, the condenser means comprising means (6) for the supply of a coolant fluid connected to an element (7) for the delivery of the coolant fluid for its distribution above a condenser (8).



Description

MOBILE AIR CONDITIONING APPARATUS

The present invention relates to a mobile air-conditioning apparatus.

As is known, air-conditioning for comfort, or civil air-conditioning, is the term describing all the treatments employed to maintain the air of a room, of a blast or the like, at preset and independent conditions.

Possible conditions are temperature, humidity, movement, purity, composition, ionization, etc.

A conditioner must adjust, within certain limits, at least the first three above conditions.

Various conditioners are known for effecting air-conditioning, and they are classified according to their functions.

In particular, mobile conditioners are known which, in order to be extremely flexible in use and therefore be easily movable from one room to another without the need for particular installations, are provided with a condenser cooled by means of a coolant fluid such as, for example, water.

In such devices it is apparent that the greater the size of the tank containing the coolant liquid, the greater the duration of the conditioner's autonomy of operation.

At the same time, an excessive volume of the tank would imply an increase in the external dimensions of the apparatus, adversely affecting its primary characteristics of mobility and flexibility in use.

It is thus apparent that such conditioning devices must necessarily be designed taking into account a plurality of basic parameters, such as, for example, reliability in use, efficiency, autonomy of operation, ease in moving, etc.

For example, conditioners are currently available on the market wherein the cooling of the condenser is obtained by spraying water upwards, by means of an impeller, against the tube nests of the condenser, which by necessity of manufacture are arranged circumferentially with respect to the impeller and in a spiral path.

The disadvantages of such a technical solution are easily understandable, and in particular the fact can be stressed that, for example, the particles of water do not strike the tube nests of the condenser uniformly, the water being sprayed upwards from below with the same direction as a flow of air adapted for the aspiration of the vapors, being therefore also partially aspirated and expelled from the conditioner and therefore no longer usable to cool the condenser.

Not least disadvantage is that, dimensions and external configurations of the conditioner being equal, the particular cylindrical configuration of the containment body of the condenser implies a reduction in the volume of the water tank adjacent thereto.

Given this situation, the technical aim of the present invention is to eliminate the above described disadvantages of the prior art.

Within this technical aim, an important object of the present invention is to devise a mobile air-conditioning apparatus wherein the coolant fluid strikes the tube nests of the condenser uniformly and homogeneously.

Another important object of the present invention is to devise a mobile air-conditioning apparatus wherein the air for aspirating the vapor generated during the cooling of the condenser has a direction which is opposite to that of the coolant fluid of said condenser.

Still another object of the present invention is to devise a mobile air-conditioning apparatus wherein the container of the coolant fluid has a quadrangular configuration so as to have a greater capacity, outer dimensions being equal, with respect to the configuration of the conditioner.

Not least object of the present invention is to devise a conditioner which is provided with elements for its movement adapted to avoid increasing its dimensions, and which can furthermore operate independently and silently as a ventilator without the need to activate the refrigerating circuit.

This aim, as well as these and other objects, are achieved by a mobile air-conditioning apparatus comprising: a supporting framework for means for compressing a refrigerating fluid associated with means for the evaporation of said refrigerating fluid and connected to means for the condensation thereof communicating with said compression means, characterized in that said condenser means comprise means for the supply of a coolant fluid connected to an element for the delivery of said coolant fluid for its homogeneous distribution above a condenser.

Further features and advantages of the present invention will become apparent from the description of a preferred, but not exclusive, embodiment of the mobile air-conditioning apparatus according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

- figure 1 is an exploded perspective view of the main components of the conditioner according to the invention;

- figure 2 is a plan view of the element for the delivery the coolant fluid according to the invention;

- figure 3 is a sectional lateral view of figure 2 according to the invention;

- figure 4 is a bottom plan view of the delivery element of figure 2 according to the invention;

- figure 5 is a cross section view along the line V-V of figure 2 according to the invention;

- figure 6 is a cross section view along the line VI-VI of figure 2 according to the invention;

- figure 7 is a cross section view along the line VII-VII of figure 2 according to the invention;

- figure 8 is a perspective view of the containment tank for the coolant fluid according to the invention;

- figure 9 is a perspective view of the shaped support for accommodating the tank illustrated in figure 8 according to the invention;

- figure 10 is a cross section view of the coupling of the tank to the shaped seat wherein it is accommodated according to the invention;
- figure 11 is a plan view illustrating the movable handle according to the invention; and
- figure 12 is a sectional lateral view illustrating the handle inside the guiding box according to the invention.

With particular reference to figure 1, the mobile air-conditioning apparatus according to the invention, generally indicated with the reference numeral 1, comprises a supporting framework, indicated by the reference numeral 2, for means, generally indicated by 3, for compressing a refrigerating fluid, which are associated with means, generally indicated by 4, for the evaporation of the refrigerating fluid, which are in turn connected to means, generally indicated by 5, for the condensation of said coolant fluid, which communicate with said compression means 3.

The condenser means 5 comprise means 6 for the supply of a coolant fluid which are connected to a delivery element, generally indicated by 7, adapted to distribute the coolant fluid homogeneously and uniformly above a condenser 8.

The condenser 8 is provided with an essentially quadrangular configuration and is accommodated, together with the delivery element 7, in a containment body 9 also advantageously having a substantially quadrangular configuration.

More precisely, the condenser 8 is provided with a plurality of tubes, each indicated by 10, which are horizontally co-planar to each other in pairs and alternately aligned vertically in pairs so as to be arrangeable in a limited space in a sufficiently large number and so as to be struck uniformly by the coolant fluid.

So that each tube 10 be struck by the coolant fluid uniformly and homogeneously, said coolant fluid is introduced, before making contact with the condenser, into the delivery element 8 and more precisely in a supply channel 11 thereof having an inlet 12 at one end.

The channel 11 is sealingly associated with a distributor element 13 which is provided, along its longitudinal extension, with a plurality of cups, each indicated by 14.

Conveniently, the cups 14 are separated from one another by means of partitions 15, and each cup is connected to the supply channel 11 by means of respective holes 16.

Each of the cups 14 is provided with at least one first pair of overflow walls, indicated by 17, which are closer to the axis of the distributor element with respect to at least one second pair of overflow walls, indicated by 18, which are instead spaced further apart from the axis of the distributor element.

Conveniently, the two overflow walls 17, which define a pair of overflow walls, are respectively arranged on two parallel planes, whereon are also arranged the inner tubes of the condenser 8; while the overflow walls 18, which define a second pair of overflow walls, are arranged on two second mutually parallel planes of arrangement of the outer tubes of the condenser 8.

From the above it is easily understood that by

virtue of the arrangement of the overflow walls 17 and 18 it is possible to strike the tubes 10 of the capacitor along their entire extension, regardless of whether they are arranged inwards or outwards with respect to said condenser.

Moreover, in order to allow the coolant fluid, and in this case in particular water, to be uniformly and homogeneously distributed on the tubes 10, the counterposed outer faces of the overflow walls 17 are provided with guiding ridges 20 which also extend along the lateral surface of the supply channel 11 in a direction substantially perpendicular to its axis.

In this manner, the water spilling over the walls 17 is guided, thus preventing its accumulation only on some regions of the walls 17 and thus preventing it from falling onto the tubes 10 in a greater amount on one part and in a smaller amount on another.

The second pair of walls 18 instead has counterposed faces substantially provided with divergent inclinations, so as to allow the overflow of the water from each cup 14 substantially simultaneously both from the walls 18 and from the walls 17 regardless of their distance from the axis of the distribution element.

The outer faces of the walls 18 are furthermore provided with lateral borders 21 which prevent the lateral escape of the water to direct it exactly and uniformly over the outer tubes 10 of the condenser 8.

The holes 16 for communication between the cups 14 and the supply channel 11 have such dimensions as to prevent any calcareous deposit from obstructing them, and should this occur in any case, consequently reducing their diameter so that the jet of water from the channel 11 would enter the cups 14 at a higher pressure, small jet-breaking discs 22 are provided spaced apart from the holes 16 to avoid the escape of the water not guided by the distributor element, and are coaxial to the holes 16 and rigidly associated with a dividing wall 23 which extends longitudinally along the entire length of the distributor element parallel to its axis.

The delivery element 7 is furthermore provided with a jet-breaking plate 24 which is associated therewith at a preset distance from the bottom of the cups 14 so as to not interfere with the free surface of the water present therein and at the same so as to prevent any jet of water, leaving one of the holes 16, from escaping over the walls of the cups and being lost, not being directed to strike the tubes of the condenser 8.

Moreover, since the fall of water or of coolant fluid above the condenser generates vapor, said vapor is taken up from the containment body 9 by means of an aspiration which acts in the opposite direction with respect to the direction of fall of the water to prevent the aspiration even of particles of water which would uselessly depauperate the amount thereof used to cool the condenser.

It should be furthermore noted that the distributor element is provided, proximate to the inlet 12 of the coolant fluid, with protection flaps, each indicated by 25 and adapted to prevent the aspiration of vapor, which determines a depression, from causing water to escape from the cups 14 improperly proximate to the inlet 12 or from causing even its aspiration.

More precisely, the protection flaps 25 extend in the direction of the jet-breaking plate for an elevation substantially equal to the distance thereof from the edge of the distributor element, so as to create a valid barrier for the aspiration air so that it does not interfere with the water contained in said cups.

Exclusively for the sake of greater precision, it should be furthermore added that the channel 11 is provided, on the opposite side with respect to the distributor element, with two spaced and parallel borders 60 which extend along its entire length and are adapted to facilitate the escape of drops of water from said channel without said drops following preferential paths along its base which would take them off their preset course, failing to make contact with the inner and outer tubes of the condenser.

The means for supplying the coolant fluid are defined by at least one quadrangular tank 26 which is removably associated with a shaped support, generally indicated by the reference numeral 27 and in turn connected to the framework 2 of the conditioner.

The shaped support 27 is provided, in a substantially central portion, with an accommodation 28 for the valve plug 28 of the tank 26.

Two recesses 30, adapted to accommodate respective resting and self-positioning feet 31 which extend to the sides of the plug 29 on the tank 26, are provided laterally with respect to the accommodation 28.

Advantageously, the tank 26 is furthermore provided with two enlarged portions 32 adapted to rotatably engage in respective semicircular accommodations 33 provided on the shaped seat 27, so as to allow the oscillation of the tank to facilitate its resting in said shaped seat and, at the same time, its extraction from the conditioner in order to fill it with coolant liquid also by virtue of a flexible tube 61 in its interior.

Inside the accommodation 28, three pins 28 are provided, the central one 34 whereof has a reduced height so as to act on the valve of the plug 29 of the tank and at the same time allow the outflow of the coolant liquid, while the remaining two lateral pins 35 act as rests for said plug.

The accommodation 28 is furthermore conveniently connected to an elongated tray 37, from an end portion whereof draws a known pump 38 adapted to send the fluid flowing out of the tank 26 and present in the elongated tray 37 to the delivery element 7.

Since the dripping of the coolant fluid along the tubes 10 of the condenser 8, by falling successively in the coolant fluid present in the elongated tray 37, produces noise, said cup is provided, below the condenser, on its bottom, with a sound-absorbing element 39 such as for example a plate-like sponge.

Moreover, to prevent any residuals of calcareous matter or other material from being aspirated by the pump 38, a filter element, for example a grid 40 adapted to provide a barrier to foreign matter which may damage the pump, is provided in a portion of the elongated tray.

The compression means 3 comprise a known compressor 41 associated with a plate 42 by means of first vibration-damping elements and more precisely by means of elastic rubber elements 43.

The plate 42 is in turn associated with the bottom of the framework 2 of the conditioner by means of second damping elements substantially identical to the rubber elements 43 so as to obtain an oscillating support which, being elastically isolated both from the bottom and from the compressor, allows the total damping of the vibrations, thus not transmitting them to the framework 2.

In greater detail, it is furthermore specified that the conditioner is provided with two motors, respectively indicated by 44 and 45, one of which is adapted to operate the pump 38, the other being adapted to operate the ventilation means 46.

In this manner the ventilation means, which are defined by a fan having blades 47 rotatable about an axis parallel to the base of the framework 2 and perpendicular to the lateral walls thereof, can be operated independently from the condenser means so that if the conditioner is to be used only as a fan the noise of the sloshing of water or coolant fluid adapted to cool the condenser will not be present.

It must be furthermore provided that since the fan is provided with its own motorization, its blades can be arranged, as mentioned, horizontally, so as to optimize the outflow of air from the conditioner's delivery outlets.

Each of the lateral walls of the framework 2 of the conditioner is furthermore provided with an element for moving the conditioner, and more precisely with a handle 45 which is advantageously slideably associated in contrast with, and by the action of, elastic means, that is to say of a spring 55, along a guiding pivot 46, inside a guiding box generally indicated at 47, internally rigidly associated with the framework 2 of the conditioner.

Each handle 45 has one face provided with a cam 48 which is provided with a locking recess 49 facing which is arranged an arrestor countercam 50 of a hook element 51 which is defined by a small elastic bar rigidly associated with the guiding box 47.

The cam 48 is provided with a first and with a second surface, having counterposed curves indicated respectively with 52 and 53, which are inclined with respect to the axis of sliding of the handle inside the guiding box 47.

The first and second surface 52 and 53 engage the end of the hook element 51 so as to move the latter in succession laterally with respect to its hinge point.

The cam 48, on the part facing towards said hook element, is pointed so as to facilitate the passage of the hook element from one side to the other while on the opposite part with respect to the hook element, being provided with the locking recess 49, it allows to engage the hook element so that the latter retains the slider inside the guiding box.

By compressing by a further amount the spring 55, the hook element leaves its locking recess 49 and moves onto the surface 52, allowing the handle to move out of its guiding box 47 so as to be gripped to move, in an extremely simple manner, the conditioner.

Naturally, after use, by replacing the handle inside the guiding box it will be retained in its interior, by virtue of the engagement of the hook element in the locking recess 49, creating no further external bulk

for the conditioner.

The operation of the mobile air-conditioning apparatus according to the invention is thus apparent from what has been described and illustrated.

In practice, it has been observed that the mobile air-conditioning apparatus according to the invention is particularly advantageous in that it is provided with an element for the delivery of a coolant fluid which allows to affect homogeneously and uniformly all the tubes provided in the condenser of the refrigerating assembly thereof.

Moreover, the particular configuration of the condenser determines the possibility of providing a quadrangular configuration also for the coolant fluid tank, so as to allow an increase in the capacity thereof, the external dimensions of the conditioner being invariant, and to allow said conditioner a longer autonomy of operation.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; moreover, all the details may be replaced with technically equivalent elements.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

Claims

1. Mobile air-conditioning apparatus comprising: a supporting framework (2) for means (3) for compressing a refrigerating fluid associated with means (4) for the evaporation of said refrigerating fluid connected to means (5) for the condensation thereof communicating with said compression means, characterized in that said condenser means comprise means (6) for the supply of a coolant fluid connected to an element (7) for the delivery of said coolant fluid for its homogeneous distribution above a condenser (8).

2. Apparatus according to claim 1, characterized in that said condenser has a substantially quadrangular configuration and is accommodated together with said delivery element in a containment body (9) also substantially quadrangular.

3. Apparatus according to claims 1 and 2, characterized in that said condenser is provided with a plurality of tubes (10) in mutually horizontally co-planar pairs and in alternately vertically aligned pairs.

4. Apparatus according to claim 1, characterized in that said delivery element comprises a channel (11) for the supply of said coolant fluid to a distributor element (13) provided with a plurality of cups (14) along its longitudinal extension, said cups being separated from one another and each communicating with said channel by means of respective holes (16).

5. Apparatus according to claim 4, characterized in that each of said cups is provided with at least one first and at least one second pair of

overflow walls (17, 18) for said coolant fluid, said overflow walls of said first pair being closer to the axis of said distribution element with respect to said overflow walls of said second pair.

6. Apparatus according to claim 5, characterized in that said overflow walls of said first pair are arranged respectively on two first parallel planes of arrangement of the inner tubes of said condenser and said overflow walls of said second pair are respectively arranged on two second parallel planes of arrangement of the outer tubes of said condenser.

7. Apparatus according to claim 6, characterized in that said first pair of walls (17) is provided, on the outer counterposed faces, with guiding ridges (20) for guiding said coolant fluid, said ridges extending along said supply channel in a direction substantially perpendicular to its axis.

8. Apparatus according to claim 6, characterized in that said second pair of overflow walls (18) has its counterposed faces substantially provided with divergent inclinations and lateral borders (21) for guiding said fluid.

9. Apparatus according to one or more of the preceding claims, characterized in that said holes are provided with a small jet-breaking disc (22) coaxial and spaced therefrom, said small disc being connected to a dividing wall (23) extending longitudinally along said distributor element and parallel to its axis.

10. Apparatus according to one or more of the preceding claims, characterized in that said delivery element comprises a jet-breaking plate (24) associated at a preset distance from the bottom of said cups.

11. Apparatus according to one or more of the preceding claims, characterized in that said channel is provided, on the opposite side with respect to said distributor element, with two spaced and parallel borders (60) extending along its length.

12. Apparatus according to one or more of the preceding claims, characterized in that said distribution element is provided, proximate to the inflow of said fluid into said channel, with protection flaps (25) extending in the direction of said jet-breaking plate for an elevation substantially equal to the distance of said plate from the edge of said distributor element.

13. Apparatus according to claim 1, characterized in that said supply means comprise at least one substantially quadrangular tank (26) for said coolant fluid, removably associated with a shaped support (27) connected to said framework, said shaped support having an accommodation (28) for a valve plug (29) of said tank, laterally where to are present two seats (30) for the accommodation of respective resting and self-positioning feet (31) extending laterally with respect to said plug of said tank.

14. Apparatus according to claim 13, characterized in that said tank is provided with two enlarged portions (32) rotatably engaging in

respective semicircular recesses (33) of said shaped support for its oscillation from a first idle position to a second position of delivery of said coolant fluid.

15. Apparatus according to claim 13, characterized in that said accommodation communicates with an elongated tray (37) for the drawing of a pump (38) to send said coolant fluid to said delivery element.

16. Apparatus according to claim 15, characterized in that said elongated cup is accommodated below said condenser and is provided, on its bottom, with a soundproofing element (39).

17. Apparatus according to one or more of the preceding claims, characterized in that a filter element (40) is arranged between said soundproofing element and said pump.

18. Apparatus according to one or more of the preceding claims, characterized in that said tank is provided, in its interior, with a flexible tube (61) which is extractable to allow the facilitated introduction therein of said coolant fluid.

19. Apparatus according to claim 1, characterized in that said compression means comprise a compressor (41), associated with a plate (42) by means of first vibration-damping elements (43), said plate being in turn associated with said framework by means of second elements (43) for damping said vibrations.

20. Apparatus according to one or more of the preceding claims, characterized in that it comprises a first and a second motor (44, 45) for the selective or simultaneous operation of said pump and of ventilation means (46) of said evaporation means.

21. Apparatus according to claim 20, characterized in that said ventilation means comprise a fan having blades (47) rotatable about an axis substantially parallel to the base of said framework and perpendicular to the lateral walls thereof.

22. Apparatus according to one or more of the preceding claims, characterized in that it comprises an aspiration element associated with said containment body adapted to aspirate vapor in the opposite direction with respect to the direction of fall of said coolant fluid from said delivery element.

23. Apparatus according to one or more of the preceding claims, characterized in that said lateral walls of said framework each comprise an element for moving said framework, said element comprising a handle (45) slideably associated along a guiding pin (46), in contrast with, and by the action of, elastic means (55), inside a guiding box (47), said guiding box being internally rigidly associated with said framework.

24. Apparatus according to claim 23, characterized in that said handle comprises a cam (48) provided with a locking recess (49) facing which is arranged an arrestor countercam (50) of a hook element (51) elastically associated with said guiding box.

25. Apparatus according to claim 24, characterized in that said cam is provided with a first and a second surface (52, 53) substantially inclined with respect to the axis of sliding of said handle in said guiding box, said first and said second surface being adapted to move said hook element in opposite directions with respect to its hinge point, and being connected to one another towards said guiding box and having said locking recess on the opposite side with respect thereto.

26. Mobile air-conditioning apparatus, characterized in that it comprises one or more of the characteristics described and/or illustrated.

0254690

FIG. 1

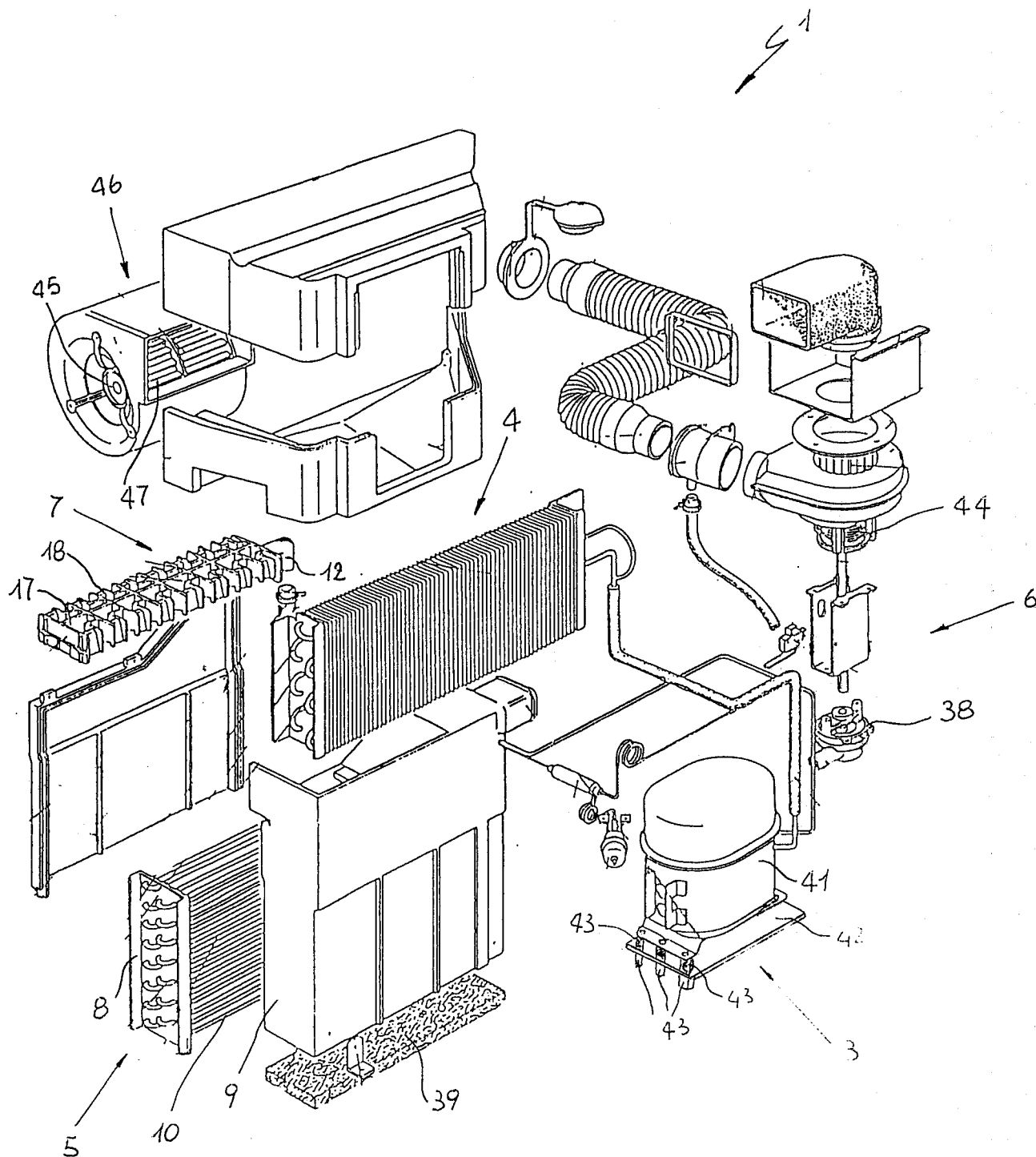


FIG. 2

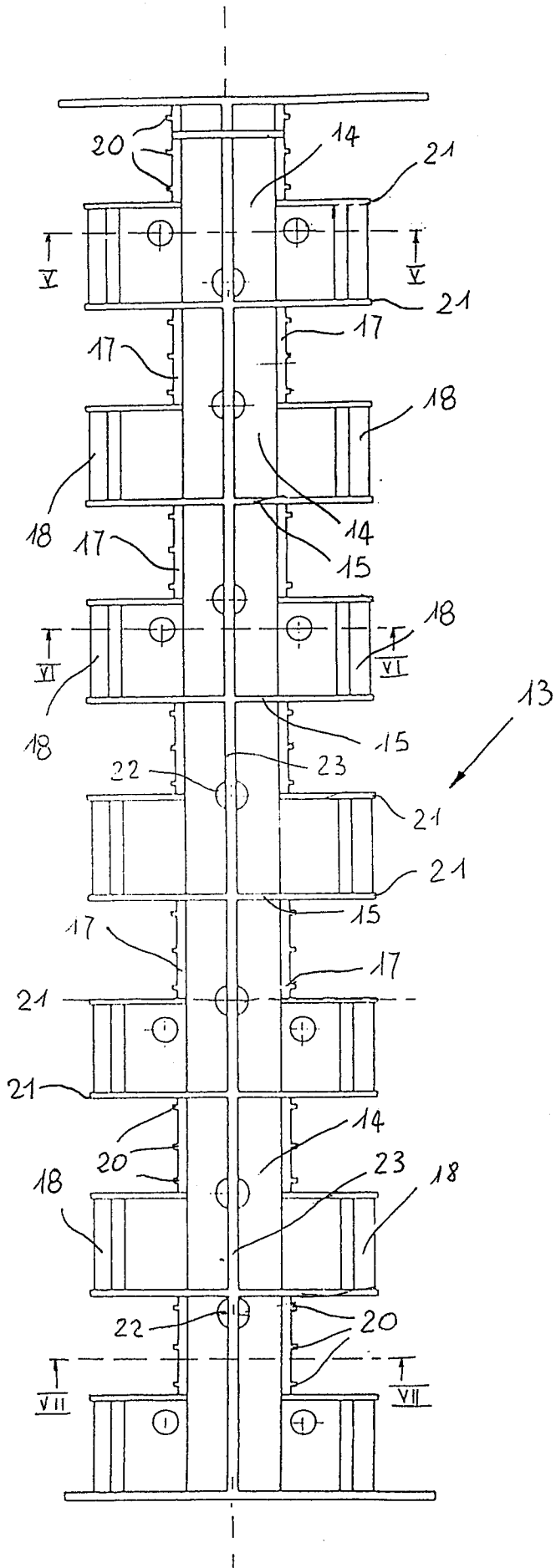


FIG. 3

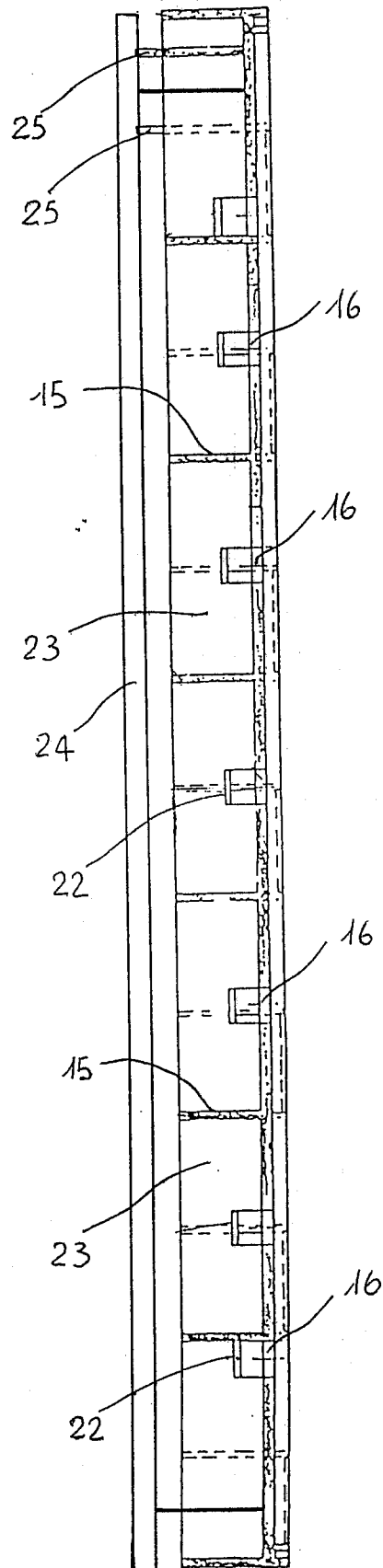


FIG. 4

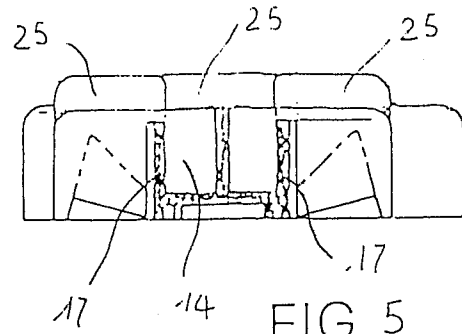
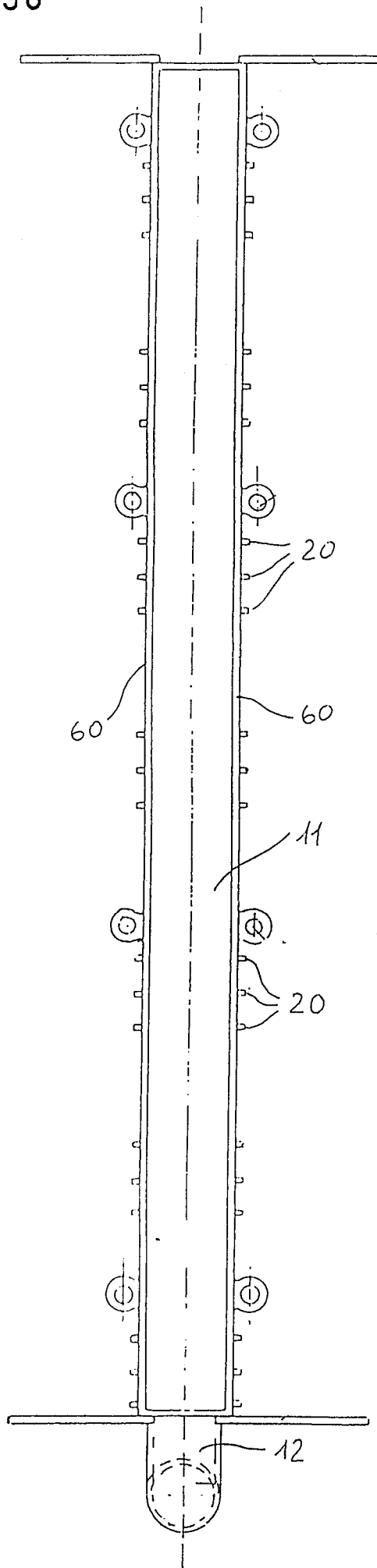


FIG. 5

FIG. 6

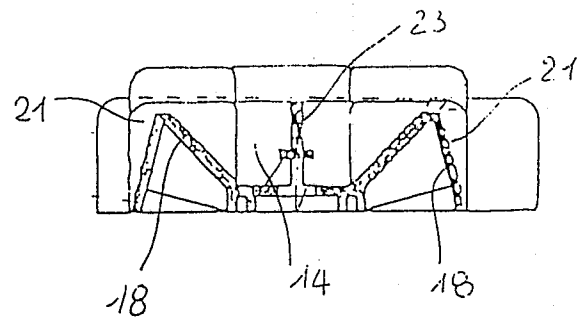
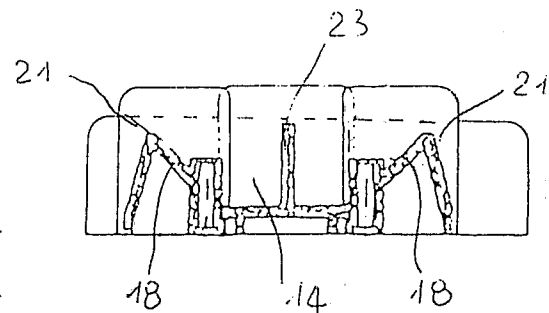


FIG. 7



0254690

FIG. 8

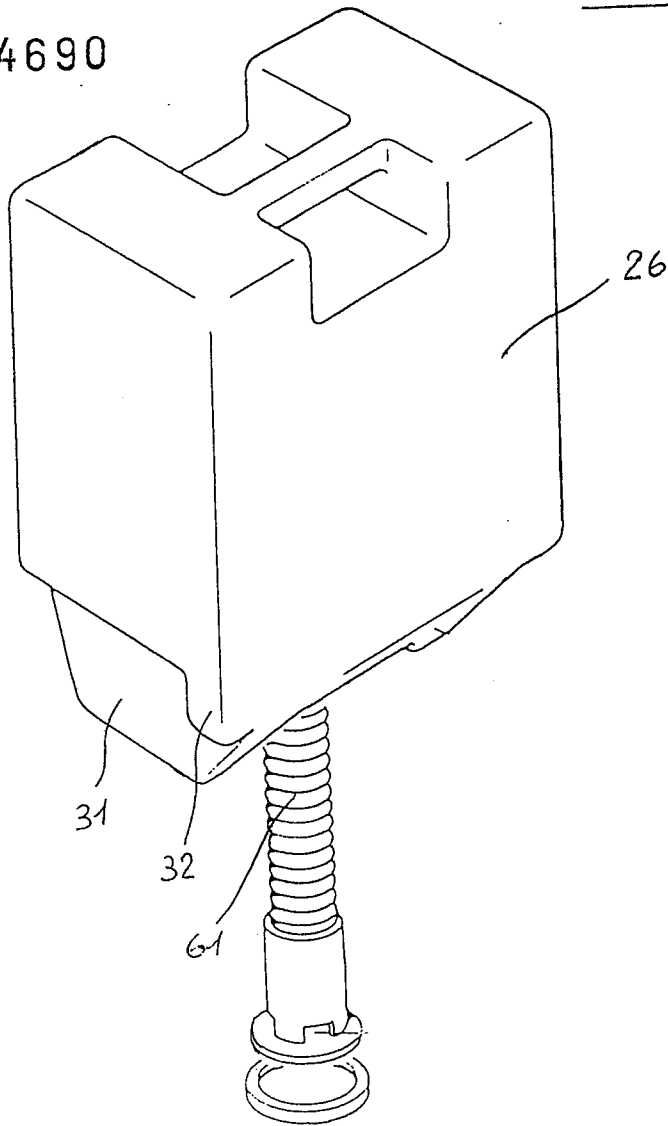
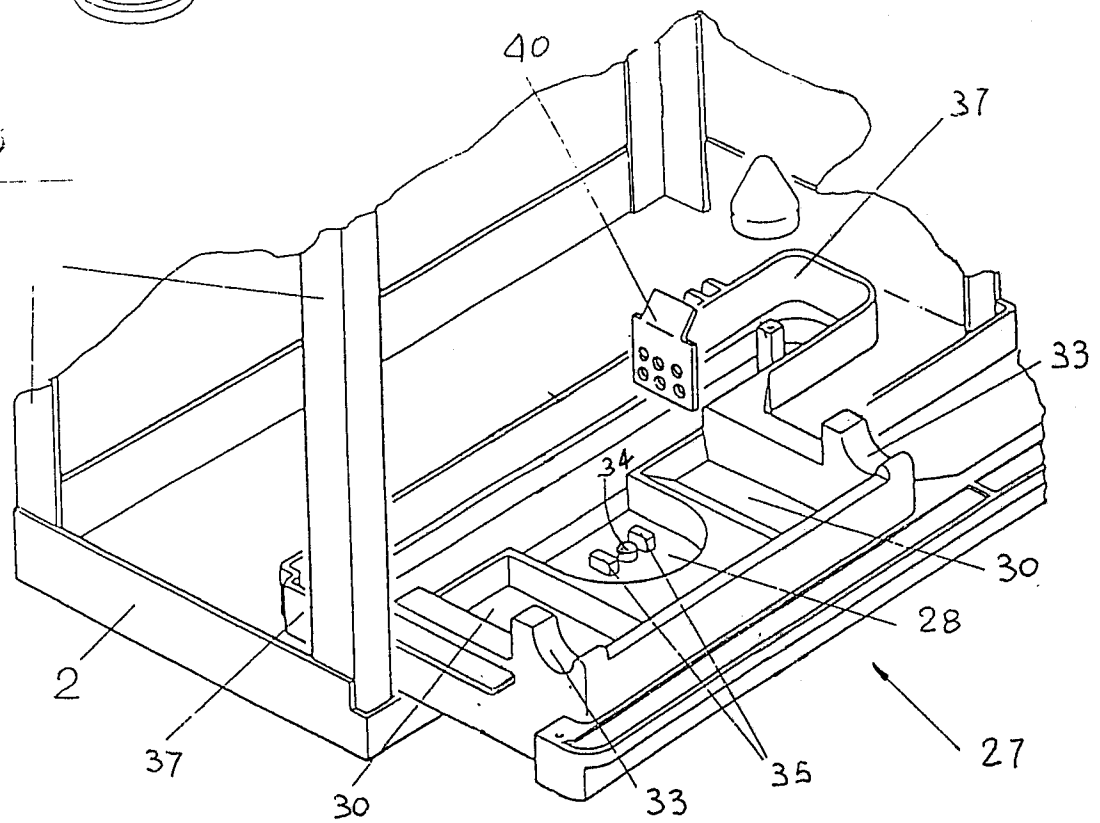
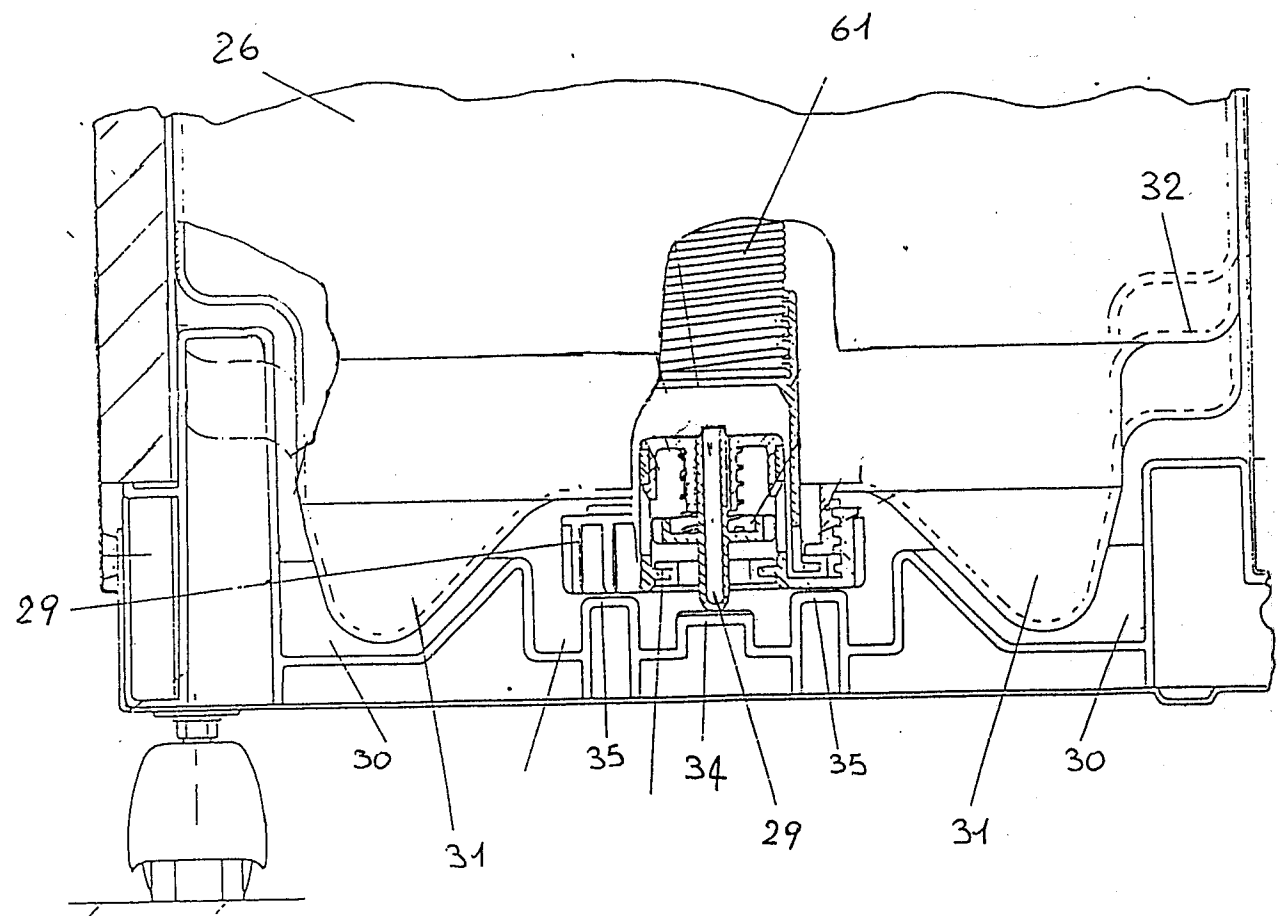


FIG. 9



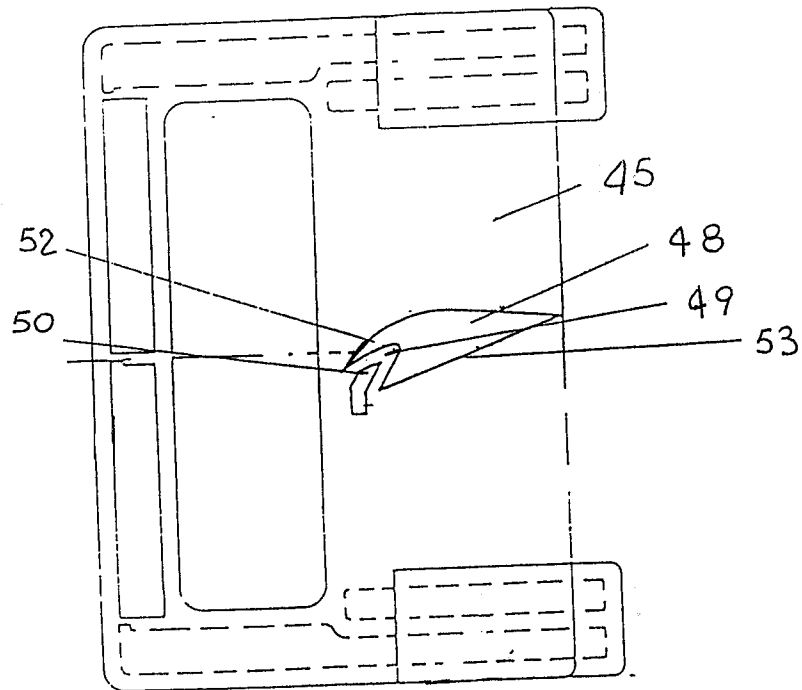
0254690

FIG. 10



0254690

FIG. 11



0254690

FIG. 12

