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(56) References cited:
**DE-A- 3 239 267**
**GB-A- 2 187 271**



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## Description

**[0001]** The present invention relates to an enclosed boiler and in particular to an enclosed boiler of the type comprising:

a base;

a top;

sidewall means extending between the base and the top and defining therewith an enclosure through which hot gases are led from a hot gas inlet to a flue gas outlet;

the sidewall means are generally rectangular in cross section and comprise a front portion, a rear portion and a pair of side portions extending between the front and rear portions;

hollow walls arranged for carrying hot water to be heated forming at least part of the portions comprising the sidewall means;

an accessway in the enclosure through which access is gained for cleaning; and

heat exchanger means within the enclosure for directing hot gases for the heat transfer as the gases are led through the enclosure.

**[0002]** Such a boiler is described and claimed in our European Patent Specification No. 0 616 676 (Alley Enterprises Limited). In particular this patent specification describes one particular type of heat exchanger means for mounting in the boiler, which heat exchanger means comprises:

at least two generally rectangular transverse baffle plate means extending transversely across the enclosure;

the transverse baffle plate means being spaced-apart one above the other to define therebetween a transverse flue gas passageway through which hot gases are led;

each transverse baffle plate means defining an opening;

the openings defined by adjacent transverse baffle plate means being offset;

the openings in one transverse baffle plate means defining an inlet through which hot gases are introduced into the transverse passageway and the opening defined by a following transverse baffle plate means defining an outlet through which the hot gases are led from the passageway; and

deflecting means associated with the transverse baffle plate means for directing hot gases for heat transfer as the gases are led through the passageway.

**[0003]** The present invention is directed towards providing an improved construction of such boiler and in particular to an improved heat exchanger means for such a boiler.

**[0004]** The principal problem being encountered by all these boilers at present is firstly the need to provide sufficient thermal efficiency and secondly to provide that thermal efficiency in the smallest possible space. As housing becomes more expensive, space utilisation becomes all the more important and indeed it is one of the major problems now being encountered by manufacturers of such boilers namely to provide a boiler of the minimum cubic capacity which at the same time can be relatively easily maintained and serviced generally. The present invention is directed towards providing such a boiler.

## Statements of Invention

**[0005]** This invention is characterised in that the heat exchanger means comprises:

an inner core mounted in the enclosure;

upright baffle plates between the core and the sidewall means defining gas passageways therebetween;

transversely arranged baffle plates sealing the passageways adjacent each end thereof;

a combustion gas inlet in a passageway communicating with the hot gas inlet;

a combustion gas outlet in another passageway communication with the flue gas outlet; and

each upright baffle plate having a transfer opening communication with an adjacent passageway, the openings being vertically offset to provide alternate rising and falling of passageways for the hot gases as they are led between combustion gas inlets and outlets around the core.

**[0006]** This arrangement of baffle plates ensures that a very high thermal efficiency is obtained in the boiler.

**[0007]** In one embodiment of the invention the core is substantially equi-spaced from the sidewall means. This has the advantage of ensuring that the heat transfer around the boiler is as constant as possible.

**[0008]** Preferably the core is rectangular in cross-sec-

tion. This has the advantage of ensuring that with a rectangular section boiler, as is common, the core mirrors the interior surface of the boiler such that the space between is of substantially constant cross-section, except at the four corners.

**[0009]** In one embodiment of the invention the combustion gas outlet communicates with the flue gas outlet via the core. This is a particularly efficient way of ensuring that you can have an equal number of passageways and permits the leading of the combustion gases through effectively 360° around the core.

**[0010]** In another embodiment of the invention the flue gas passageways communicating with the hot gas inlet and the flue gas outlet are opposite each other on either side of the core such that as flue gases are led around the flue through substantially 180°. While this doesn't allow quite the same length of travel around the core, it has the advantage of scavenging the boiler quicker.

**[0011]** In one embodiment of the invention the core is in the form of a cylinder. In certain circumstances, particularly if the enclosure of the boiler should be circular in cross-section such a construction would be advantageous.

**[0012]** In another embodiment of the invention the heat exchanger means comprises:

a top plate forming an upper transverse baffle plate;

a bottom plate forming a lower transverse baffle plate;

four rectangular core plates connecting the top and bottom plates to form an enclosed core; and

rectangular plates forming the upright baffle plates connected to the core and to at least one of the top and bottom plates and in which the transfer openings are provided by a gap between a transverse edge of the plate forming the upright baffle plate and the top or bottom plate.

**[0013]** This has been found to be a particularly suitable construction for fabrication.

**[0014]** In this latter embodiment preferably the bottom plate has an opening communicating with the interior of the core and an opening communicating with a passageway to form the combustion gas inlet and in which the top plate seals the core and has an opening communicating with a passageway to form the combustion gas outlet.

**[0015]** Alternatively,

the bottom plate seals the interior of the core and has an opening communicating with a passageway to form the combustion gas inlet;

the core communicates through an opening in one of the core plates with a passageway; and

the top plate has an opening communicating with the interior of the core to form the combustion gas outlet.

**[0016]** Both of these constructions are again particularly easy for manufacture and thus suitable for fabrication by most boiler manufacturers.

**[0017]** In another embodiment at least one of the transverse passageways sealing the core is a hollow wall for carrying hot water to be heated.

**[0018]** Preferably in this latter embodiment there is provided a boiler comprising:

a top plate formed from a hollow water carrying top wall sealing the core and three passageways;

a bottom plate forming a lower transverse baffle plate and having an opening connecting with the core;

four equi-spaced rectangular plates forming the upright baffle plates connected to the core;

an opening in the core adjacent the top wall feeding the passageway between the two plates, one of which plates connects between the bottom plate and the top and each of the other plates connects to only one of the top wall and the bottom plate; and

transfer openings provided by a gap between the transverse edge of the plates forming the baffle plates and the top wall or bottom plate.

**[0019]** Ideally the heat exchanger means forms a plurality of interconnecting parts for ease of removal. It will be appreciated that manufacturing the heat exchanger in a number of parts will facilitate removal in that the accessway provided can be smaller than is necessary if the heat exchanger is manufactured as one composite piece.

**[0020]** Ideally the core includes hollow walls arranged for carrying hot water to be heated. This further increases the heat transfer.

**[0021]** Ideally the cross-sectional area of the core is between 20% and 50% of the enclosure cross-sectional area.

**[0022]** Preferably the cross-sectional area of the passageway is greater than or equal to the cross-sectional of the transfer opening.

## Detailed Description of the Invention

**[0023]** The invention will be more clearly understood from the following description of some embodiments of the invention, given by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a perspective partially cut-away view of a

boiler according to the invention;

Fig. 2 is a partially exploded view from the rear of baffles forming heat exchanger means in accordance with the invention;

Fig. 3 is a diagrammatic plan view of the heat exchanger means mounted in the boiler;

Fig. 4 is a sectional view along the lines IV-IV of Fig. 3;

Fig. 5 is a sectional view along the lines V-V of Fig. 3;

Fig. 6 is a plan view similar to Fig. 3 of an alternative arrangement of heat exchanger means according to the invention;

Fig. 7 is a cross-sectional view along the lines VII-VII of Fig. 6;

Fig. 8 is a cross-sectional view along the lines VIII-VIII of Fig. 6;

Fig. 9 is a cross-sectional view along the lines IX-IX of Fig. 6;

Fig. 10 is a plan view similar to Fig. 3 of an alternative arrangement;

Fig. 11 is a cross-sectional view along the line XI-XI of Fig. 10;

Fig. 12 is a plan view similar to Fig. 3 of a further alternative arrangement;

Fig. 13 is a plan view similar to Fig. 3 of a still further alternative arrangement;

Fig. 14 is a perspective partially exploded view of another construction of boiler according to the invention;

Fig. 15 is a perspective view of portion of an alternative construction of heat exchanger means according to the invention;

Fig. 16 is a plan view similar to Fig. 3 of the arrangement of the heat exchanger means of Fig. 13;

Fig. 17 is a perspective view of an alternative construction of boiler according to the invention;

Fig. 18 is a plan view similar to Fig. 3 of the heat exchanger means of the boiler of Fig. 15;

Fig. 19 is a sectional view along the lines XVII-XVII of Fig. 16;

Fig. 20 is a sectional view along the lines XVIII-XVIII of Fig. 16;

Fig. 21 is a front view of a wall mounted boiler according to the invention;

Fig. 22 is a vertical section through the boiler of Fig. 21;

Fig. 23 is a horizontal section similar to Fig. 3;

Fig. 24 is a perspective view of the heat exchanger means used in the boiler; and

Fig. 25 is a view similar to Fig. 23 of a still further construction of wall mounted boiler.

**[0024]** Referring to the drawings and initially to Figs. 1 to 5 thereof, there is illustrated an enclosed boiler according to the invention indicated generally by the reference numeral 1. The boiler 1 is of generally rectangular shape in cross-section and comprises a base 2, a top 3 and sidewall means extending between the base 2 and top 3. The sidewalls means are water carrying sidewall tanks and comprise a rear front and side portions formed from a main rear tank 4, a main front tank 5 and a pair of main side tanks 6 and 7 respectively. These define an enclosure within which is mounted a heat exchanger means indicated generally by the reference numeral 10 through which flame and hot gases are led from a hot gas inlet supplied by an oil burner 12 to a flue gas outlet 13 feeding an exhaust gas flue 15. Water is circulated through the tanks 4, 5, 6 and 7 by a water circulating pump from a water inlet to a water outlet all of which is not shown. Typically these would feed a hot water central heating system. The top 3 has an accessway 16 with a removable cover 17 through which access is gained for the maintenance and cleaning of the boiler as will be described below.

**[0025]** The heat exchanger means 10 which is illustrated in more detail in Fig. 2 comprises a removable top plate 20 forming an upper transverse baffle plate and a bottom plate 21 forming a lower transverse baffle plate. Four rectangular core plates 22 forming a core 23 are mounted on the bottom plate 21. A plurality of rectangular plates 24 forming baffle plates extend outwardly from the core 23. The plates 24 and the various tanks 4, 5, 6 and 7 define with the core 23 gas passageways. The gas passageways are identified by the reference letter U for gas passageways in which the gas rises and by the reference letter D for gas passageways within which the gas falls and by various numerals to distinguish the various gas passageways U and D from each other. Any gas passageway which forms the entrance to the heat exchanger means 10 is identified by the letters ENT and the reference letter D or U as appropriate and similarly

the gas passageway forming the last passageway before the hot gases exit the heat exchanger means 10 is identified by the additional letters EX. Each plate 24 is connected to either the top plate 20 or the bottom plate 21 and is spaced apart from at least one of them, such that a transverse opening 25 is provided by a gap between the transverse edge of the plate 24 forming the upright baffle plate and the top plate 20, or the bottom plate 21. In this embodiment the bottom plate 21 has an opening 26 communicating with the interior of the core 23 and an opening 27 communicating with the passageway UEN (see Fig. 4) to form a combustion gas inlet. The top plate 20 seals the core 23 and has an opening 28 communicating with the passageway UEX to form a combustion gas outlet which as can be seen from Fig. 1 communicates with a space above the top plate 20 and beneath the top 3.

**[0026]** In the drawings sectional lines are only shown where clarity requires them.

**[0027]** In use, the burner 12 delivers flame through the hot gas inlet 11 beneath the bottom plate 21 and up through opening 27 into the passageway UEN and across into the passageway D1 through the opening 25 in the plate 24 between the passageway UEN and the passageway D1. This can be seen clearly from Fig. 4. The hot gases are delivered down the passageway D1 to the bottom of the passageway D1 to the opening 25 where they enter the passageway U1 as can be seen from Fig. 5. From thence the hot gases pass up the passageway U1 through the opening 25 into the passageway D2 and down the passageway D2. They are then delivered out the passageway D2 through the opening 25 into the passageway UEX and out the heat exchanger means 10 through the opening 28. Similarly hot gases are delivered up the passageway UEN into the passageway D3 and hence from the passageway D3 to the passageway U2 to D4 and again then to UEX. The gases have thus split around the core 23 and have traveled up and down the main rear tank 4, the main front tank 5 and the side tanks 6 and 7.

**[0028]** Because of the arrangement of the various baffle plates a very high heat transfer efficiency is obtained because the hot gases travel a considerable distance over the surface of the water carrying tanks of the boiler giving a large proportion of their heat before discharge to the exhaust gas flue.

**[0029]** For cleaning the cover 17 is removed and the top plate 20 and then the rest of the heat exchanger means 10 is removed from the boiler 1.

**[0030]** Referring now to Figs. 6 to 9 inclusive, there is illustrated an alternative construction of boiler indicated generally by the reference numeral 30 in which parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment it can be seen clearly the flue gases are carried the whole way around the core 23. In this embodiment the hot gases enter through the passageway UENT and then proceed down the passageway D1 up the passageway U1 down the passageway D2 and alternatively up and down the passageways D1 to D5 and from D5 they are delivered into the passageway UEXT where they are delivered out the flue. The advantage of this arrangement is that the gas has now been led effectively round 360° rather than 180° of the embodiment of Figs. 1 to 5 inclusive.

**[0031]** Referring now to Figs. 10 and 11 there is illustrated an alternative construction of boiler indicated generally by the reference numeral 40 and again parts similar to those described with reference to the previous drawings are identified by the same reference numerals.

**[0032]** Referring to Fig. 12 there is illustrated in plan view another arrangement of boiler indicated generally by the reference numeral 50 and again parts similar to those described with reference to the previous drawings are identified by the same reference numerals. The operation can be readily easily seen and doesn't require any further explanation.

**[0033]** .Fig. 13 illustrates a still further construction of boiler indicated generally by the reference numeral 60 again in which the gases are led through almost 360°.

**[0034]** Referring to Fig. 14 there is illustrated a still further construction of boiler indicated generally by the reference numeral 70 and again parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment there is provided an accessway 71 in the main front tank 5 into which can be inserted a heat exchanger identified by the reference numeral 72 this is identical in every respect to the heat exchanger means 10 except that it is constructed in a number of separate pieces to allow ease of insertion and removal.

**[0035]** Referring to Figs. 15 and 16 there is illustrated a still further construction of boiler indicated generally by the reference numeral 80 in which parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment there is provided a heat exchanger means indicated generally by the reference numeral 81 having a cylinder like core 82 and a plurality of radially arranged upright baffle plates 83 and 84. The plate 84 extends between the top and bottom transverse baffle plates.

**[0036]** Referring to Fig. 17 there is illustrated a still further construction of boiler indicated generally by the reference numeral 90 again parts which are similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment there is provided an inner core 91 in the form of a water carrying tank against which are mounted a plurality of baffle plates 92. It will be appreciated that the baffle plates 92 cannot in this embodiment be affixed permanently to the core 91, but will preferably be mounted thereon by, for example, being slotted into grooves or the like on the outer surface thereof.

**[0037]** Referring now to Figs. 18 to 20 there is illustrated a still further construction of boiler indicated generally by the reference numeral 100, again parts similar

to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment all the passageways are the same size and the bottom of the core 23 is sealed by the bottom plate 21 and the exhaust gases are delivered from the passageway UEN right through to the passageway U5 and from the passageway U5 to the top of the passageway DEX where they are delivered down the passageway DEX through an opening 101 into the core 23 of the boiler and through an opening 102 in the top plate 20 to the gas flue 15.

**[0038]** Referring to Figs. 21 to 24 inclusive there is illustrated an alternative construction of wall mounted boiler indicated generally by the reference numeral 110, in this embodiment parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment the oil burner 12 is mounted below the base 2 and the front tank 5 contains an accessway having a removable cover 111 to allow access into the enclosure. Within the accessway is mounted a heat exchanger means 112. The heat exchanger means 112 comprises a top plate formed from a hollow water carrying top wall 113 which is connected to the main side tank 6. The heat exchanger means 112 is also provided with a bottom plate 114 communicating through an opening 115 with a hollow cylindrical core 116 from which project radially outwards four equi-spaced rectangular plates 117 and 118. The plates 117 are again provided with openings 25, however, it will be noted that the plate 118 connects between both the top wall 113 and the bottom plate 114 forming the lower transverse baffle plate. The core 116 is provided with an opening 119 adjacent the top wall 113. The core 116 effectively forms the entrance passageway and feeds through the opening 119 into the passageway D1 as is shown clearly in Figs. 22 and 24.

**[0039]** Referring to Fig. 25 there is illustrated in a view similar to Fig. 24 an alternative construction of wall hung boiler indicated generally by the reference numeral 120 in which parts similar to those described with reference to the previous drawings are identified by the same reference numerals. This boiler 120 is essentially identical to the boiler illustrated in Figs. 22 to 24 inclusive, except that instead of a cylindrical core, there is provided a rectangular core 121.

**[0040]** It has been found that ideally the cross-sectional area of the core is between 20 and 50% of the enclosure cross-sectional area. This ensures that most of the hot gases are directed against the boiler walls and not carried out the boiler without adequate heat transfer having occurred. Preferably the cross-sectional area of the passageway is greater than or equal to the cross-sectional area of the transfer opening. This has been found to provide sufficient slowing down of the gases to ensure that sufficient time is taken for the hot gases in the boiler to ensure adequate heat transfer.

**[0041]** It is envisaged that instead of just the one heat exchanger means such as is illustrated in Fig. 2, that more than one heat exchanger means could be mounted one on top of the other. For example, the heat exchanger means 10 of Fig. 2 could be mounted on top of another heat exchanger means 10 as long as they were reversed. Thus, two double layers of gases passing both horizontally and vertically could be achieved.

**[0042]** In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

**[0043]** The invention is not limited to the embodiment hereinbefore described, but may be varied in both construction and detail within the scope of the claims.

## Claims

**1.** An enclosed boiler (1,60,70,80,100,110,120) of the type comprising:

a base (2);

a top (3);

sidewall means (4,5,6,7) extending between the base (2) and the top (3) and defining therewith an enclosure through which hot gases are led from a hot gas inlet (11) to a flue gas outlet (15);

the sidewall means (4,5,6,7) are generally rectangular in cross section and comprise a front portion (5), a rear portion (4) and a pair of side portions (6,7) extending between the front and rear portions (5,4);

hollow walls arranged for carrying hot water to be heated forming at least part of the portions comprising the sidewall means (4,5,6,7);

an accessway (16) in the enclosure through which access is gained for cleaning; and

heat exchanger means (10) within the enclosure for directing hot gases for the heat transfer as the gases are led through the enclosure, **characterised in that** the heat exchanger means (10) comprises:

an inner core (23) mounted in the enclosure;

upright baffle plates (24) between the core (23) and the sidewall means (4,5,6,7) defining gas passageways (U,D) therebetween;

transversely arranged baffle plates (20,21) sealing the passageways adjacent each end thereof;

a combustion gas inlet (27) in a passageway (UEN) communicating with the hot gas inlet (11);

a combustion gas outlet (28) in another passageway (UEX) communicating with the flue gas outlet (15); and

each upright baffle plate (24) having a transfer opening (25) communicating with an adjacent passageway (U,D), the openings (25) being vertically offset to provide alternate rising and falling of passageways (U,D) for the hot gases as they are led between the combustion gas inlet (27) and outlet (28) around the core.

**2.** A boiler as claimed in claim 1 in which the core (23) is substantially equi-spaced from the sidewall means (4,5,6,7).

**3.** A boiler as claimed in claim 1 or 2 in which the core (23) is rectangular in cross-section.

**4.** A boiler as claimed in any preceding claim in which the combustion gas outlet (28) communicates with the flue gas outlet (15) via the core (23).

**5.** A boiler as claimed in any preceding claim in which the passageways (UENT,UEX) communicating with the hot gas inlet (27) and the flue gas outlet (28) are adjacent each other and the flue gases are led around the flue through substantially 360°.

**6.** A boiler as claimed in any of claims 1 to 4 in which the flue gas passageways (UENT, UEX) communicating with the hot gas inlet (27) and the flue gas outlet (28) are opposite each other on either side of the core (23) such that as flue gases are led around the flue through substantially 180°.

**7.** A boiler as claimed in any preceding claim in which the core (83) is in the form of a cylinder.

**8.** A boiler as claimed in any of claims 1 to 6 in which the heat exchanger means (10) comprises:

a top plate (20) forming an upper transverse baffle plate;

a bottom plate (21) forming a lower transverse baffle plate;

four rectangular core plates (22) connecting the top and bottom plates (20,21) to form an enclosed core (23); and

rectangular plates (24) forming the upright baffle plates connected to the core (23) and to at least one of the top and bottom plates (20,21) and in which the transfer openings (25) are provided by a gap between a transverse edge of the plate (24) forming the upright baffle plate and the top or bottom plate (20,21).

**9.** A boiler as claimed in claim 8 in which the bottom plate (21) has an opening (26) communicating with the interior of the core (23) and an opening (27) communicating with a passageway (UEN) to form the combustion gas inlet and in which the top plate (20) seals the core (23) and has an opening (28) communicating with a passageway (UEN) to form the combustion gas outlet (28).

**10.** A boiler as claimed in claim 8 in which:

the bottom plate (21) seals the interior of the core (23) and has an opening (27) communicating with a passageway (UEN) to form the combustion gas inlet;

the core (23) communicates through an opening (101) in one of the core plates (22) with a passageway (DEX); and

the top plate (20) has an opening communicating (102) with the interior of the core (23) to form the combustion gas outlet.

**11.** A boiler as claimed any of claims 1 to 6 in which at least one of the transverse passageways sealing the core (116) is a hollow wall (113) for carrying hot water to be heated.

**12.** A boiler as claimed in claim 11 comprising:

a top plate formed from a hollow water carrying top wall (113) sealing the core (116) and three passageways (U,D);

a bottom plate (114) forming a lower transverse baffle plate and having an opening (115) connecting with the core (116);

four equi-spaced rectangular plates (117,118) forming the upright baffle plates connected to the core (116);

an opening (119) in the core (116) adjacent the top wall (113) feeding the passageway between the two plates (117,118), one of which plates (118) connects between the bottom plate (114)

and the top (113) and each of the other plates (117) connects to only one of the top wall (113) and the bottom plate (114); and

transfer openings (25) provided by a gap between the transverse edge of the plates (117) forming the baffle plates and the top wall (113) or bottom plate (114).

**13.** A boiler as claimed in any preceding claim in which the heat exchanger means (10,72) forms a plurality of interconnecting parts for ease of removal.

**14.** A boiler as claimed in any preceding claim in which the core (23) includes hollow walls (91) arranged for carrying hot water to be heated.

**15.** A boiler as claimed in any preceding claim in which the cross-sectional area of the core (23) is between 20% and 50% of the enclosure cross-sectional area.

**16.** A boiler as claimed in any preceding claim in which the cross-sectional area of the passageway (U,D) is greater than or equal to the cross-sectional of the transfer opening (25).

**Patentansprüche**

**1.** Umschlossener Boiler (1, 60, 70, 80, 100, 110, 120) des Typs, der umfasst:

einen Grundteil (2);

ein Oberteil (3),

Seitenwandmittel (4, 5, 6, 7), die sich zwischen dem Grundteil (2) und dem Oberteil (3) erstrekken und damit eine Umschließung begrenzen, durch die heiße Gase aus einem Heißgaseinlass (11) zu einem Rauchgasauslass (15) geführt werden;

wobei die Seitenwandmittel (4, 5, 6, 7) einen allgemein rechteckigen Querschnitt haben und einen Vorderabschnitt (5), einen Rückabschnitt (4) und ein Paar Seitenabschnitte (6, 7) aufweisen, die sich zwischen dem Vorder- und Rückabschnitt (5, 4) erstrecken;

hohle Wände, die zum Tragen von zu erhitzendem heißem Wasser eingerichtet sind und die zumindest einen Teil der Abschnitte bilden, welche die Seitenwandmittel (4, 5, 6, 7) aufweisen;

einen Zugangsweg (16) in der Umschließung, durch den Zugang für Reinigung erhalten wird;

Wärmetauschmittel (10) innerhalb der Umschließung zum Leiten heißer Gase für die Wärmeübertragung, wenn die Gase durch die Umschließung geleitet werden, **dadurch gekennzeichnet, dass** das Wärmetauschmittel (10) umfasst:

einen inneren Kern (23), der in der Umschließung angebracht ist;

aufrechtstehende Prallplatten (24) zwischen dem Kern (23) und den Seitenwandmitteln (4, 5, 6, 7), die Gasdurchgangswege (U, D) dazwischen begrenzen;

quer angeordnete Prallplatten (20, 21), die die Durchgangswege angrenzend an jedes Ende derselben abdichten;

einen Verbrennungsgaseinlass (27) in einem Durchgangsweg (UEN), der mit dem Heißgaseinlass (11) kommuniziert;

einen Verbrennungsgasauslass (28) in einem anderen Durchgangsweg (UEX), der mit dem Rauchgasauslass (15) kommuniziert; und

wobei jede aufrechtstehende Prallplatte (24) eine Übertragungsöffnung (25) aufweist, die mit einem angrenzenden Durchgangsweg (U, D) kommuniziert, und die Öffnungen (25) vertikal versetzt sind, um abwechselndes Ansteigen und Abfallen der Durchgangswege (U, D) für die heißen Gase zu schaffen, wenn diese zwischen dem Verbrennungsgaseinlass (27) und Auslass (28) um den Kern geführt werden.

**2.** Boiler nach Anspruch 1, bei dem der Kern (23) sich im wesentlichen im gleichen Abstand zu den Seitenwandmitteln (4, 5, 6, 7) befindet.

**3.** Boiler nach Anspruch 1 oder 2, bei dem der Kern (23) einen rechteckigen Querschnitt aufweist.

**4.** Boiler nach einem vorhergehenden Anspruch, bei dem der Verbrennungsgasauslass (28) mit dem Rauchgasauslass (15) über den Kern (23) kommuniziert.

**5.** Boiler nach einem vorhergehenden Anspruch, bei dem die Durchgangswege (UENT, UEX), die mit dem Heißgaseinlass (27) und dem Rauchgasauslass (28) kommunizieren, einander benachbart angeordnet sind und die Rauchgase um den Heizzug über im wesentlichen 360° herum geführt werden.

6. Boiler nach einem der Ansprüche 1 bis 4, bei dem die Rauchgasdurchgangswege (UENT, UEX), die mit dem Heißgaseinlass (27) und dem Rauchgasauslass (28) kommunizieren, einander auf jeder Seite des Kerns (23) gegenüberliegen, so dass Rauchgase um den Heizzug über im wesentlichen 180° herum geleitet werden.

7. Boiler nach einem vorhergehenden Anspruch, bei dem der Kern (83) in Form eines Zylinders vorliegt.

8. Boiler nach einem der Ansprüche 1 bis 6, bei dem das Wärmetauschmittel (10) umfasst:

eine obere Platte (20), die eine obere Querprallplatte bildet;

eine untere Platte (21), die eine untere Querprallplatte bildet;

vier rechteckige Kernplatten (22), die die obere und untere Platte (20, 21) zum Bilden eines umschlossenen Kerns (23) verbinden; und

rechteckige Platten (24), die die aufrechtstehenden Prallplatten bilden, welche mit dem Kern (23) und mindestens einer der oberen und unteren Platte (20, 21) verbunden sind, und in denen die Übertragungsöffnungen (25) durch einen Spalt zwischen einer Querkante der die aufrechtstehende Prallplatte bildenden Platte (24) und der oberen oder unteren Platte (20, 21) bereitgestellt sind.

9. Boiler nach Anspruch 8, bei dem die untere Platte (21) eine Öffnung (26), die mit dem Innenraum des Kerns (23) kommuniziert, und eine Öffnung (27) umfasst, die mit einem Durchgangsweg (UEN) zum Bilden des Verbrennungsgaseinlasses kommuniziert, und bei dem die obere Platte (20) den Kern (23) abdichtet und eine Öffnung (28) aufweist, die mit einem Durchgangsweg (UEN) zum Bilden des Verbrennungsgasauslasses (28) kommuniziert.

10. Boiler nach Anspruch 8, bei dem

die untere Platte (21) den Innenraum des Kerns (23) abdichtet und eine Öffnung (27) aufweist, die mit einem Durchgangsweg (UEN) zum Bilden des Verbrennungsgaseinlasses kommuniziert;

der Kern (23) durch eine Öffnung (101) in einer der Kernplatten (22) mit einem Durchgangsweg (DEX) kommuniziert; und

die obere Platte (20) eine Öffnung (102) umfasst, die mit dem Innenraum des Kerns (23) zum Bilden des Verbrennungsgasauslasses kommuniziert.

11. Boiler nach einem der Ansprüche 1 bis 6, bei dem mindestens einer der Querdurchgangswege, die den Kern (116) abdichten, eine hohle Wand (113) zum Tragen von zu erhitzendem heißem Wasser darstellt.

12. Boiler nach Anspruch 11, umfassend:

eine obere Platte, die aus einer hohlen, wassertragenden oberen Wand (113), die den Kern (116) abdichtet, und drei Durchgangswegen (U, D) gebildet wird;

eine untere Platte (114), die eine untere Querprallplatte bildet und eine Öffnung (115) aufweist, die mit dem Kern (116) verbunden ist;

vier gleich beabstandete rechteckige Platten (117, 118), die die aufrechtstehenden, mit dem Kern (116) verbundenen Prallplatten bilden;

eine Öffnung (119) in dem Kern (116) angrenzend an die obere Wand (113), die den Durchgangsweg zwischen den beiden Platten (117, 118) speist, wobei eine der Platten (118) zwischen der unteren Platte (114) und der oberen (113) verbunden ist und jede der anderen Platten (117) mit nur einer der oberen Wand (113) und der unteren Platte (114) verbunden ist; und

Übertragungsöffnungen (25), die durch einen Spalt zwischen der Querkante der Platten (117), die die Prallplatten bilden, und der oberen Wand (113) oder unteren Platte (114) bereitgestellt werden.

13. Boiler nach einem vorhergehenden Anspruch, bei dem das Wärmetauschmittel (10, 72,) eine Mehrzahl miteinander verbundener Teile zur Entfernungsleichtigkeit bildet.

14. Boiler nach einem vorhergehenden Anspruch, bei dem der Kern (23) hohle Wände (91) einschließt, die zum Tragen von zu erhitzendem heißem Wasser eingerichtet sind.

15. Boiler nach einem vorhergehenden Anspruch, bei dem die Querschnittsfläche des Kerns (23) zwischen 20% und 50% der Umschließungsquerschnittsfläche beträgt.

16. Boiler nach einem vorhergehenden Anspruch, bei dem die Querschnittsfläche des Durchgangswegs (U, D) größer oder gleich dem Querschnitt der Übertragungsöffnung (25) ist.

**Revendications**

**1.** Chaudière blindée (1, 60, 70, 80, 100, 110, 120) du type comprenant :

une base (2) ;

un haut (3) ;

des moyens de parois latérales (4, 5, 6, 7) qui s'étendent entre la base (2) et le haut (3) et définissant avec ces postes une enceinte à travers laquelle des gaz chauds sont acheminés à partir d'un orifice d'entrée de gaz chauds (11) vers un orifice de sortie de gaz brûlés (15) ;

les moyens de parois latérales (4, 5, 6, 7) ont généralement une coupe transversale rectangulaire et se composent d'une portion frontale (5), d'une portion arrière (4) et d'une paire de portions latérales (6, 7) qui s'étendent entre les portions frontale et arrière (5, 4) ;

des parois creuses qui sont agencées de manière à acheminer de l'eau chaude destinée à être chauffée, qui constituent au moins une partie des portions comprenant les moyens de parois latérales (4, 5, 6, 7) ;

un passage d'accès (16), prévu dans l'enceinte, à travers lequel on peut obtenir un accès pour effectuer le nettoyage ; et

un moyen échangeur de chaleur (10), prévu dans l'enceinte, afin de diriger les gaz chauds destinés au transfert de chaleur, au fur et à mesure que les gaz sont acheminés à travers l'enceinte, **caractérisée en ce que** le moyen échangeur de chaleur (10) comprend :

un noyau interne (23) qui est monté dans l'enceinte ;

des plaques déflectrices verticales (24) situées entre le noyau (23) et les moyens de parois latérales (4, 5, 6, 7) qui définissent entre eux des passages de gaz (U, D) ;

des plaques déflectrices agencées dans le plan transversal (20, 21) qui assurent le scellement des passages de façon adjacente à chaque extrémité de celles-ci ;

un orifice d'entrée de gaz de combustion (27) dans un passage (UEN) qui communique avec l'orifice d'entrée de gaz chauds (11) ;

un orifice de sortie de gaz de combustion (28) dans un autre passage (UEX) qui communique avec l'orifice de sortie des gaz brûlés (15) ; et

chaque plaque déflectrice verticale (24) est munie d'une ouverture de transfert (25) laquelle communique avec un passage adjacent (U, D), les ouvertures (25) étant décalées dans le plan vertical afin d'offrir des montées et des descentes alternantes pour les passages (U, D) pour les gaz chauds au fur et à mesure qu'ils sont acheminés entre l'orifice d'entrée (27) et l'orifice de sortie (28) des gaz de combustion autour du noyau.

**2.** Chaudière, selon la revendication 1, dans laquelle le noyau (23) est essentiellement équidistant des moyens de parois latérales (4, 5, 6, 7).

**3.** Chaudière, selon la revendication 1 ou 2, dans laquelle le noyau (23) a une coupe transversale rectangulaire.

**4.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle l'orifice de sortie de gaz de combustion (28) communique avec l'orifice de sortie de gaz brûlés (15) par l'intermédiaire du noyau (23).

**5.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle les passages (UENT, UEX) communiquant avec l'orifice d'entrée de gaz chauds (27) et l'orifice de sortie de gaz brûlés (28) sont adjacents l'un de l'autre et les gaz brûlés sont amenés autour de la conduite d'évacuation en décrivant essentiellement 360°.

**6.** Chaudière, selon l'une quelconque des revendications 1 à 4, dans laquelle les passages des gaz brûlés (UENT, UEX) communiquant avec l'orifice d'entrée de gaz chauds (27) et l'orifice de sortie de gaz brûlés (28) se trouvent l'un en face de l'autre de part et d'autre du noyau (23) de sorte que les gaz brûlés sont amenés autour de la conduite d'évacuation en décrivant essentiellement 180°.

**7.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle le noyau (83) se présente sous la forme d'un cylindre.

**8.** Chaudière, selon l'une quelconque des revendications 1 à 6, dans laquelle le moyen échangeur de chaleur (10) comprend :

une plaque supérieure (20) qui constitue une plaque déflectrice transversale supérieure;

une plaque inférieure (21) qui constitue une plaque déflectrice transversale inférieure ;

quatre plaques de noyau rectangulaires (22) qui raccordent les plaques supérieure et inférieure (20, 21) afin de former un noyau blindé (23) ; et

des plaques rectangulaires (24) qui constituent les plaques déflectrices verticales raccordées au noyau (23) et à l'une au moins des plaques supérieure et inférieure (20,21), et dans laquelle les ouvertures de transfert (25) sont mises à disposition par un intervalle entre un bord transversal de la plaque (24) constituant la plaque déflectrice verticale et la plaque supérieure ou inférieure (20, 21).

**9.** Chaudière, selon la revendication 8, dans laquelle la plaque inférieure (21) possède une ouverture (26) qui communique avec le volume intérieur du noyau (23) ainsi qu'une ouverture (27) qui communique avec un passage (UEN) afin de constituer l'orifice d'entrée des gaz de combustion et dans laquelle la plaque supérieure (20) scelle le noyau (23) et possède une ouverture (28) qui communique avec un passage (UEN) afin de constituer l'orifice de sortie des gaz de combustion (28).

**10.** Chaudière, selon la revendication 8, dans laquelle :

la plaque inférieure (21) scelle le volume intérieur du noyau (23) et possède une ouverture (27) qui communique avec un passage (UEN) afin de constituer l'orifice d'entrée des gaz de combustion ;

le noyau (23) communique avec un passage (DEX) par l'intermédiaire d'une ouverture (101) pratiquée dans l'une des plaques de noyau (22) ; et

la plaque supérieure (20) possède une ouverture qui communique (102) avec le volume intérieur du noyau (23) afin de constituer l'orifice de sortie des gaz de combustion.

**11.** Chaudière, selon l'une quelconque des revendications 1 à 6, dans laquelle l'un au moins des passages transversaux qui scellent le noyau (116) est une paroi creuse (113) pour acheminer l'eau chaude destinée à être chauffée.

**12.** Chaudière, selon la revendication 11, comprenant :

une plaque supérieure fabriquée à partir d'une paroi supérieure creuse acheminant de l'eau (113), qui scelle le noyau (116) ainsi que trois passages (U, D) ;

une plaque inférieure (114) constituant une plaque déflectrice transversale inférieure et qui possède une ouverture (115) qui est raccordée au noyau (116);

quatre plaques rectangulaires équidistantes (117, 118) constituant les plaques déflectrices verticales qui sont raccordées au noyau (116) ;

une ouverture (119) dans le noyau (116), adjacente à la paroi supérieure (113), qui alimente le passage entre les deux plaques (117, 118), alors que l'une des plaques (118) assure le raccordement entre la plaque inférieure (114) et le haut (113), et chacune des autres plaques (117) est raccordée à seulement l'un des postes suivants : soit la paroi supérieure (113) soit la plaque inférieure (114) ; et

des ouvertures de transfert (25) mises à disposition par un intervalle entre le bord transversal des plaques (117) constituant les plaques déflectrices et la paroi supérieure (113) ou la plaque inférieure (114).

**13.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle le moyen échangeur de chaleur (10, 72) forme une pluralité de pièces interconnectées afin de faciliter la dépose.

**14.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle le noyau (23) inclut des parois creuses (91) qui sont agencées pour acheminer l'eau chaude destinée à être chauffée.

**15.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle la superficie de la coupe transversale du noyau (23) représente entre 20% et 50% de la superficie de la coupe transversale de l'enceinte.

**16.** Chaudière, selon l'une quelconque des revendications précédentes, dans laquelle la superficie de la coupe transversale du passage (U, D) est supérieure, ou égale, à la coupe transversale de l'ouverture de transfert (25).

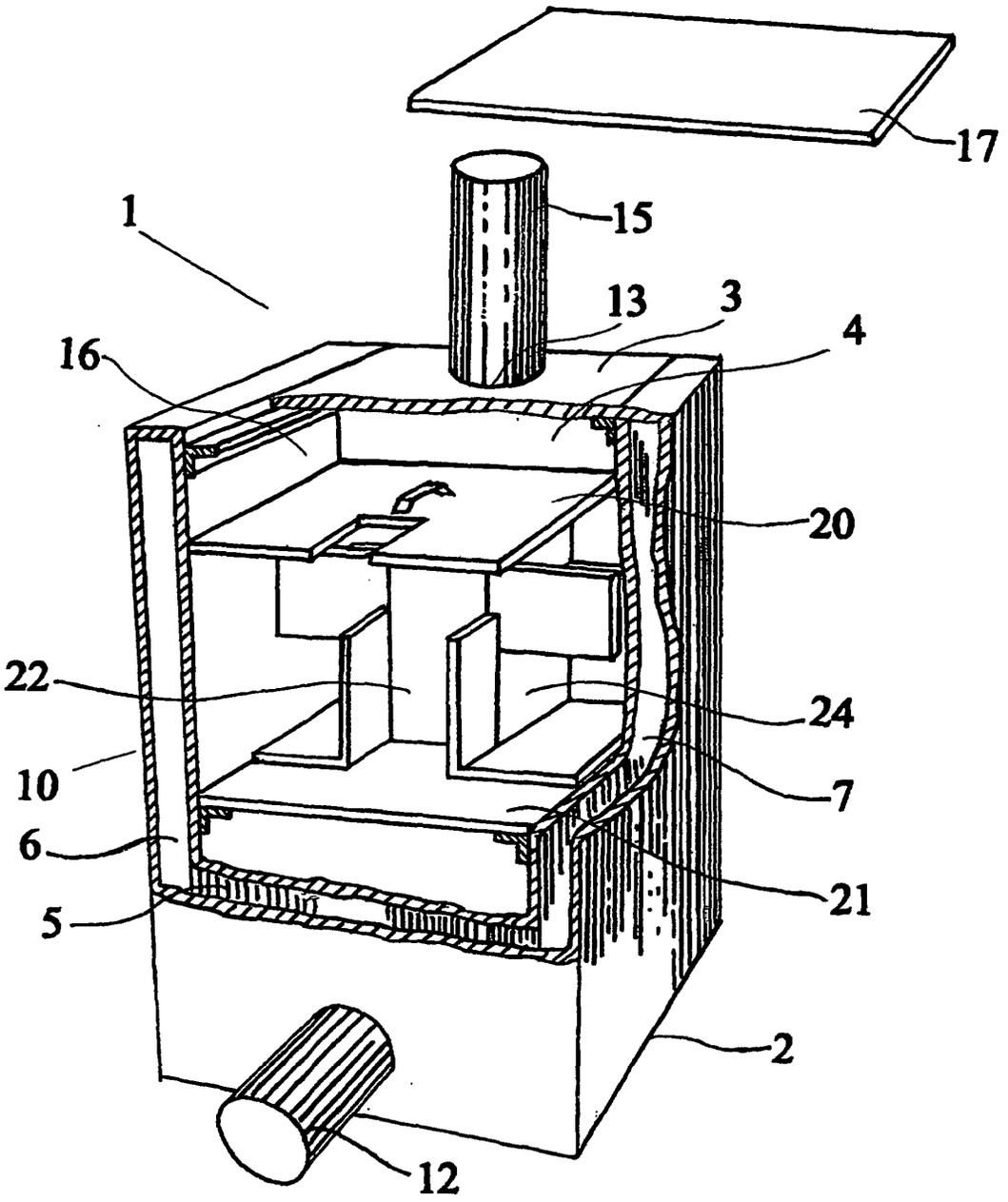


Fig. 1

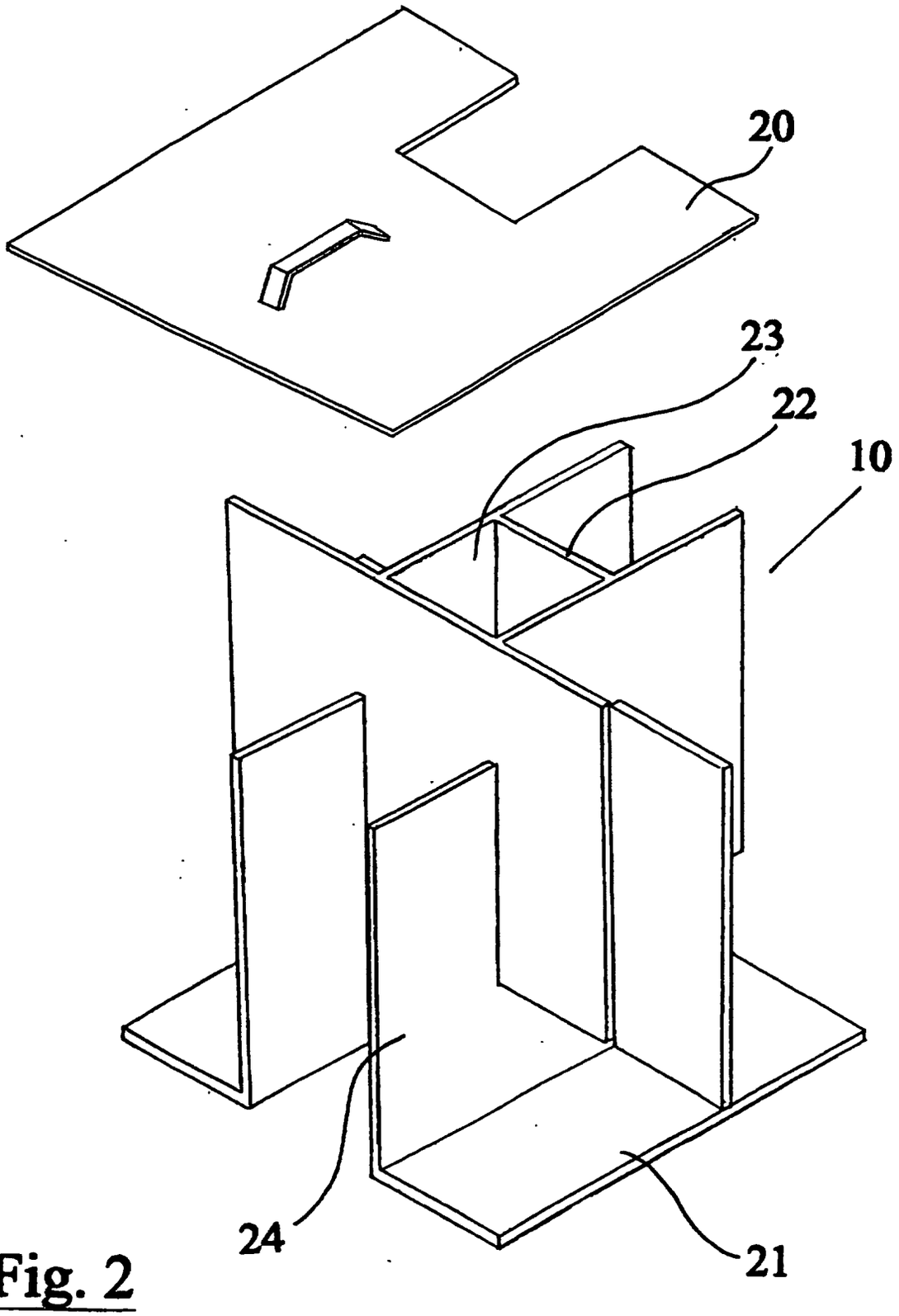


Fig. 2

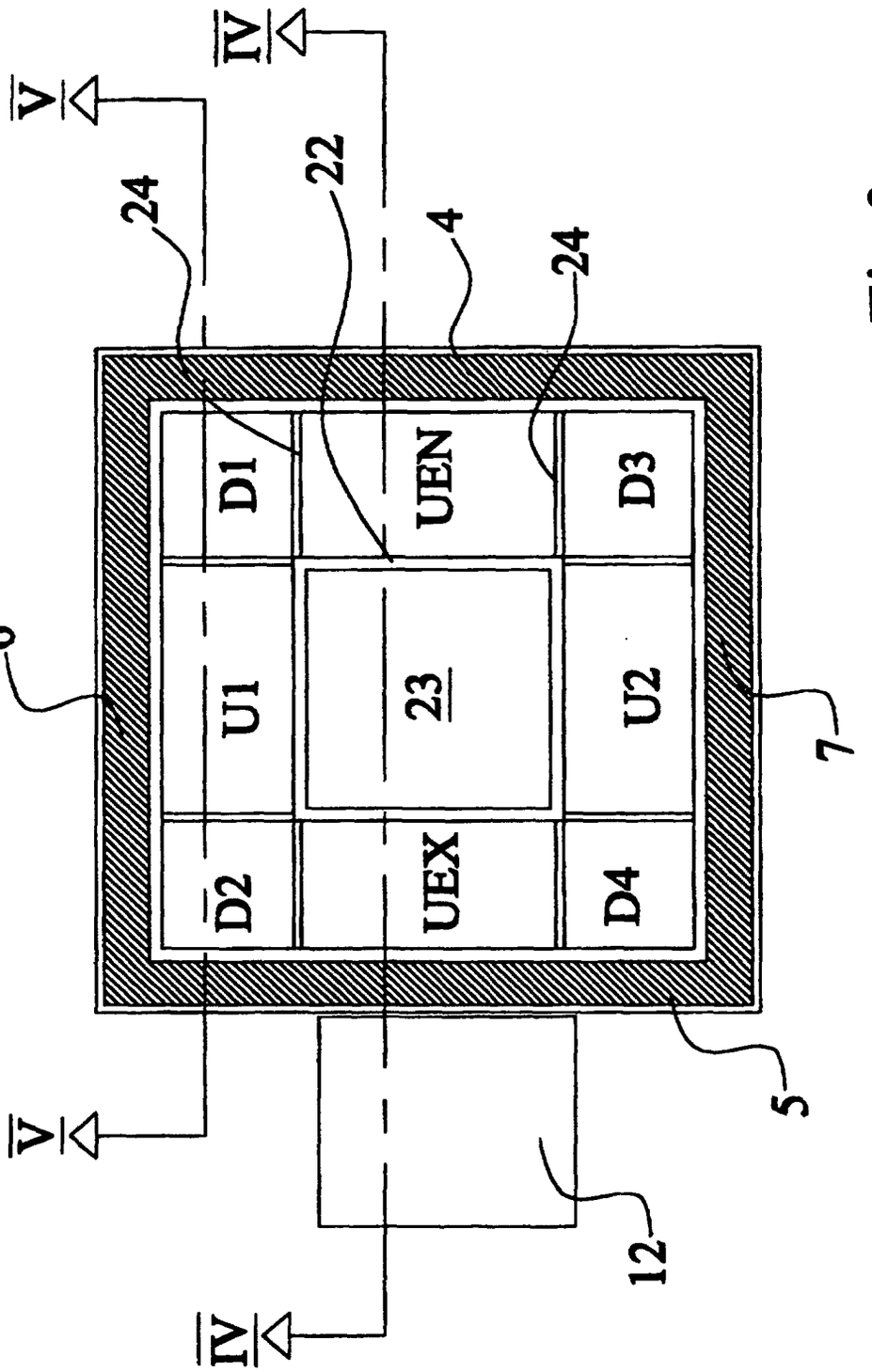


Fig 3

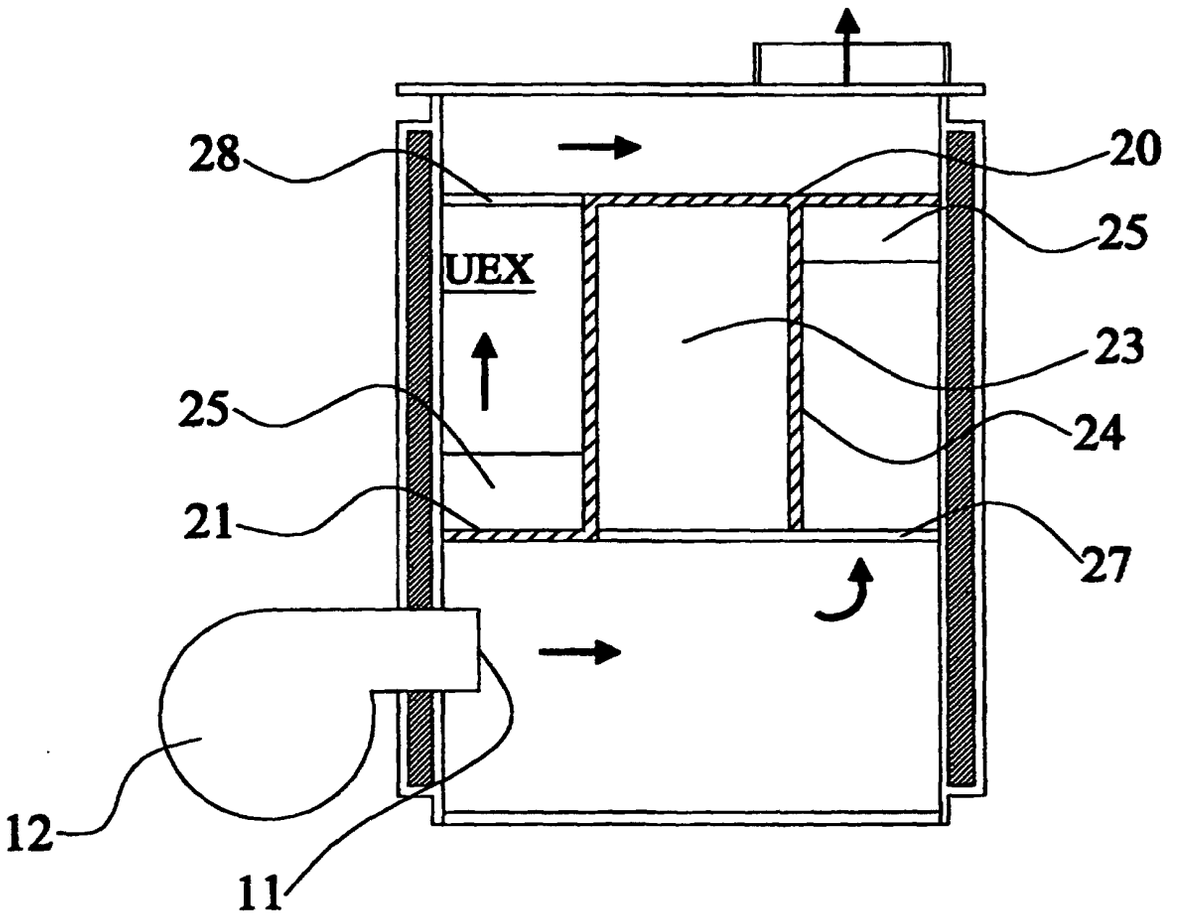


Fig 4

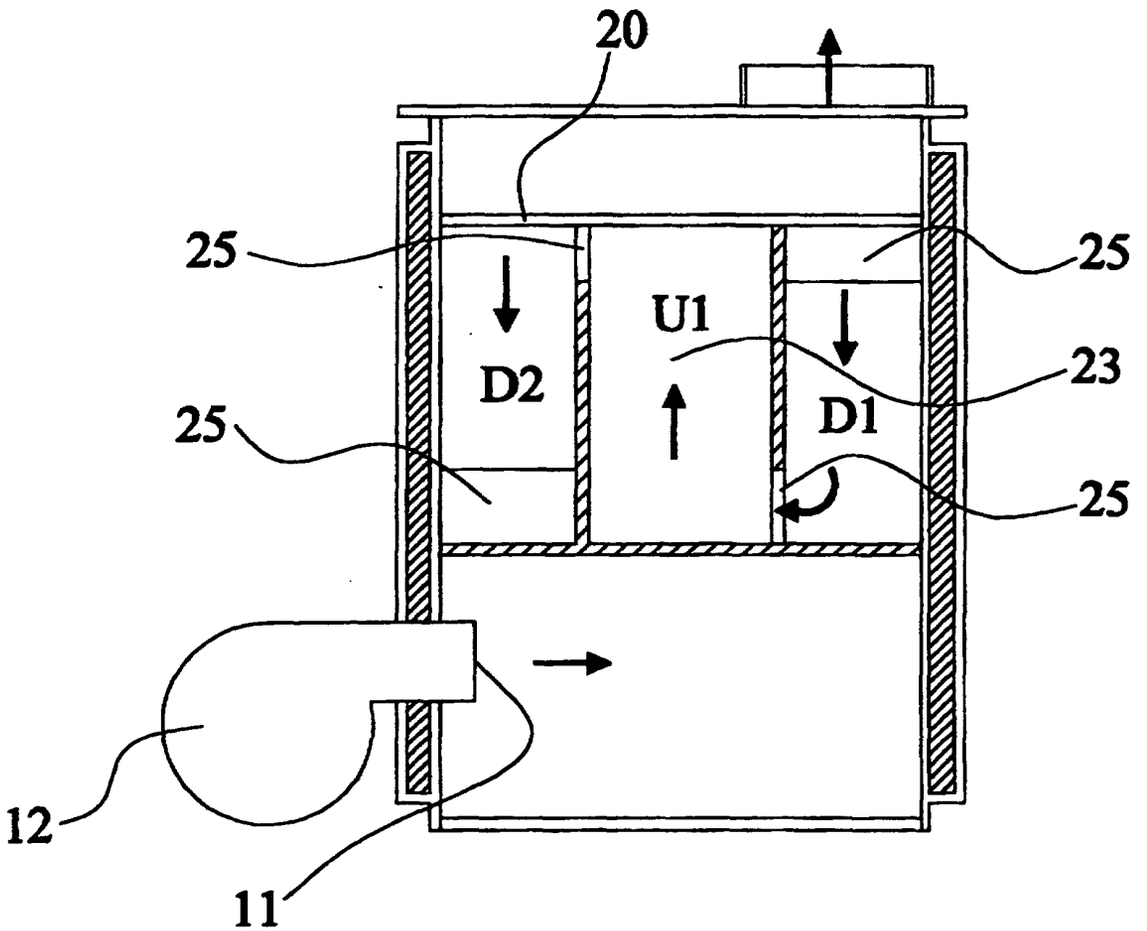


Fig 5

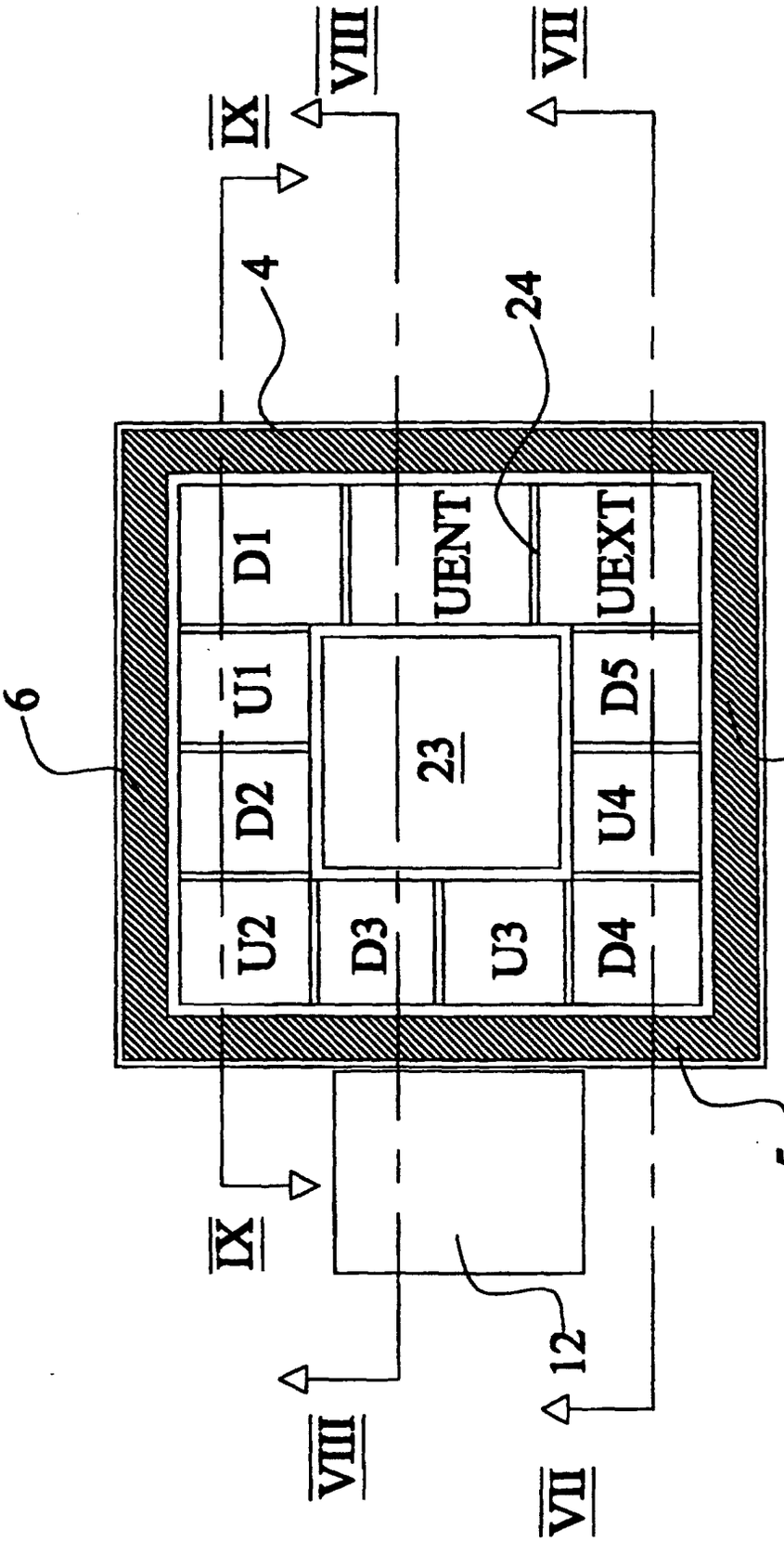
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Fig 6

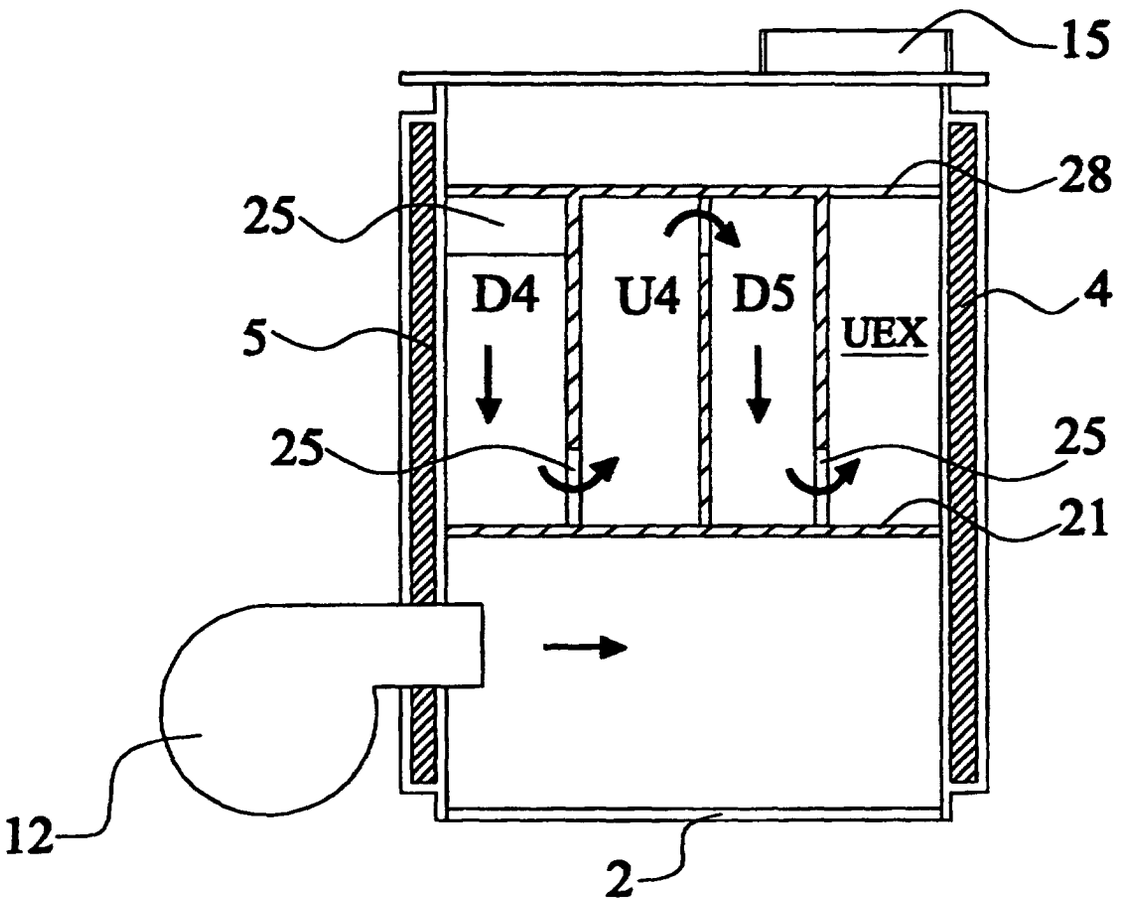


Fig 7

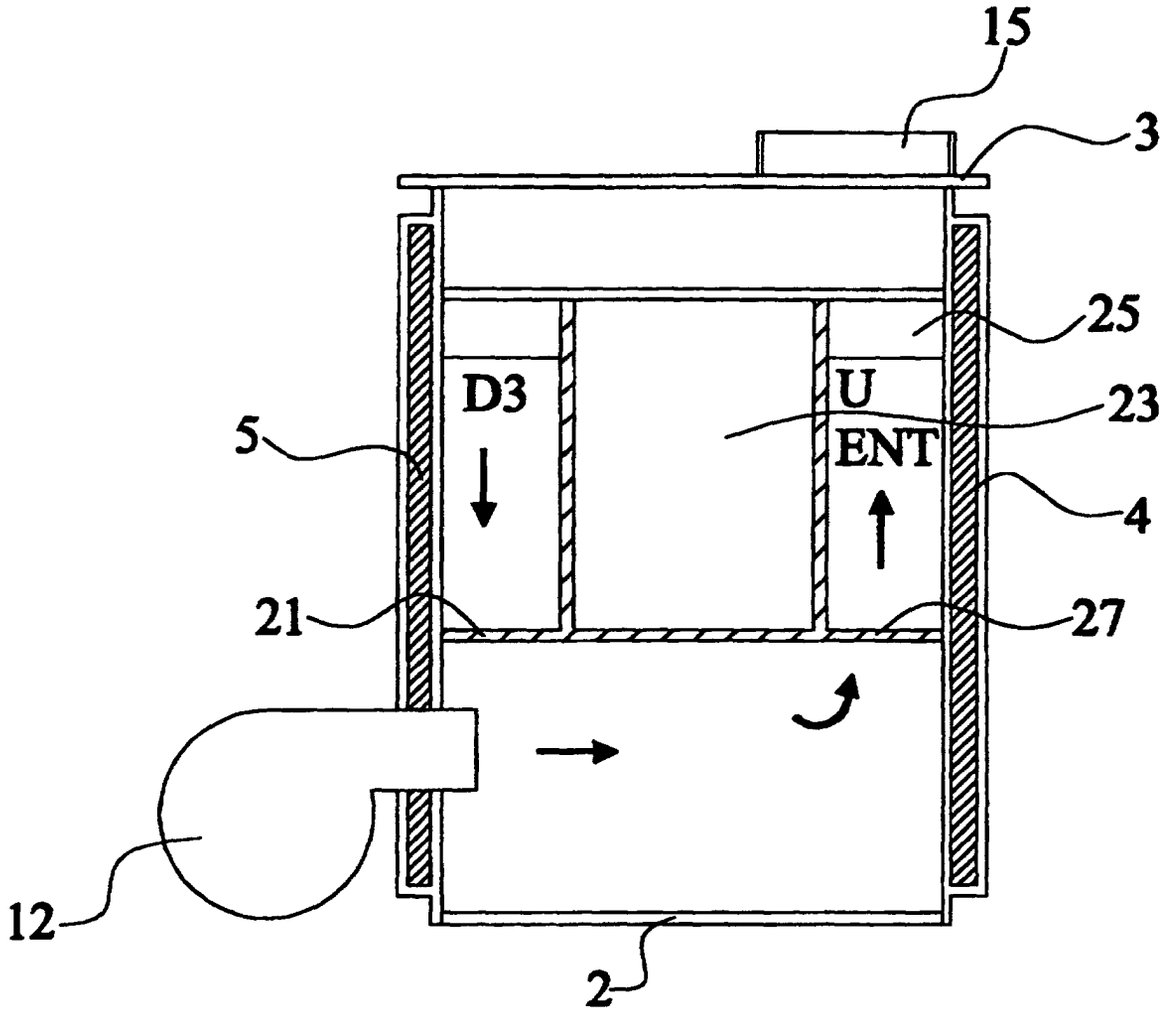


Fig 8

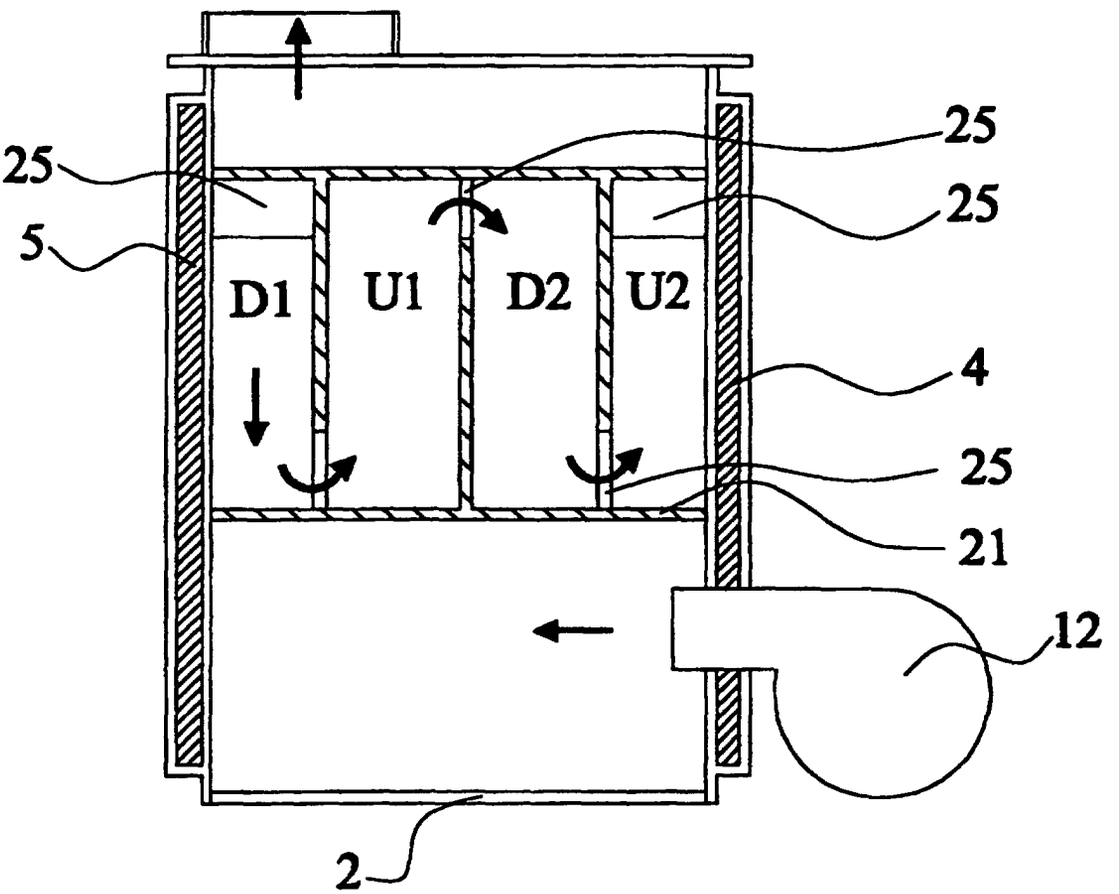


Fig 9

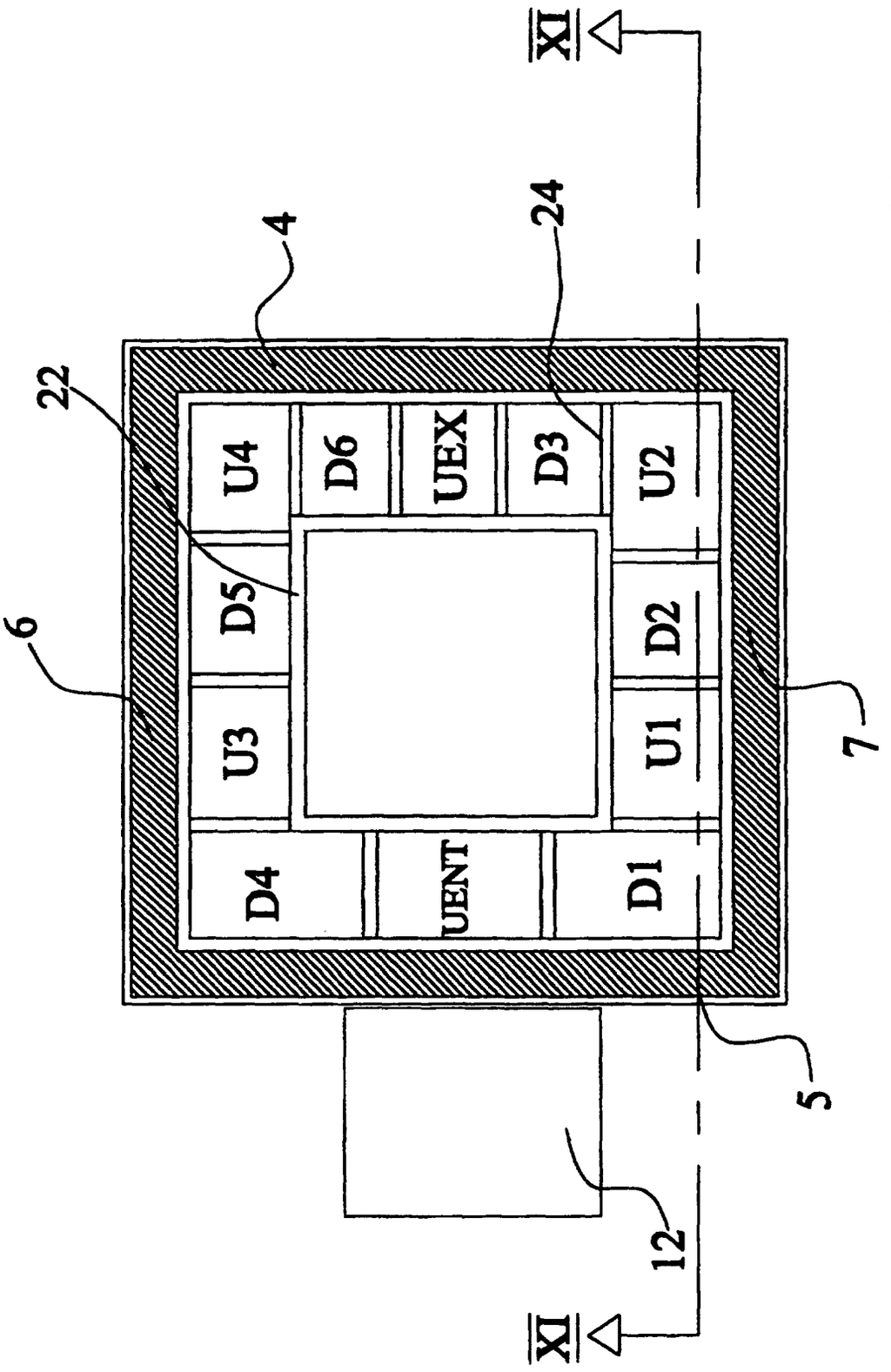


*Fig. 10*

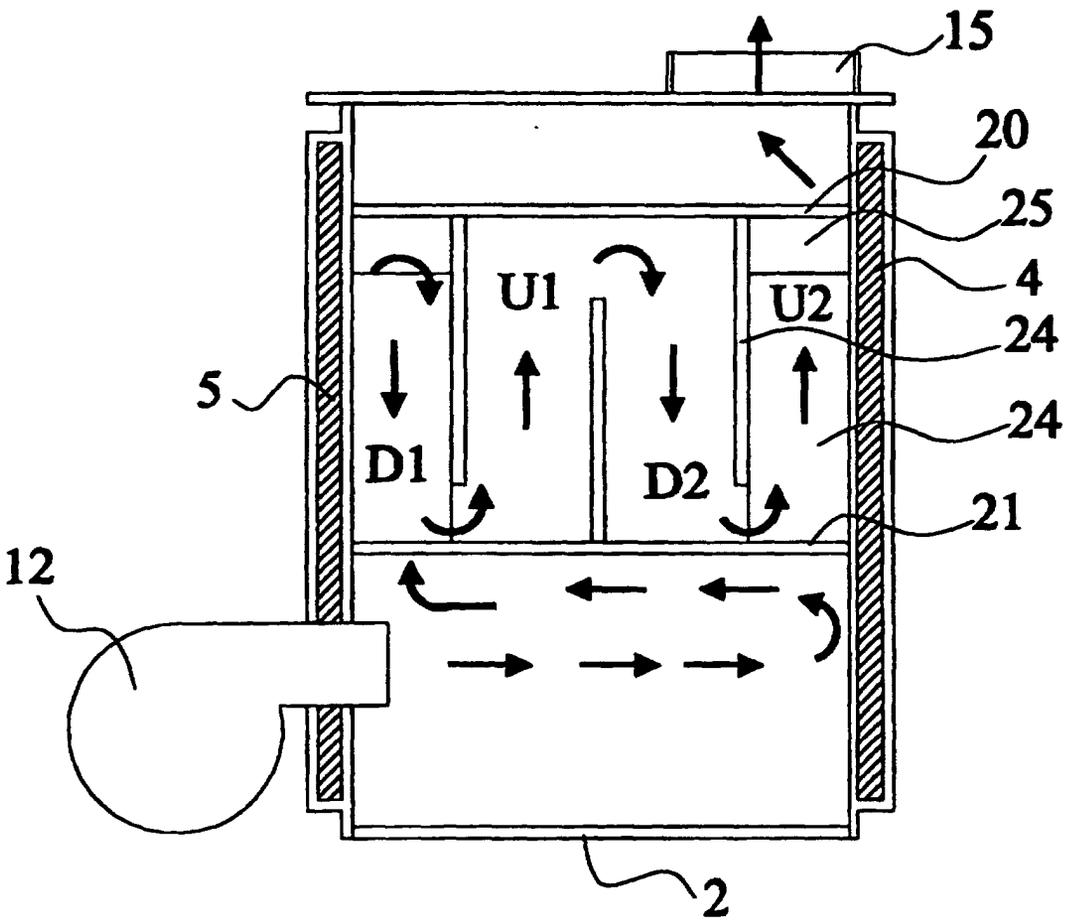


Fig 11

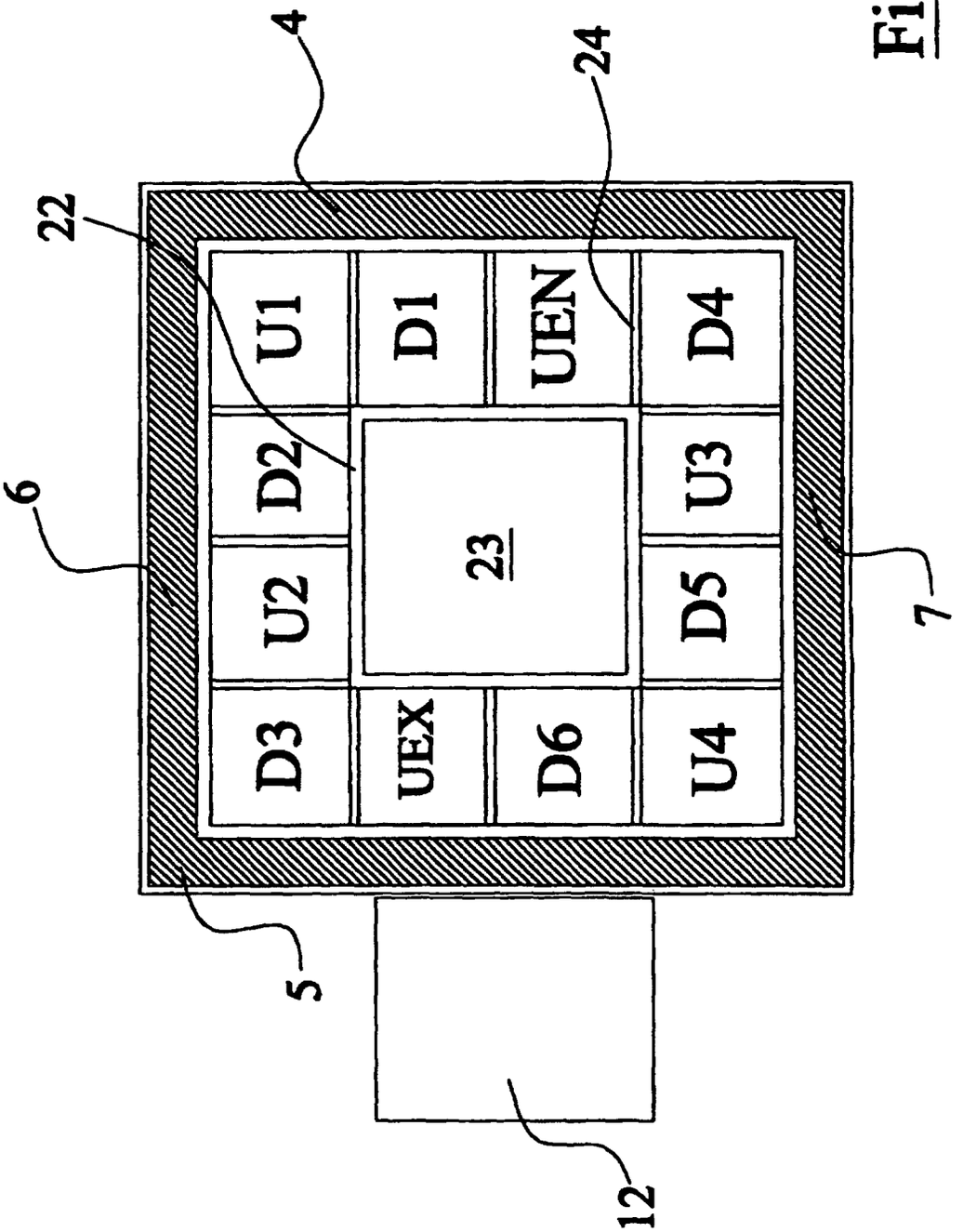


Fig 12

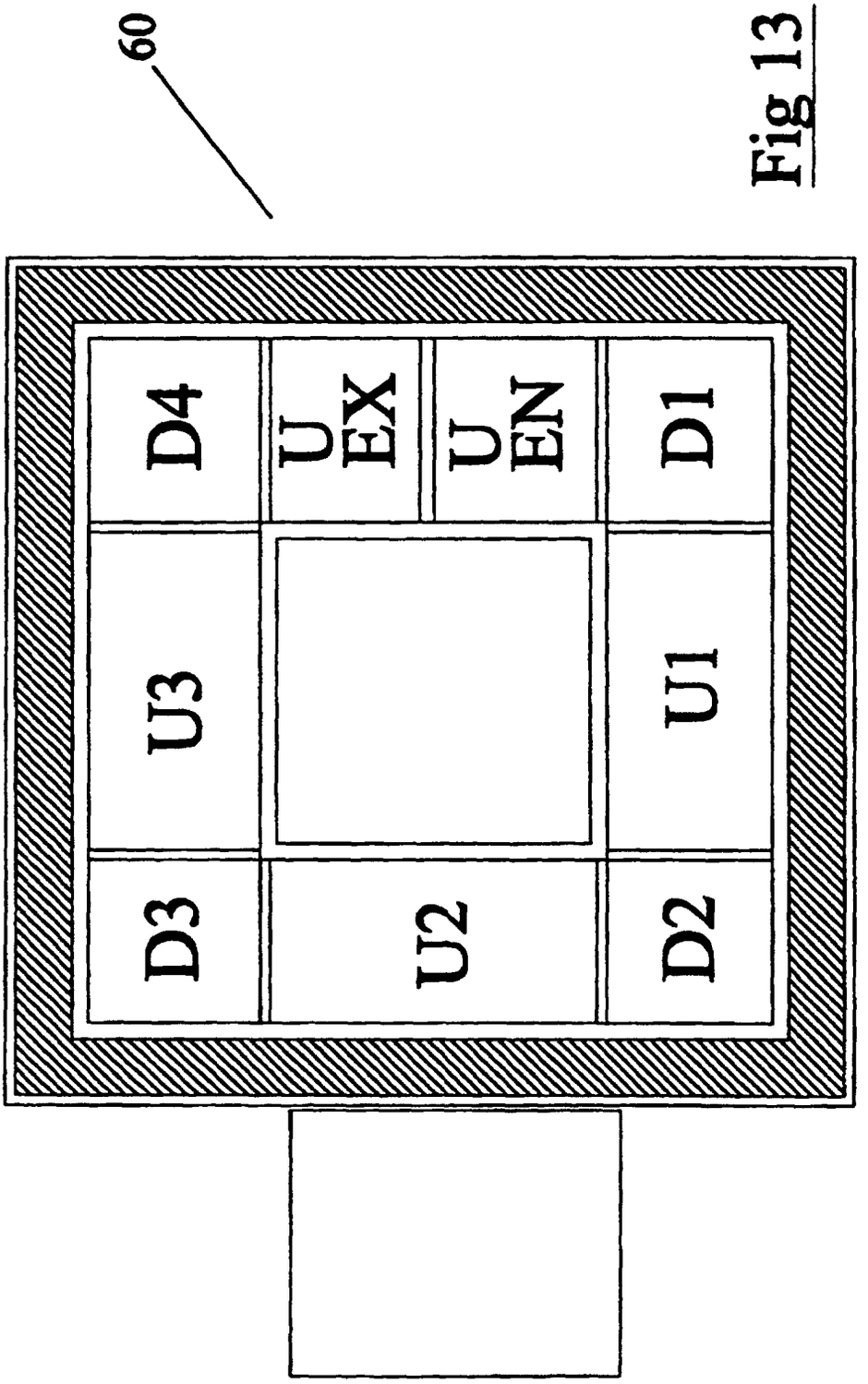


Fig 13

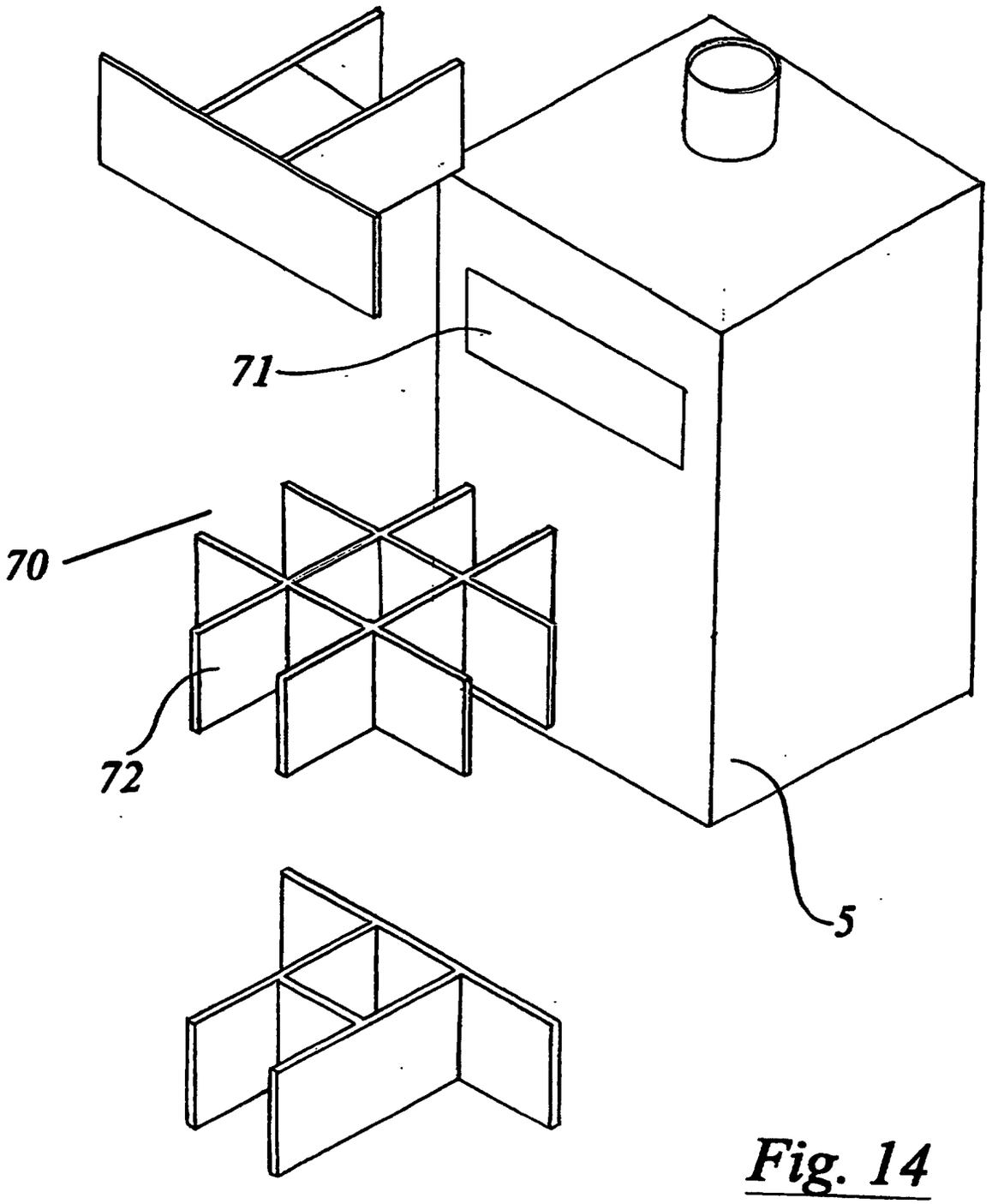


Fig. 14

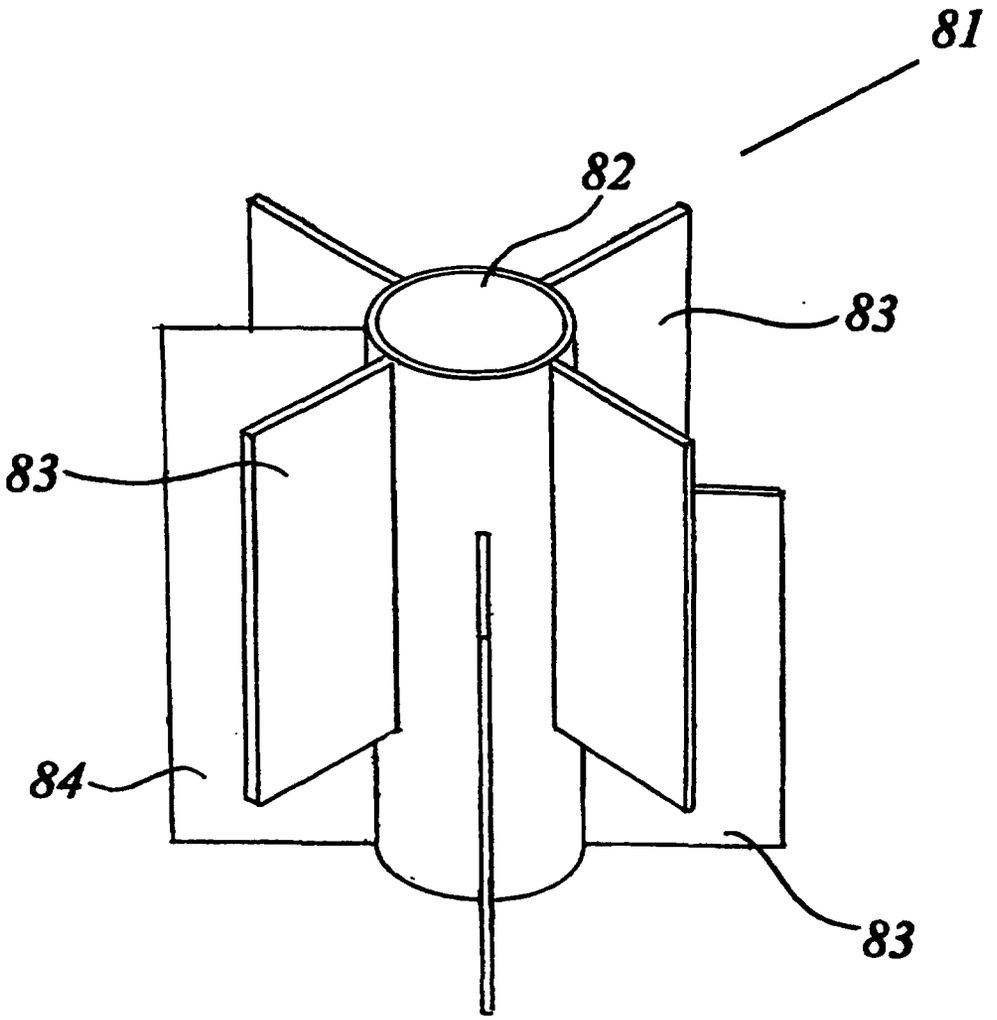


Fig. 15

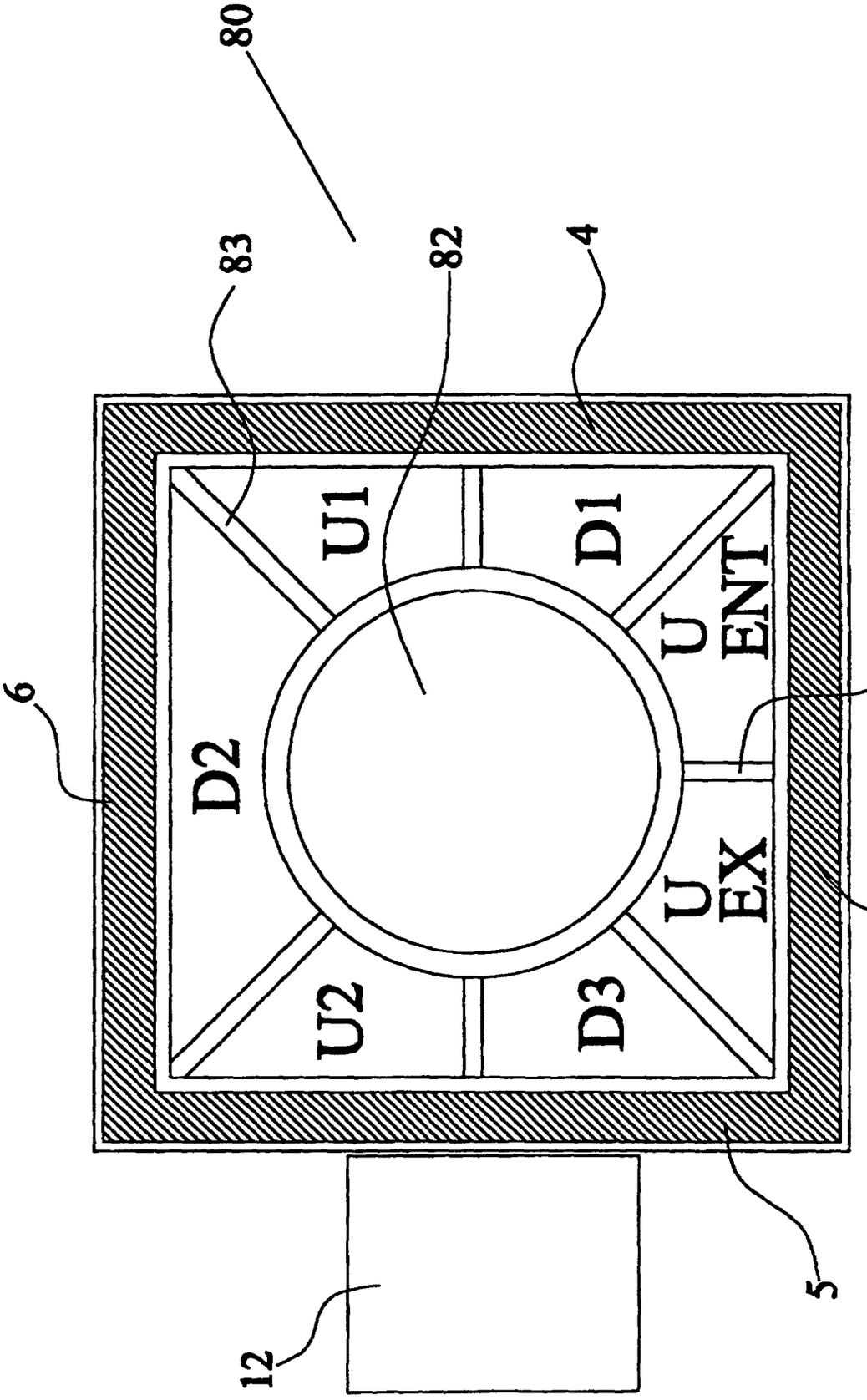


Fig 16

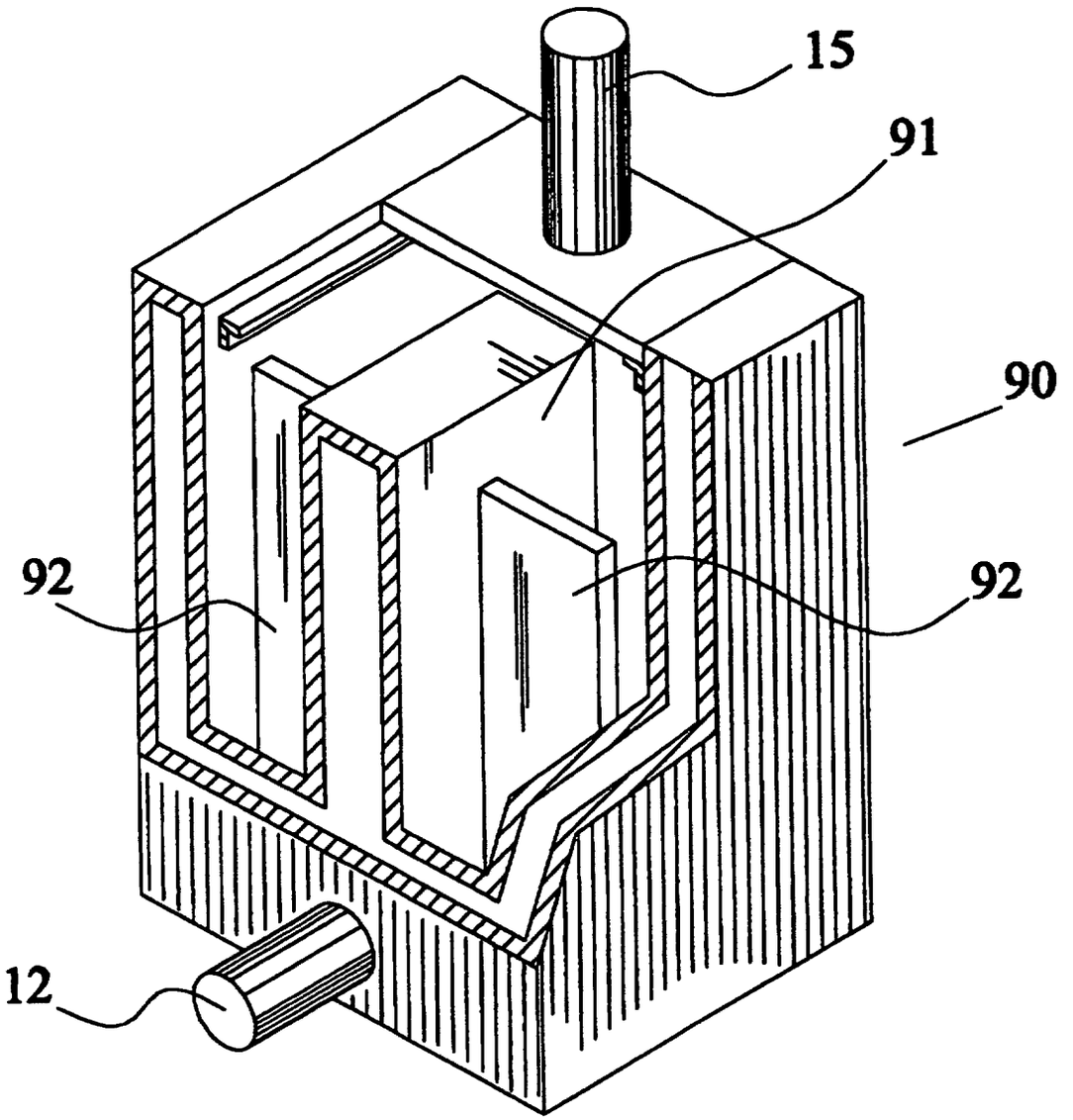


Fig. 17

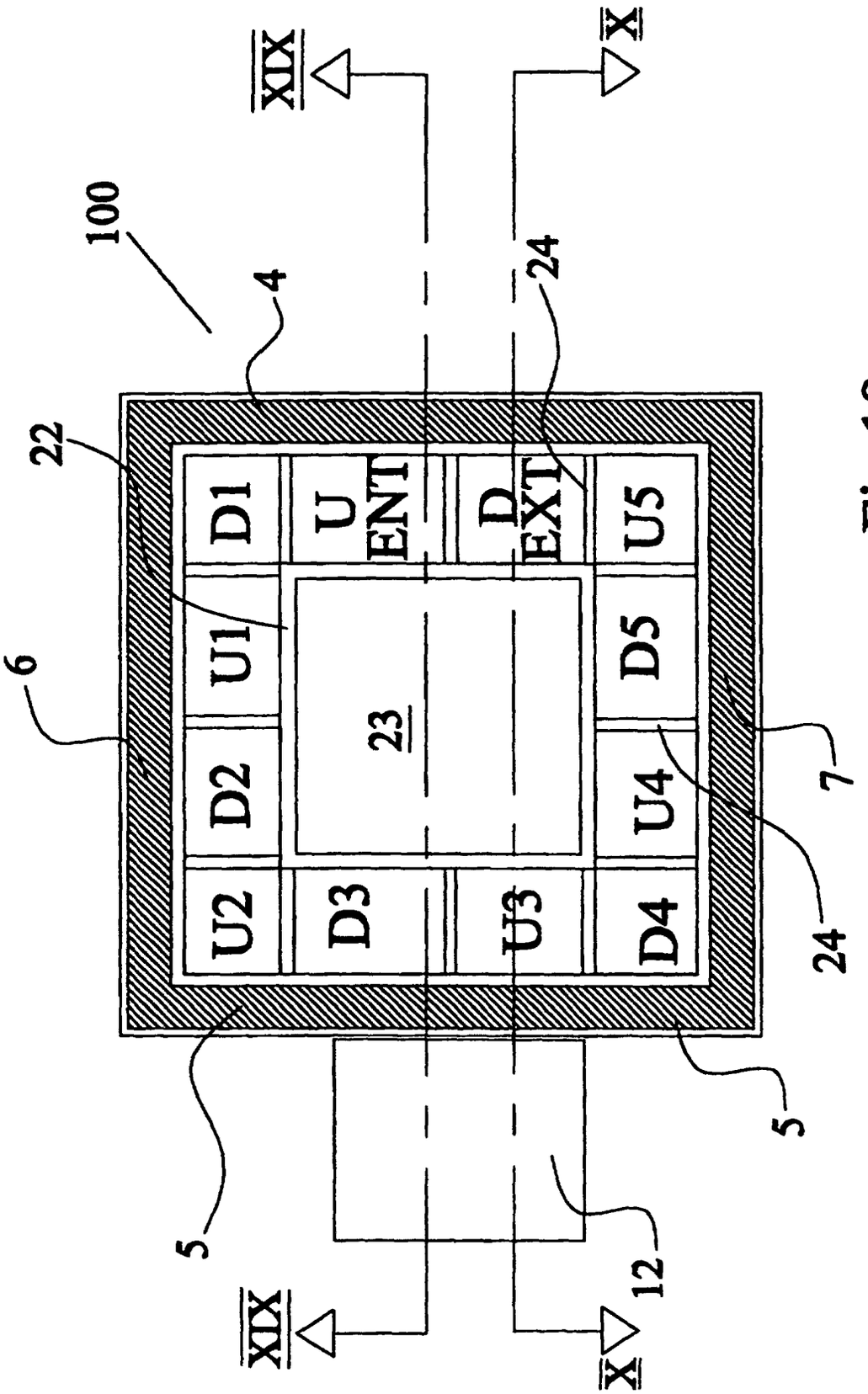
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Fig 18

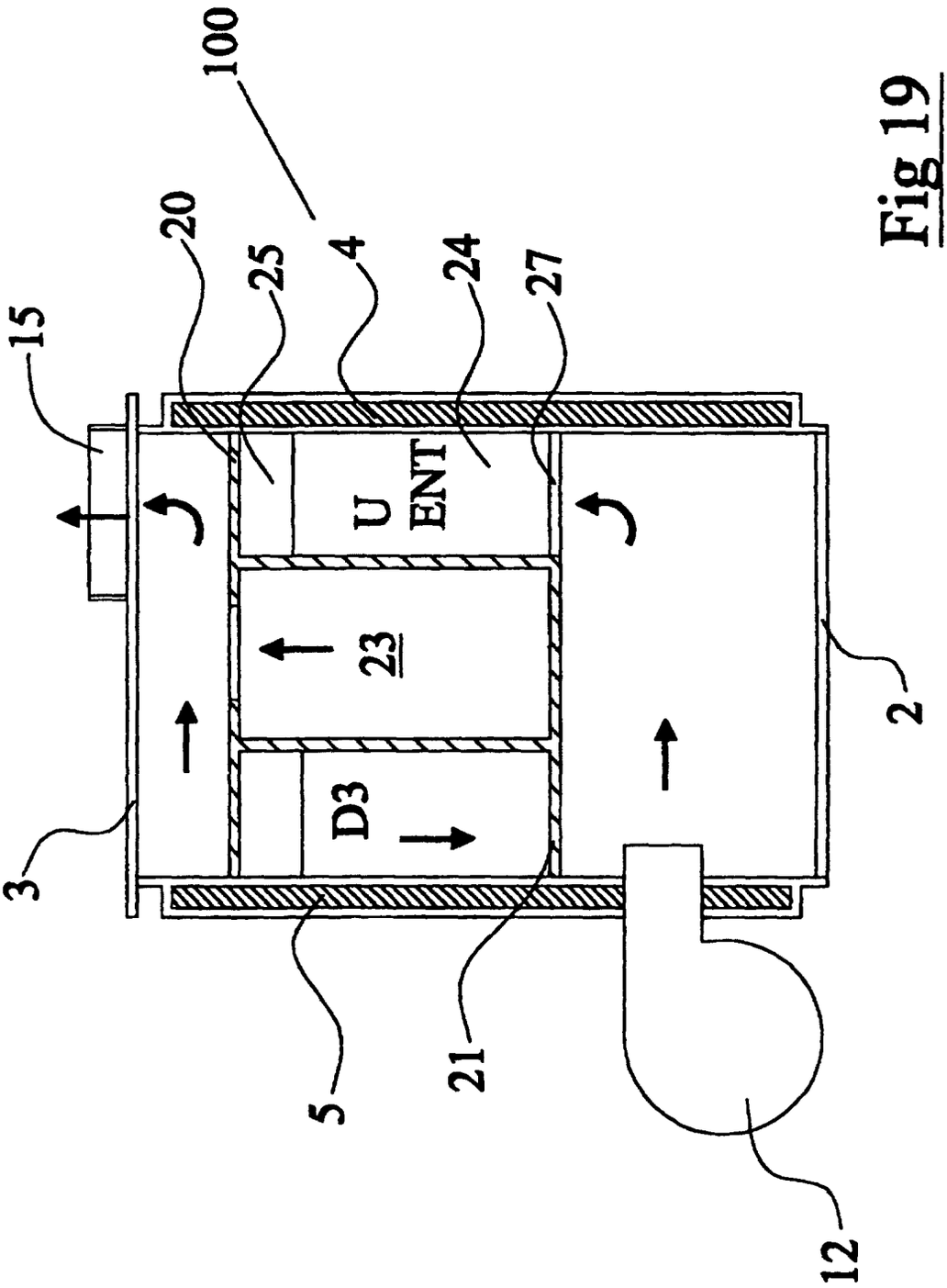


Fig 19

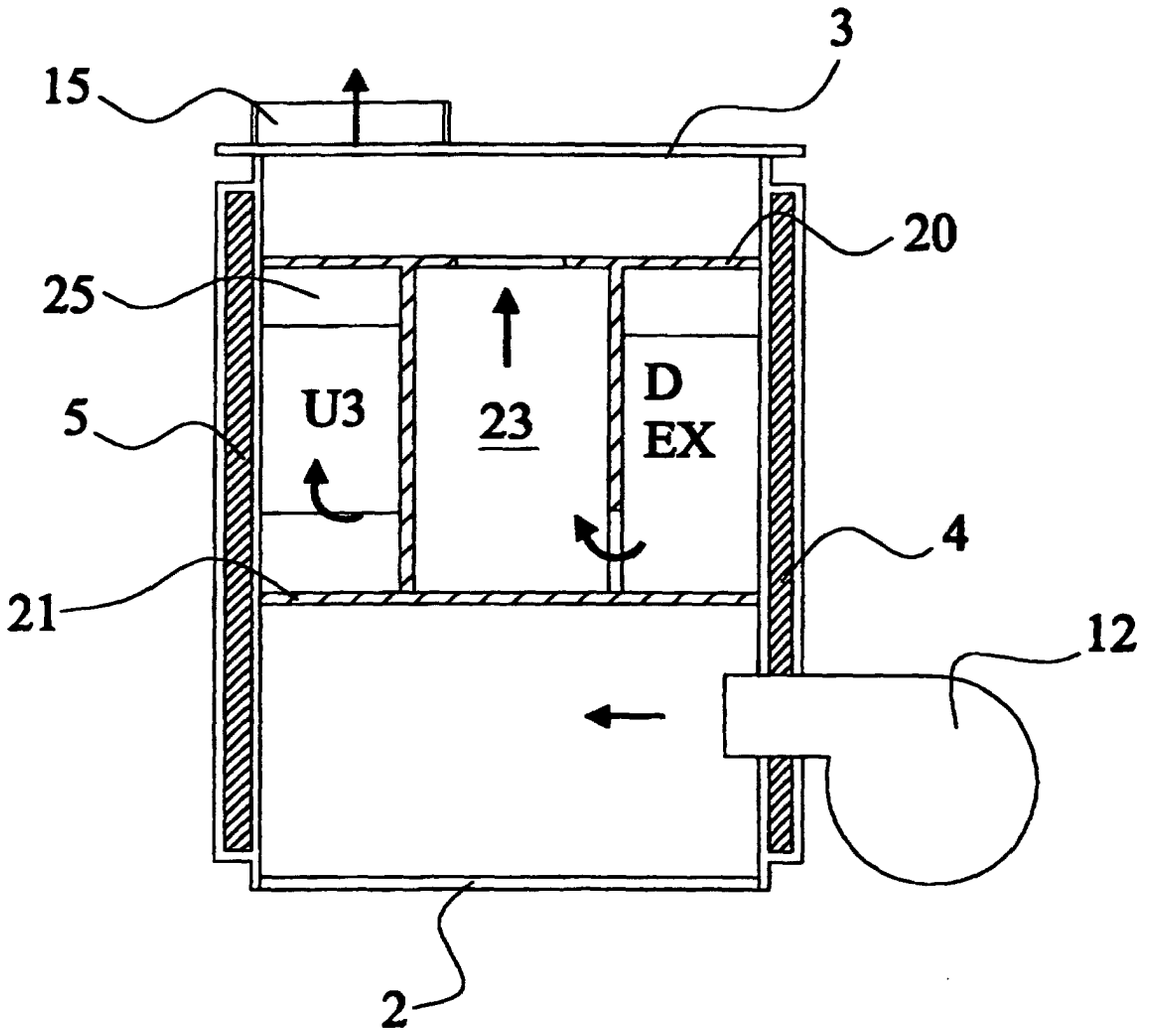


Fig 20

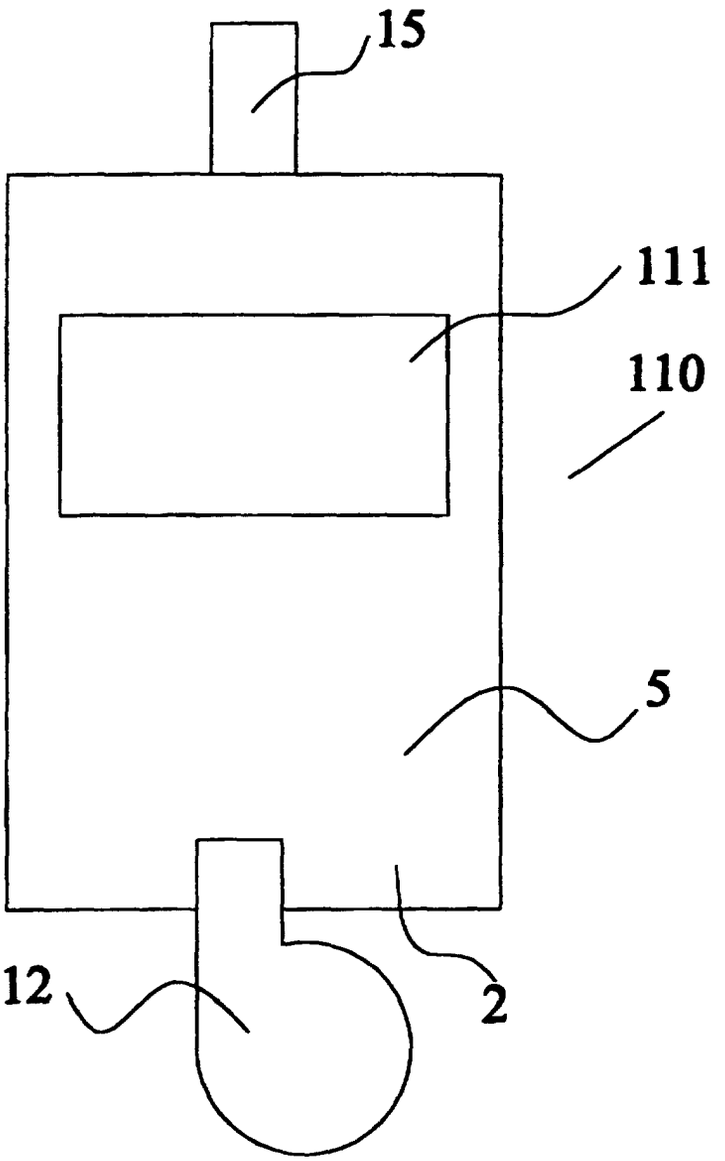


Fig 21

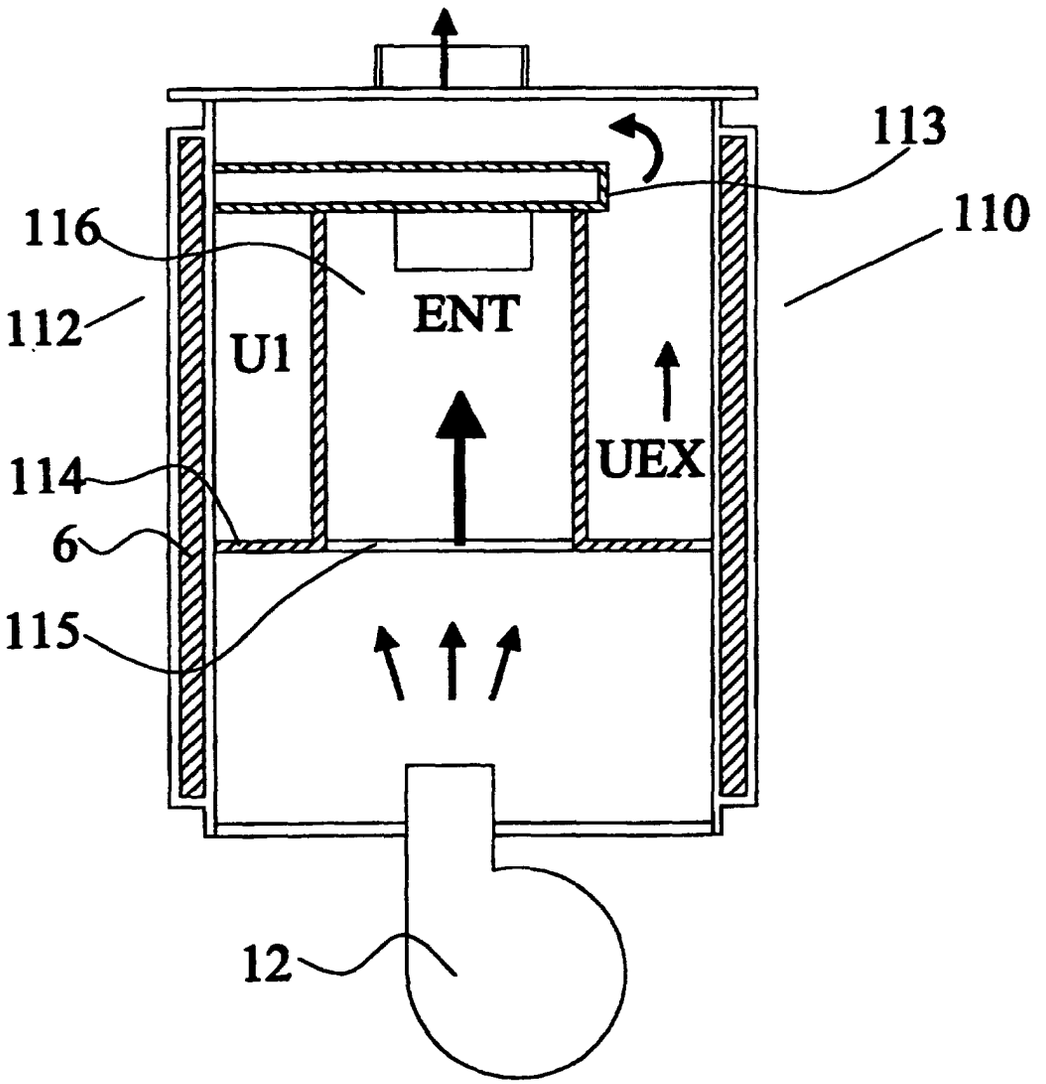


Fig 22

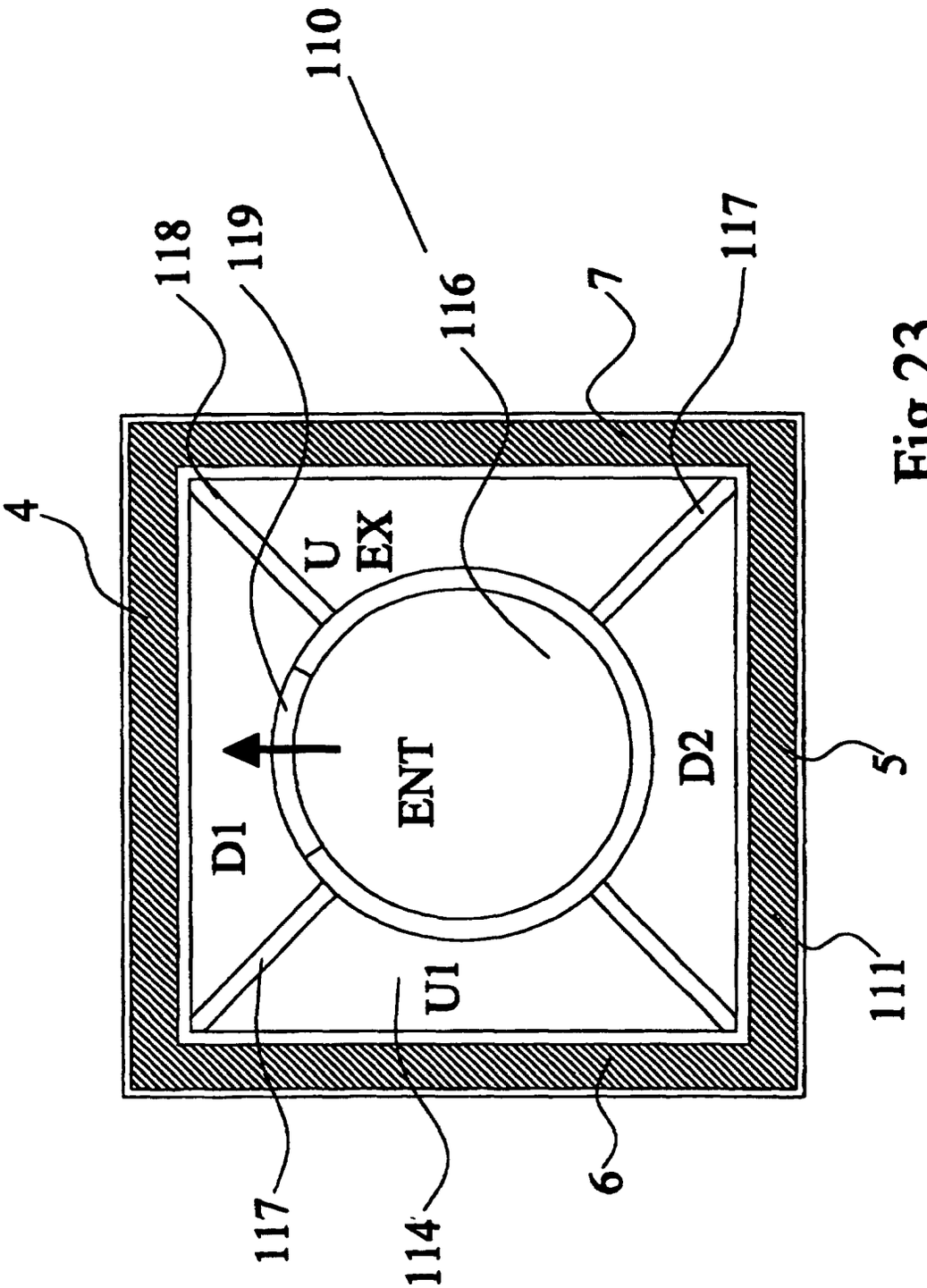


Fig 23

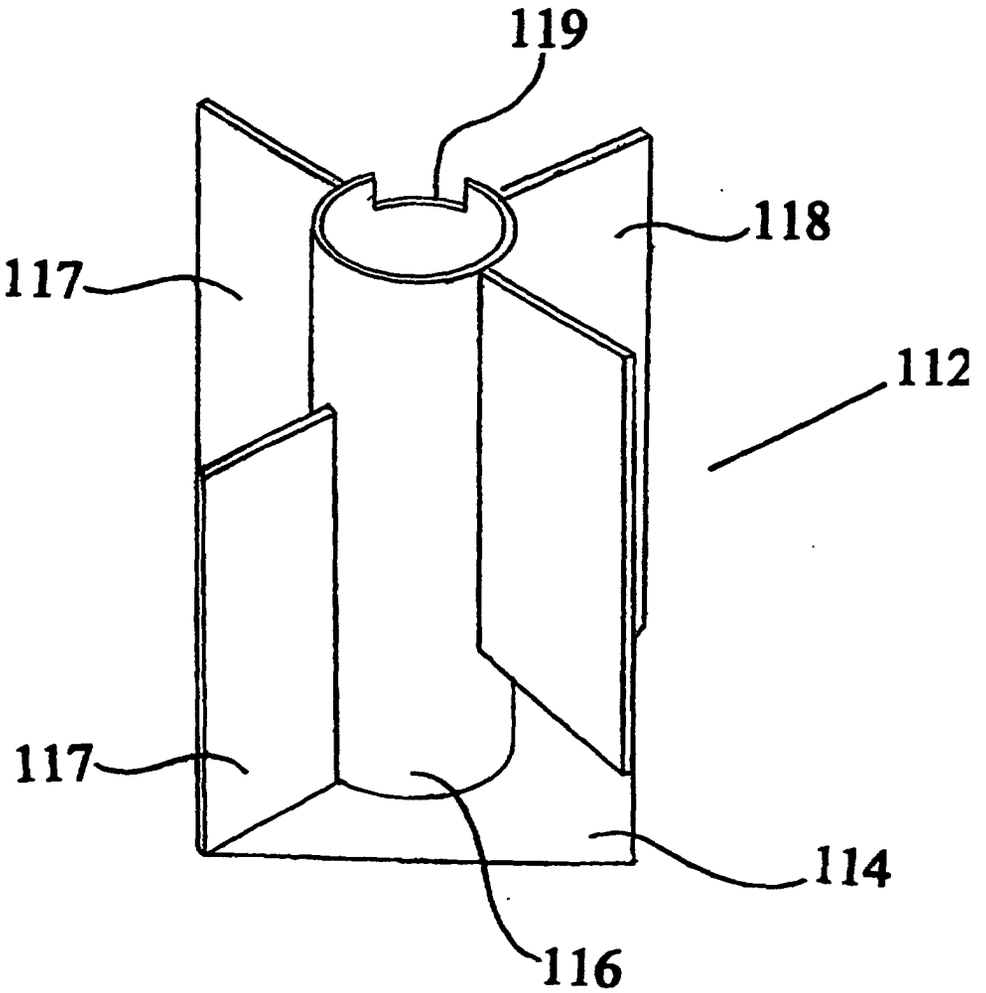


Fig. 24

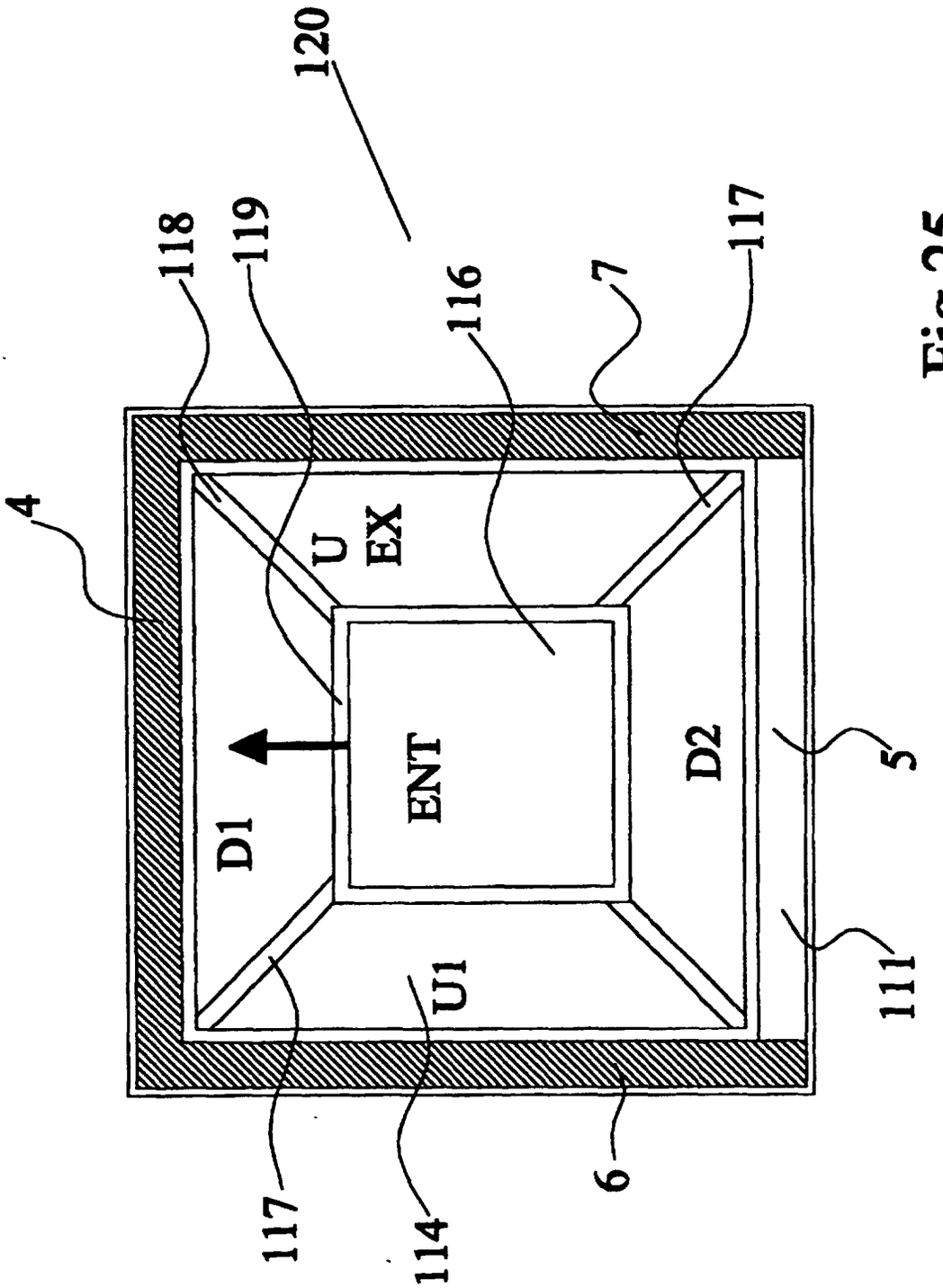


Fig 25