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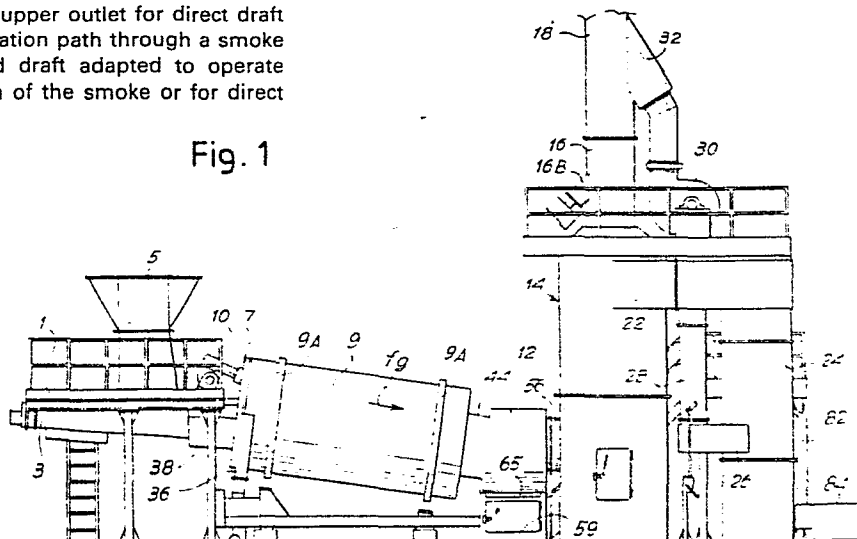
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54 Refuse incineration plant with parallel-flow furnace.

57 Incineration plant includes a cylinder furnace (9) which rotates about an inclined axis and whose lower end empties into an ash chamber (12) for the collection and withdrawal of ash, a post-combustion chamber (14) having lower access from the ash chamber with an upper outlet for direct draft and a lateral outlet for a purification path through a smoke purification complex (24). Said draft adapted to operate alternatively for the purification of the smoke or for direct draft.

Fig. 1



Background of the Invention

The present invention concerns an urban waste incineration plant which provides continuous and versatile operation particularly suitable for small centers.

Summary of the Invention

The plant substantially comprises a cylinder furnace which rotates around an inclined axis and which is fed from its upper end. The lower end of the furnace debouches into an ash chamber which is provided with a lower section having a grate through which ash may be collected and withdrawn. The plant of the instant invention further includes a vertical post-combustion chamber having lower access from the ash chamber and being provided with a shut-off gate which controls the direct draft through an upper outlet. The post-combustion chamber is also provided with a lateral outlet for the introduction of smoke into a smoke purification unit, the draft from which not only operates in the purification of the smoke but alternatively provides direct draft to the furnace.

The ash chamber may in practice have an upper hopper part, a lower ash-collecting and withdrawal part equipped with a removal door, and a separating gate. Guides for opening and closing the separating gate may be provided with discharge chutes which prevent ash and slag from collecting and compacting in the guides. Additionally, the gate may be provided with means for stopping the rotation of the furnace when the gate is in its closed position.

The purification unit may be provided with a parallel-flow shower and a ring filter which is positioned over a conical deflector having deflector fins which are adapted to remove water and dust from the smoke. Discharge of the smoke is

accomplished through a central conduit having its mouth positioned under the conical deflector. The ring filter may comprise two symmetrical boxes which can be turned over and interchanged.

The plant of the present invention may be switched from direct draft or draft through the purification unit. For this purpose, a coupling body, located between the upper part of the post-combustion chamber and the draft conduit is provided. Within the coupling body is located two symmetrical gate sections which are slideable in the same plane and are adapted to close and open the direct draft passage from the post-combustion chamber. The coupling body may also be provided with an auxiliary burner, as well as a lateral coupling, for connection to the pressure side of the forced draft.

The rotating furnace may be provided with a discharge collar of reduced diameter having helicoidal shaped zones which form planes for the lifting and advancing of ash and slag in said discharge collar. The discharge opening of the furnace has a shape similar to that of an inverted isosceles trapezoid and a pusher, of the same shape, may be provided with a front appendage for the purpose of removing any material which has clogged said mouth.

Brief Description of the Drawings

The invention will be better understood from the following description and the accompanying drawings, which shows one practical non-limitative embodiment of the invention.

In the drawings:

Figs. 1, 2 and 3 are side, plan and end views respectively of the entire plant;

Fig. 4 shows the front of the furnace in longitudinal section;

Fig. 5 depicts the front of the furnace in section along the line V-V of Fig. 4;

Figs. 6, 7 and 8 depict the ash-discharge collector of the furnace in longitudinal cross section, in a free front view, and in an illustrative perspective view respectively;

Figs. 9 and 10 show the ash chamber in detail, in cross section, in a section along the line X-X of Fig. 9 respectively;

Fig. 11 depicts the lower part of the ash chamber in perspective view;

Fig. 12 is an enlarged section of the separating gate provided in the ash chamber;

Figs. 13, 14 and 15 show in detail the purification unit in two partial vertical sections and in cross section;

Figs. 16, 17 and 18 show the post-combustion chamber and an overlying coupling, in vertical section, in cross section and in a detail of the control gate for the direct draft.

Description of the Preferred Embodiment

Referring to Figs. 1 to 3, reference number 1 generically indicates a frame for reciprocating feeder 3 which introduces the refuse materials into the furnace for incineration.

Hopper 5 is one example of a refuse feeding system. However, any number of systems may be used, as for example, the feeder may be of the carriage type. When loading by means of hopper 5, a bucket, which withdraws refuse from a vehicle, ditch or the like can be used. Furnace 9 comprises a stationary front 7 and is provided with a cylindrical chamber having its axis inclined downward for operation in parallel with the flow of the air and the combustion gases which pass through it, as indicated by arrow *f*_g.



Furnace 9 is supported by annular tracks 9A which roll on

rollers of the frame, some of which may be driven. Reference number 10 designates the burner. Ash chamber 12, described in further detail below accepts the discharge of furnace 9.

Combustion gases from chamber 12 pass via coupling 56 through the lower part of post-combustion chamber 14. Chamber 14 is extended on top by coupling 16 which provides vertical direct draft towards stack 18; said draft being controlled by a shut-off gate, described below. Post-combustion chamber 14 communicates laterally at its upper part with outlet coupling 22 which debouches into the top of purification unit 24. Coupling 22 is provided at its bottom with an outlet for the removal of water and ash as well as a vacuum outlet 26 which provides a forced draft towards stack 18 via suction conduit 28, aspirator 30 and delivery coupling 32. Couplings 56 and 22 are tangential in order to impart a whirling motion to the gases in the chamber 14.

Furnace front 7 (see Figs. 4 and 5) forms a sealing labyrinth with the front upper ends of the furnace 9; hopper 36 being provided for the collection of material which may enter into the lower part of said labyrinth. At its center, front 7 is provided with loading mouth 38, shaped in the manner which can be clearly noted from Fig. 5. The longitudinal profile of said loading mouth 38, which increases gradually from hopper 5 towards the furnace 9 is shown in Fig. 4. Feeder 3 is provided with pusher 40 which is driven alternately in both directions as indicated by double-ended arrow f40. The front active part of pusher 40, which penetrates into mouth 38 has an appendage 42 which protrudes towards furnace 9 and facilitates the removal of any material which may have compacted in hopper 5 and/or mouth

38. On the side of furnace 9, opposite front 7, is located discharge collector 44. The diameter of collector 44 is smaller than the diameter of the furnace so as to allow penetration of the collector into ash chamber 12. The inside step of discharge collector 44 (see particularly Figs. 6, 7 and 8) is shaped so as to assure the cyclic removal of slag and ash from the lower part of the furnace to the narrower part of the collector. This shape is defined by front circular segment surfaces 46A, by approximately tangential blade surfaces 46B and by approximately helicoidal surfaces 46C. This arrangement, in combination with the axis of the furnace being inclined and the direction of rotation of the cylindrical furnace being that indicated by the arrows f9, results in a temporary stoppage of the material between the end part of furnace 9 and coupling 44. This temporary stoppage allows for the complete combustion of the refuse before removal of the slag and ash, by surfaces 46b, to ash chamber 12 via the axial passage of collector 44.

In Figs. 9, 10 and 11 ash chamber 12 is shown in greater detail. It comprises an upper portion 51 with first apperture 53 to receive collector 44 and with second apperture 55 for the departure of the fumes towards chamber 14 through coupling 56. Upper portion 51 of ash chamber 12 is structured as a hopper for discharge of refuse towards the lower or collecting portion 57 of said chamber. Lower portion 57 is provided with side opening 59 for the removal of the ash. The size of upper and lower portion of passage 61 is controlled by gate 63 which is slideable between an open position and a closed position in which it intercepts said passage 61. Gate 63 (see also Fig. 12) is slideable in seat 65 to reach a normal open position in which passage 61 is



-6-

free and the ash, slag and solid residues can easily fall into the collecting portion 57 to be periodically removed. Gate 63 can be pushed in the direction of arrow f63 until seated so as to fully close passage 61 thereby assuring draft through the combustion furnace rather than through opening 59 when the door of the latter must be opened for the removal of ash, slag and unburned solid residues.

During the periods of closure of passage 61 by gate 63, the rotation of furnace 9 is stopped by means of an electric limit-switch which is actuated when the door to side opening 59 is opened. Stopping the rotation of furnace 9 when gate 63 is in its closed position, prevents the discharge of ashes and solid residues from the furnace through the collector 44 into the ash chamber 12, thereby avoiding the depositing on the closed gate 63 of ash and solid residues which could interfere with the opening of the gate. The rotation of furnace 9 is resumed as soon as gate 63 is opened again. The stopping and starting of the rotation of furnace 9 can be controlled by the movements of the gate, or there can be provided suitable devices for the timed sequence of such maneuvers. Suitable linkages or devices may be provided as to prevent opening the door of opening 59 when the gate 63 is in its open position.

Gate 63 can be made in the form of a heat resistant box 63A which defines the upper surface of gate 63 since the combustion in furnace 9, chamber 12, and post-combustion chamber 14 continues regardless of the position of the gate, thereby exposing said gate to continuous high temperature combustion gases. Slide guides located in seat 65 for gate 63 advantageously have discharge chutes 65A for the removal of ash deposits from the guides, which if not removed would clog the ends of the guides and thereby prevent complete closing of

gate 63. The maneuvering of gate 63 is effected by handle member 66 which may be pivotally connected to gate 63.

Figs. 13, 14 and 15 depict purification unit 24 which is in substance a smoke wash tower unit. Purification unit 24 is provided with upper connector 22 for the introduction of the fumes from the post-combustion chamber. Purification unit 24 is also provided with outlet 26 for the introduction of a forced draft. In practice, the smoke flows downward in parallel flow with a shower of water coming from spray group 70. A ring or similar filter, the components of which are contained in a cage-like basket, is provided in two sections 72 which are substantially symmetrical with respect to a diameter and can be removed laterally from mouth 74 and turned over to facilitate the cleaning thereof; they being reinserted in reverse position after a certain period of use. Below the basket of the filter there is a substantially conical wall 76 for centrifuging the drops of water. Conical wall 76 serves to convey the smoke and aqueous particles towards an annular perimetral passage which is provided with fins 78. This passage in combination with fins 78 is adapted to impose an eddying movement to the smoke and liquid particles containing the solid parts to be separated from the smoke. The liquid is collected in bottom 80 of the wash tower and passed through conduits 82 into settling tanks 84 or other recovery system. The gases, however, proceed in the direction indicated by arrows f86 and pass through a central conduit 86 which has its inlet opening below cone 76. The exit end of conduit 86 extends below bottom 80. From conduit 86 the smoke is introduced into conduit 28 of the forced draft via outlet 26.

Figs. 16, 17 and 18 depict the post-combustion chamber 14 with overlying connector 16 leading to stack 18. In these figures, it can be seen that connection 56, as well as outlet connection 22, are tangential so as to obtain an eddying movement of the smoke during its passage through the post-combustion chamber. At its upper end, chamber 14 terminates in passage 16a towards connector 16; the latter being provided with a draft metering gate having two symmetrical sections 90. Sections 90 are adapted to slide symmetrically in their plane so as to close and open the direct draft passage 16A from the post-combustion chamber 14 to stack 18. Gate sections 90, which are suitably protected with heat resistant material, are closed when the smoke is to be drawn into purification unit 24. Alternatively, these gates are open for direct draft when purification of the smoke is not necessary or when it is necessary to intervene temporarily for maintenance or the like in the purification unit.

Connection 16 may also be provided with an attachment 16B for possible use in connection with an auxiliary burner, while above or in said connection outlet 32 of the forced draft can be located.

It will be understood that the drawings show only one example given merely as a practical demonstration of the invention and it may be varied in its forms and arrangements without going beyond the scope of the concept which forms the basis of the invention.

- 1 -

WHAT IS CLAIMED IS:

1. A plant for the incineration of refuse with combustion chamber with rotating cylinder, characterized by the fact that it comprises in combination: a cylindrical furnace (9) rotating around an inclined axis, fed from its upper end; an ash chamber (12) into which the lower end of the rotating cylinder furnace discharges and which has a lower section for the collection and withdrawal of the ash which can be removed through a gate; a substantially vertically extending post-combustion chamber (14) having a lower access from the ash chamber (12), an upper outlet for direct draft provided with a gate and a lateral outlet for a purification path; a smoke purification unit arranged alongside the post-combustion chamber (14); and a forced draft from said purification unit (24) adapted to operate for the purification of the smoke alternatively with the direct draft.

2. A plant according to the preceding claim, characterized by the fact that the ash chamber (12) has an upper hopper portion (36), a lower ash collecting (57) and withdrawal portion provided with a withdrawal door, and a separating gate with horizontal box filled at its top with refractory;

- 2 -

the guides of said gate possibly having discharges for ash and slag which are adapted to avoid the compacting of ash and slag therein.

3. A plant according to the preceding claims, characterized by the fact that it comprises means for stopping the rotation of the furnace (9) upon the closing of the removal gate of the ash chamber (12).

4. A plant according to the preceding claims, characterized by the fact that the purification unit (24) comprises a parallel-flow shower and a ring filter overlying a cone deflector with deflecting fins for the removal of the water and the dust in a separation chamber; the discharge of the smoke coming from said removal chamber through a central conduit (86) the mouth (74) of which is underneath the said cone.

5. A plant according to the preceding claims, characterized by the fact that the ring filter comprises two symmetrical boxes which can be turned over and interchanged.



- 3 -

6. A plant according to the preceding claims,
characterized by the fact that a connecting body
between the upper part of the post-combustion chamber
(14) and the draft conduit has a gate in two symmetrical
5 sections (90) which are slideable in the same plane,
a connection for a possible auxiliary burner, as well
as a side connection for the pressure side of the
forced draft.

7. A plant according to the preceding claims,
10 characterized by the fact that the rotating furnace
(9) has a discharge collector (44) of reduced diameter
shaped with helicoidal zones (46c) forming ramps for
lifting and advancing ash and slag in said discharge
collector (44).

15 8. A plant according to the preceding claims,
characterized by the fact that the discharge mouth (74)
of the furnace (9) is shaped with a section approximately
that of an inverted isosceles trapezoid and a pusher
(40) of the same shape has a front appendage for
20 removing any material possibly compacted in said
mouth.

- 4 -

9. A plant for the incineration of refuse including a combustion chamber having a rotating cylinder, said plant comprising in combination: a cylindrical furnace (9) which rotates about an inclined axis and which is fed from its upper end; an ash chamber (12) into which the lower end of the rotating cylinder furnace (9) discharges, said ash chamber (12) having a lower section which is provided with a gate for the collection and withdrawal of ash; a vertical post-combustion chamber (14) having a lower access from the ash chamber, an upper outlet for direct draft and a lateral outlet for access to a smoke purification unit (24), said smoke purification unit (24) being positioned alongside of the post-combustion chamber (14); and means for providing a forced draft from said purification unit (24), said means being adapted to operate for the purification of smoke alternatively with providing direct draft to said post-combustion chamber (14).

10. A plant according to claim 9, wherein the ash chamber (12) includes an upper hopper portion (36) and said lower ash collecting and withdrawal portion is provided with a withdrawal door.

- 5 -

11. A plant according to claim 10, wherein said lower section of said ash chamber (12) is provided with guides adapted for sliding engagement with said gate (63), said gate being a horizontal box having
5 discharge chutes (65A) for ash and slag so as to avoid compacting of ash and slag therein.

12. A plant according to claim 9, which further includes means for stopping the rotation of the furnace (9) upon the closing of said gate (63) of
10 the ash chamber.

13. A plant according to claim 9, wherein the purification unit (24) includes a parallel-flow shower and a ring filter which overlies a cone deflector having a plurality of deflecting fins (78)
15 for the removal of water and dust and a central conduit (86), the mouth of which is below said cone for the discharge of purified smoke.

14. A plant according to claim 13, wherein the ring filter comprises two symmetrical boxes which can be
20 turned over and interchanged.

- 6 -

15. A plant according to claim 9, wherein the upper portion of said post-combustion chamber (14) is provided with a connecting body for connection to a draft conduit.

5 16. A plant according to claim 15, wherein said draft conduit is provided with a draft metering gate having two symmetrical sections (90) slideable in the same plane; first means for connecting an auxiliary burner and a second means for connecting
10 the pressure side of said forced draft.

17. A plant according to claim 9, wherein the rotating furnace (9) has a discharge collector (44) of reduced diameter shaped with helicoidal zones (46C)
15 forming ramps for lifting and advancing ash and slag in said discharge collector (44).

18. A plant according to claim 17, wherein the shape of the discharge mouth of the furnace (9) is that of an inverted isosceles trapezoid.

20 19. A plant according to claim 18, wherein the discharge collector (44) is further provided

- 7 -

with a pusher (40) of the same shape as said discharge mouth, said pusher being provided with a front appendage for removing any material compacted in said mouth.

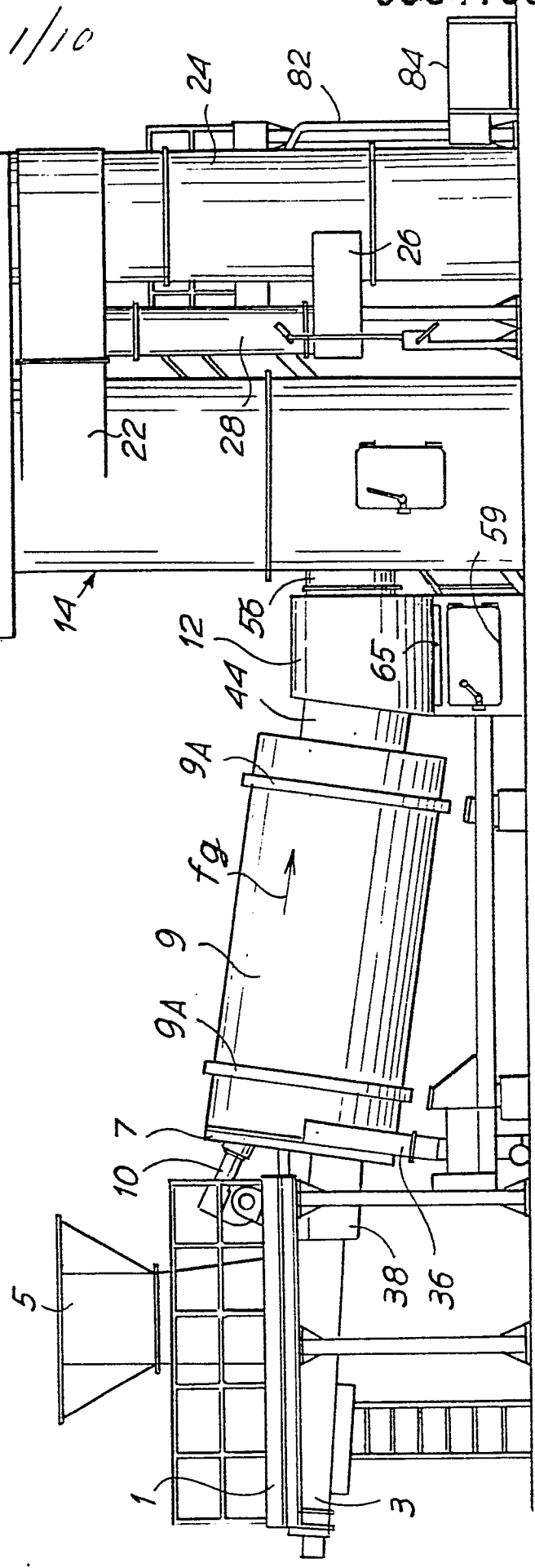


Fig. 1

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Fig.3

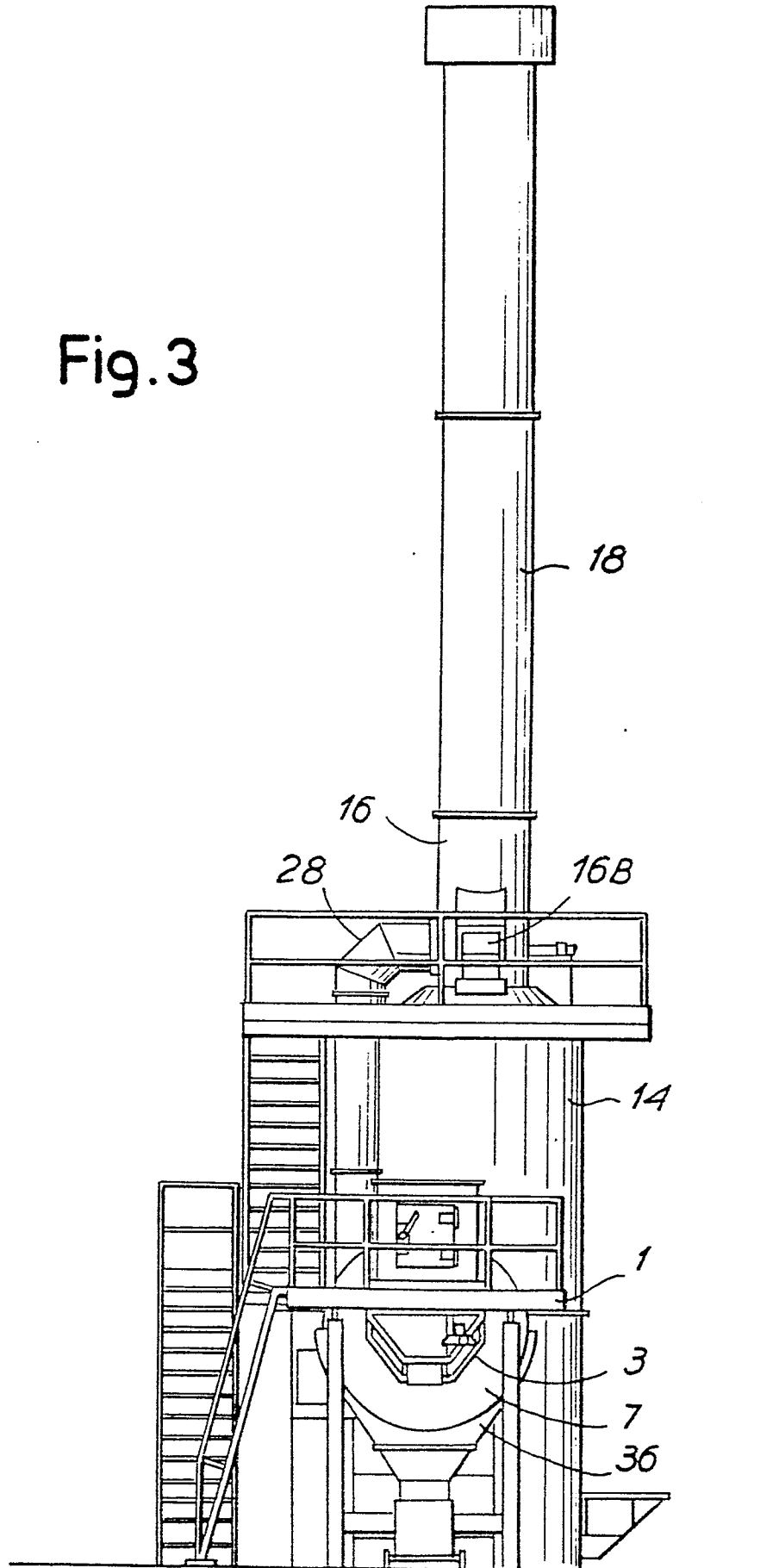


Fig.4

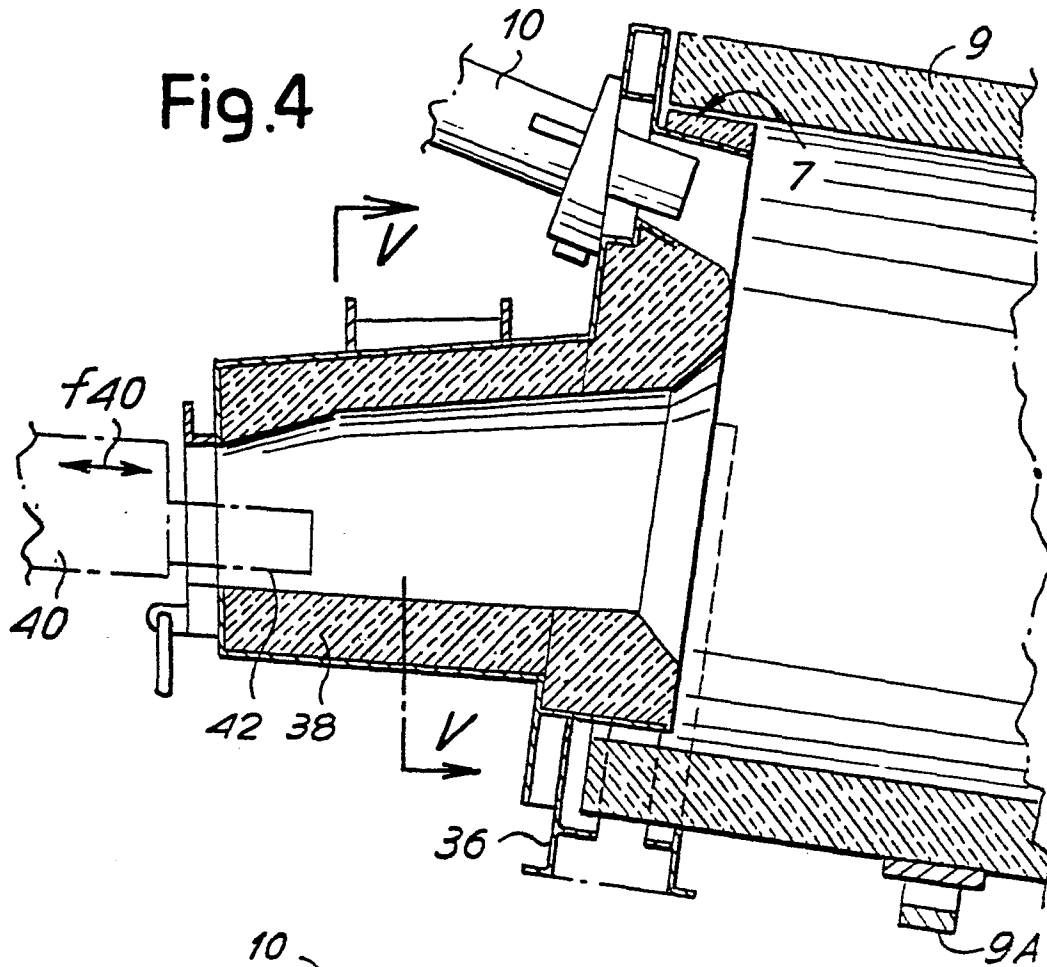
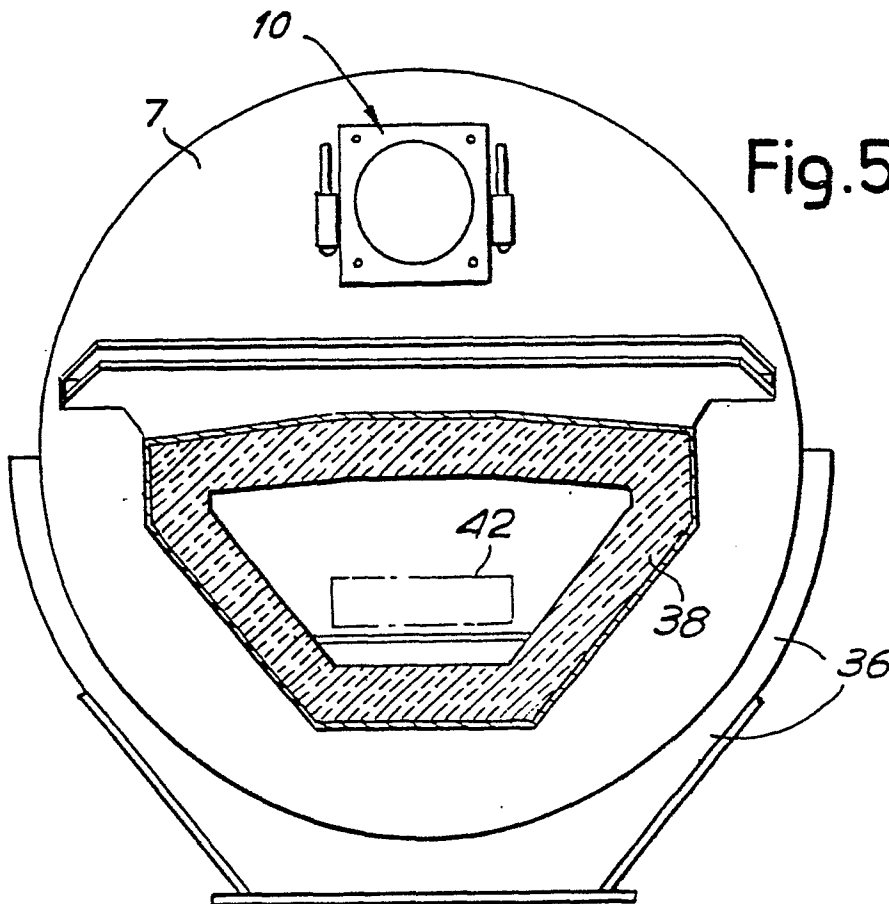


Fig.5



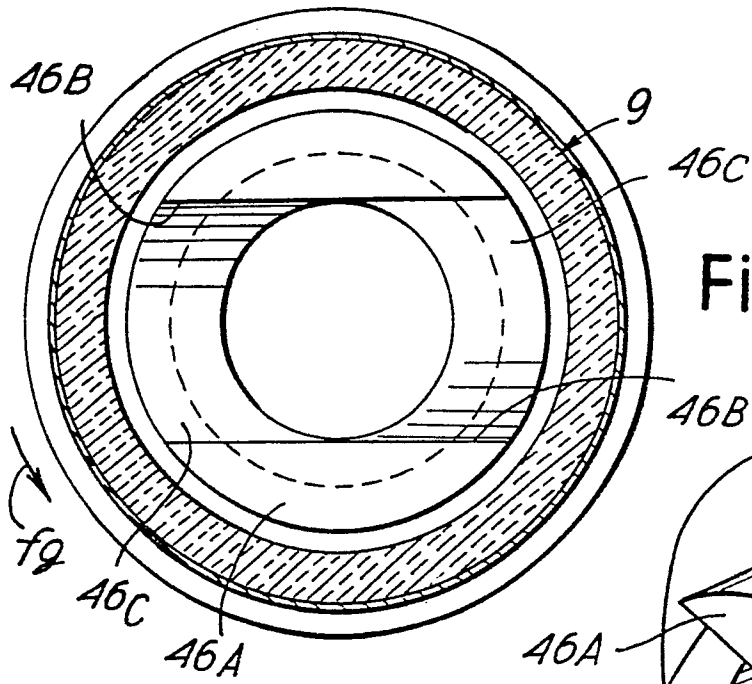
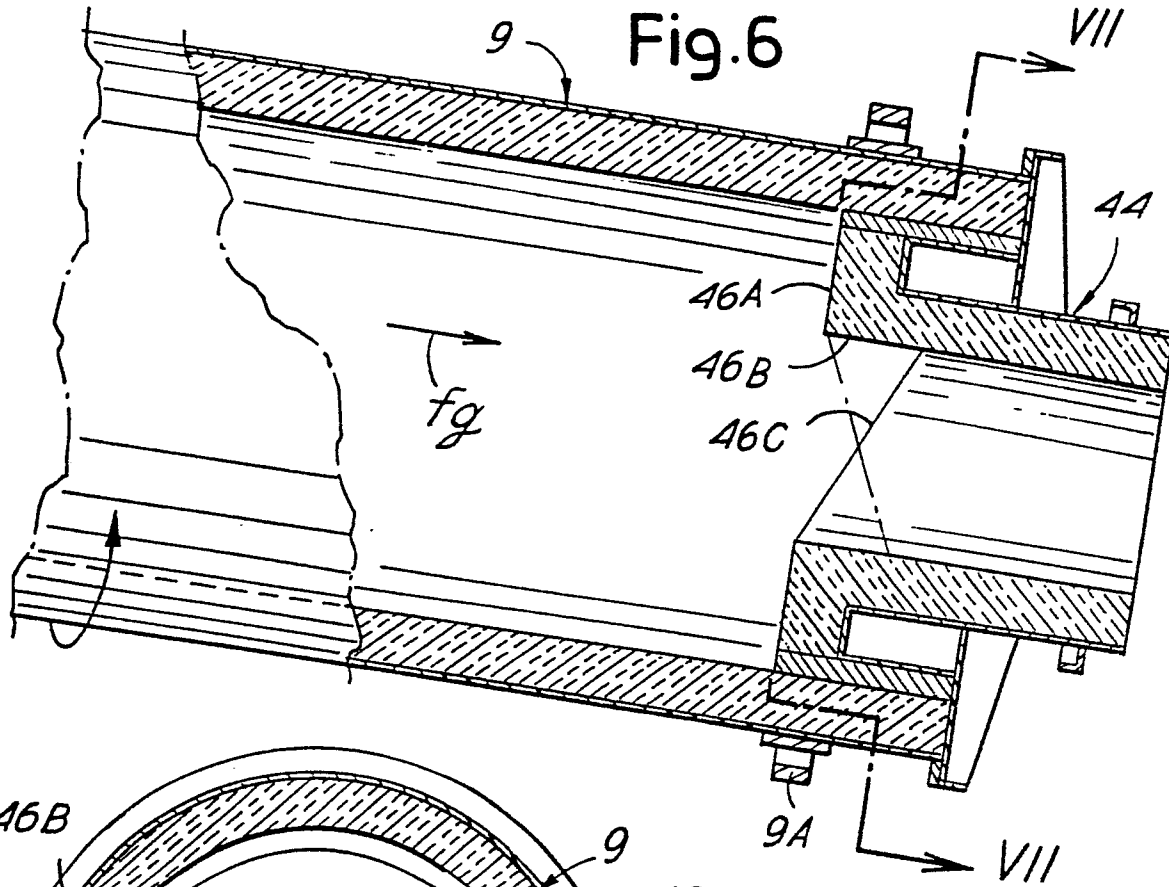
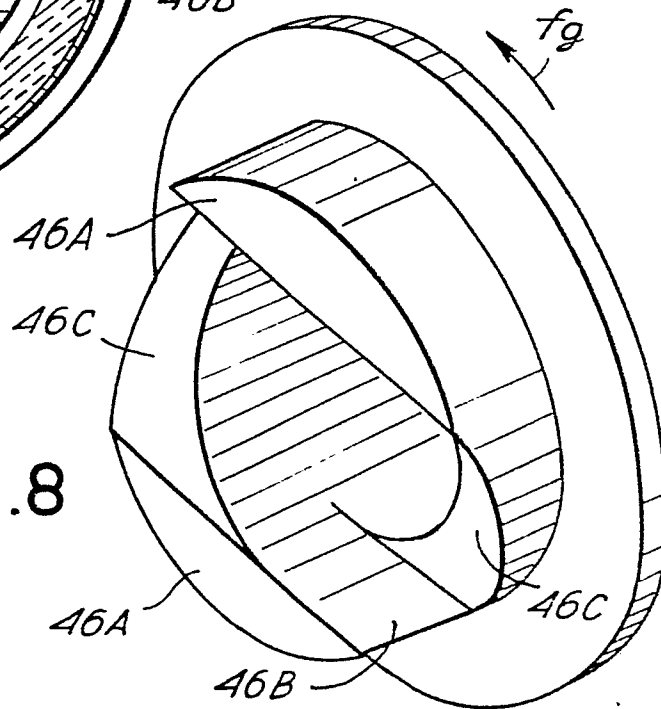
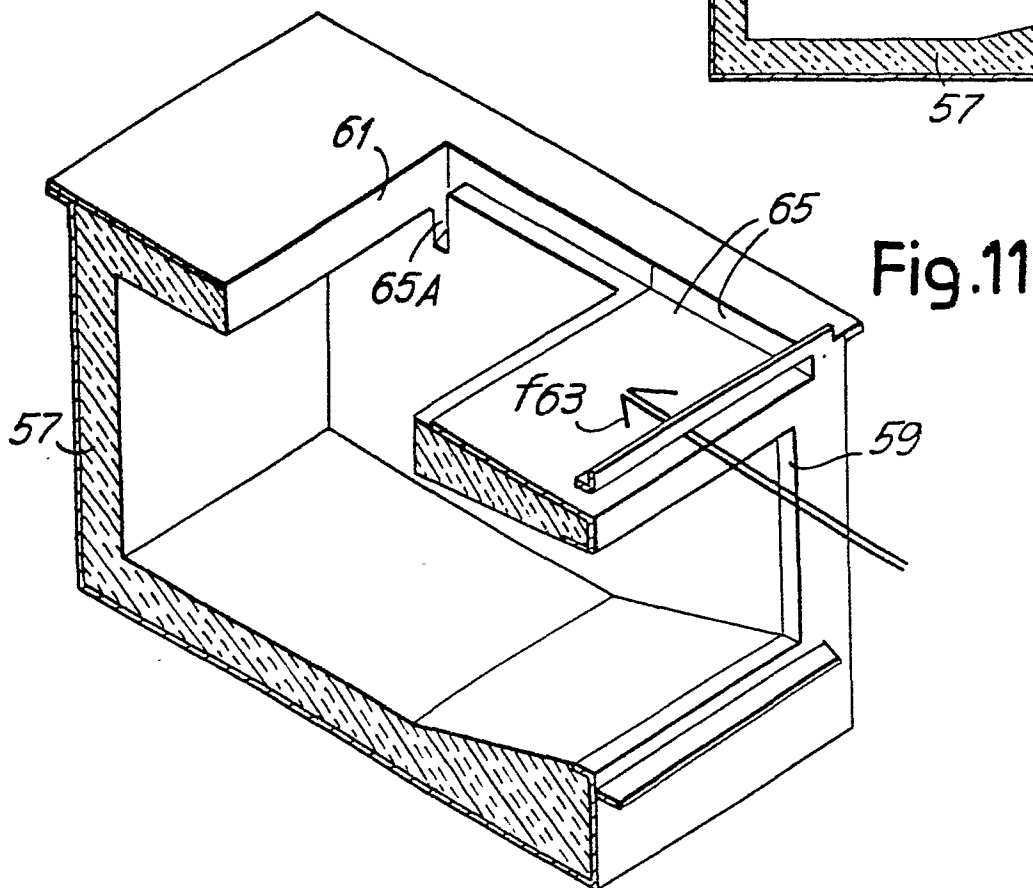
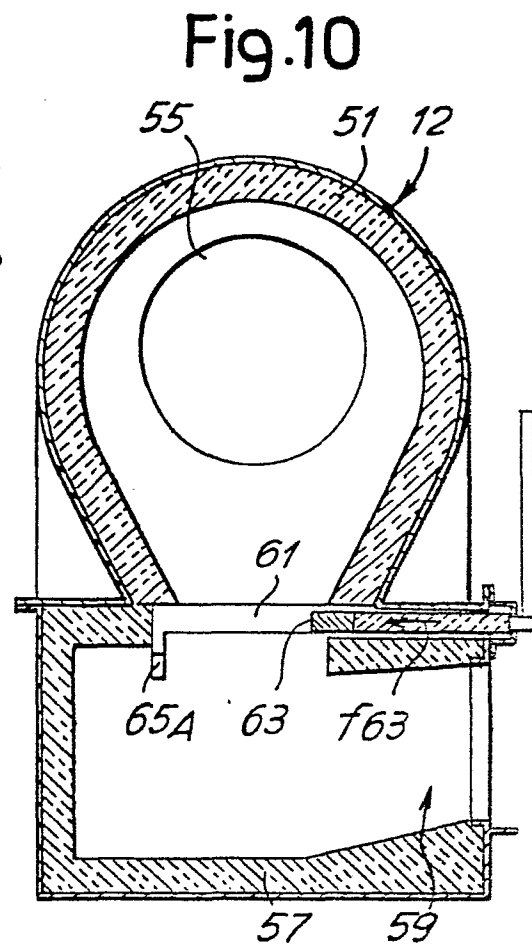
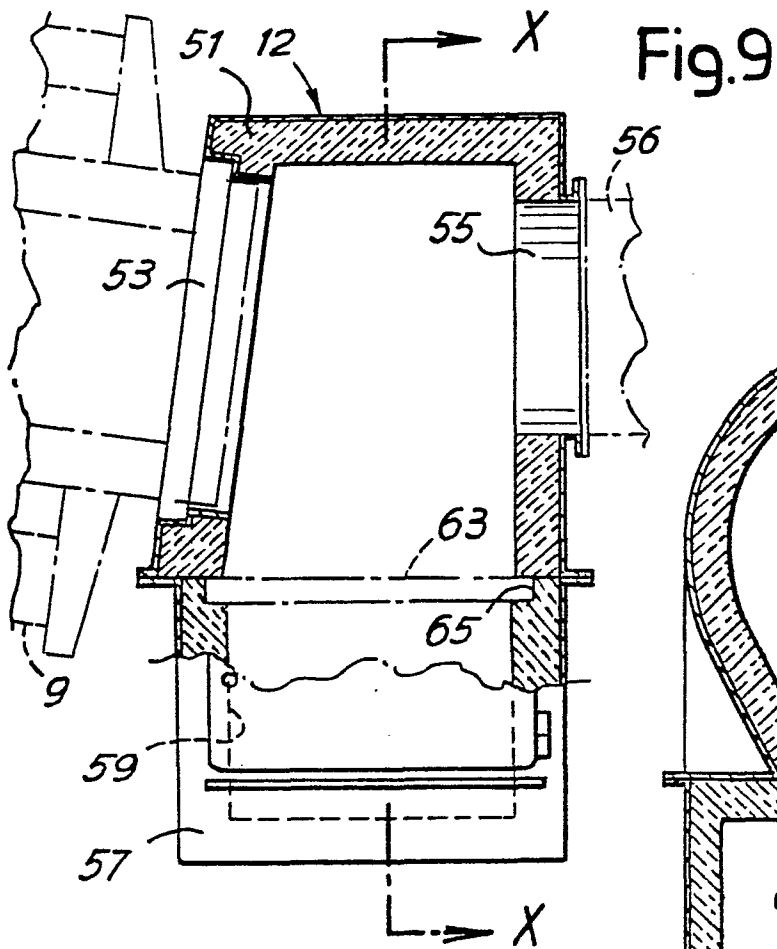


Fig.8





7/10

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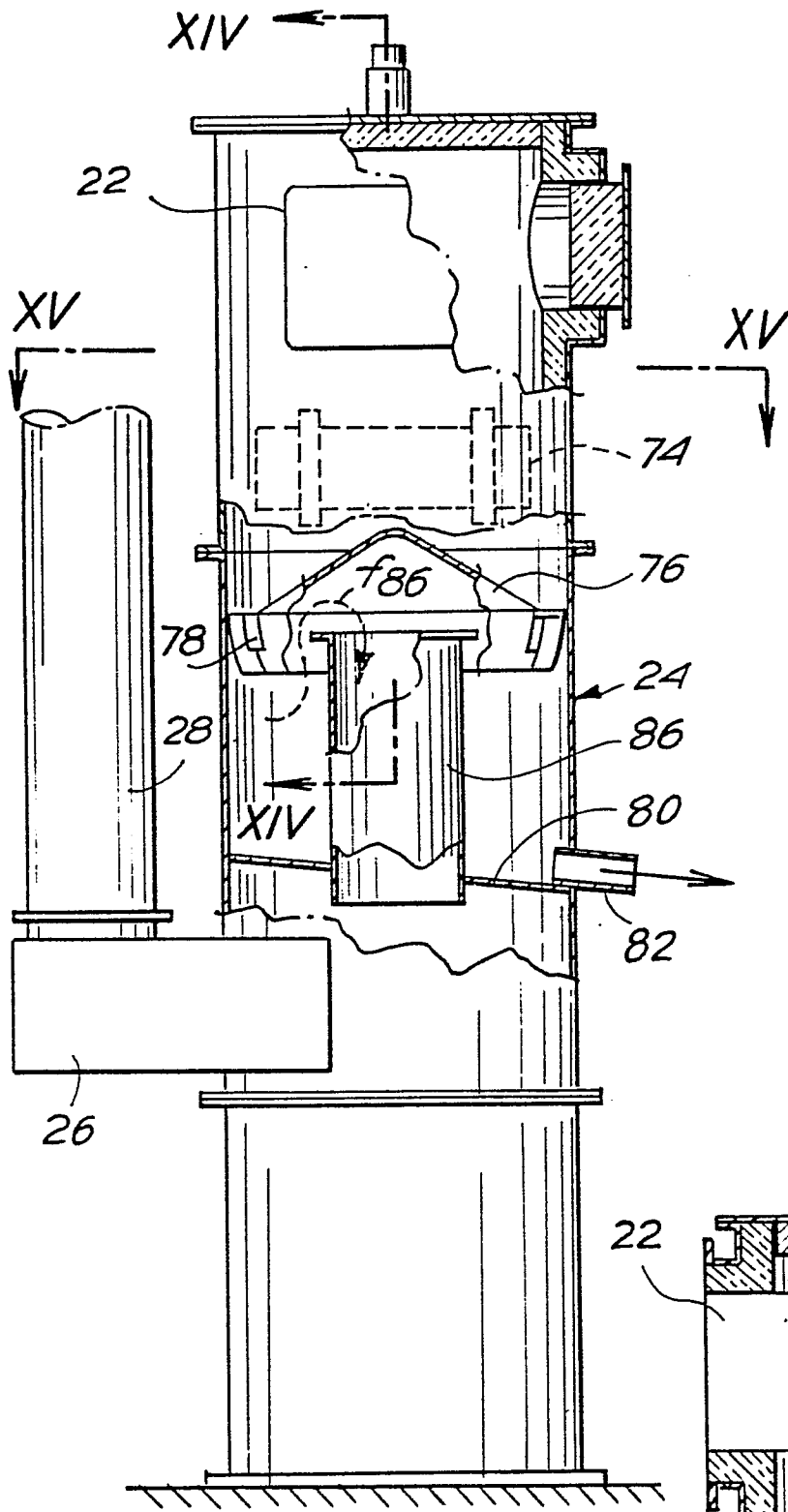


Fig. 13

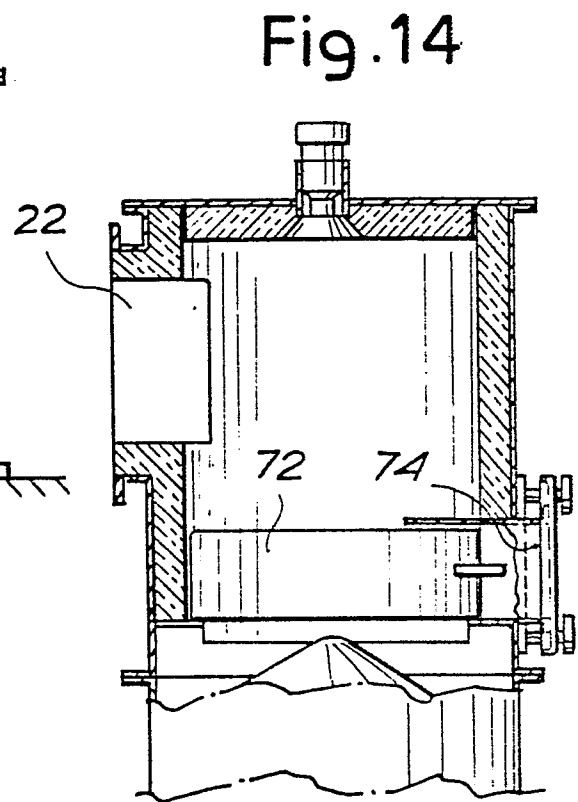


Fig. 14

Fig. 12

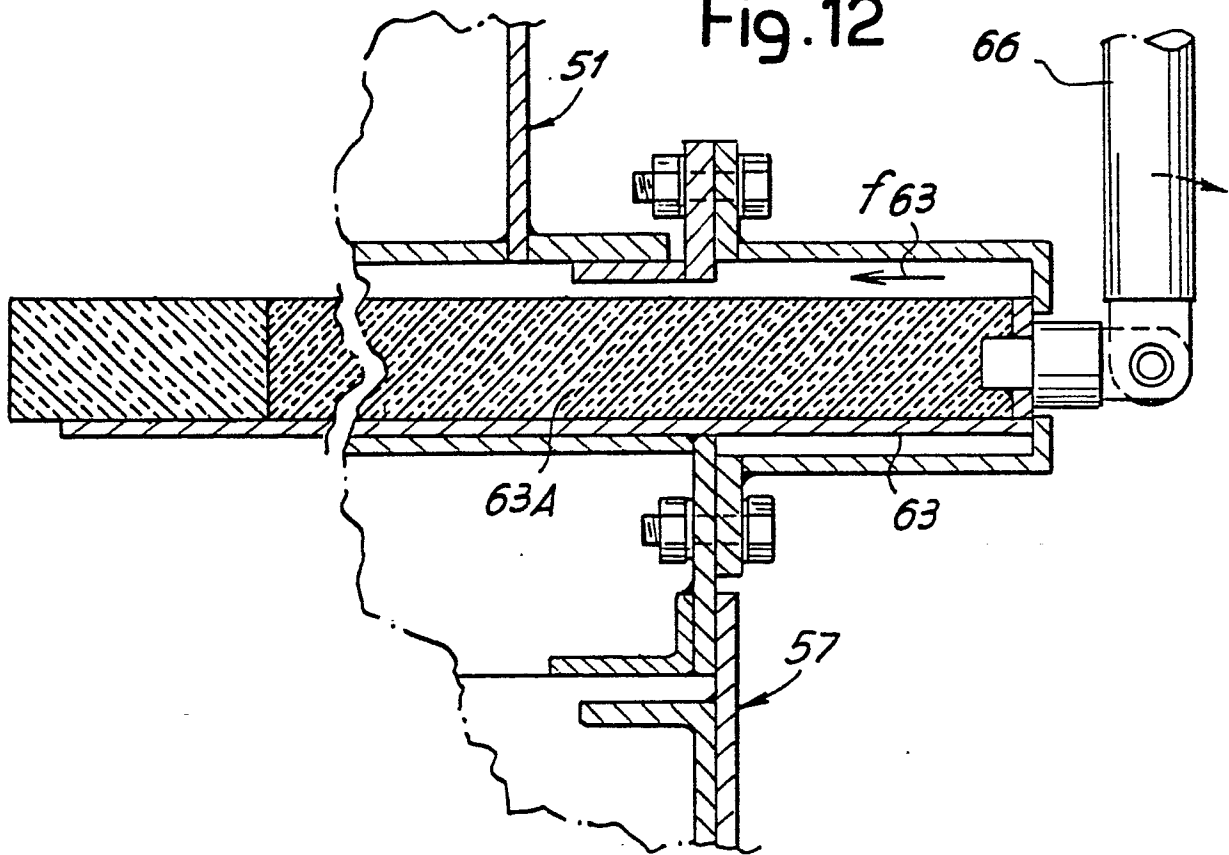
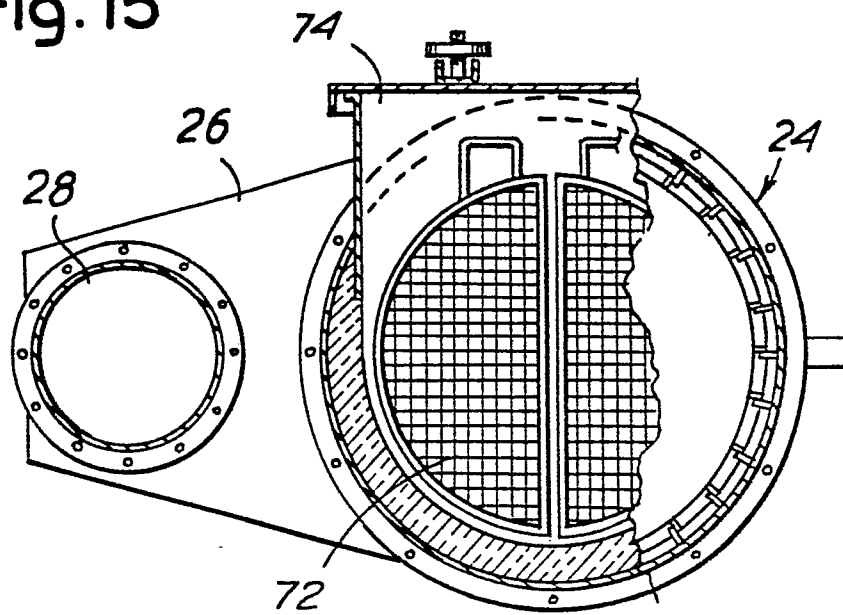


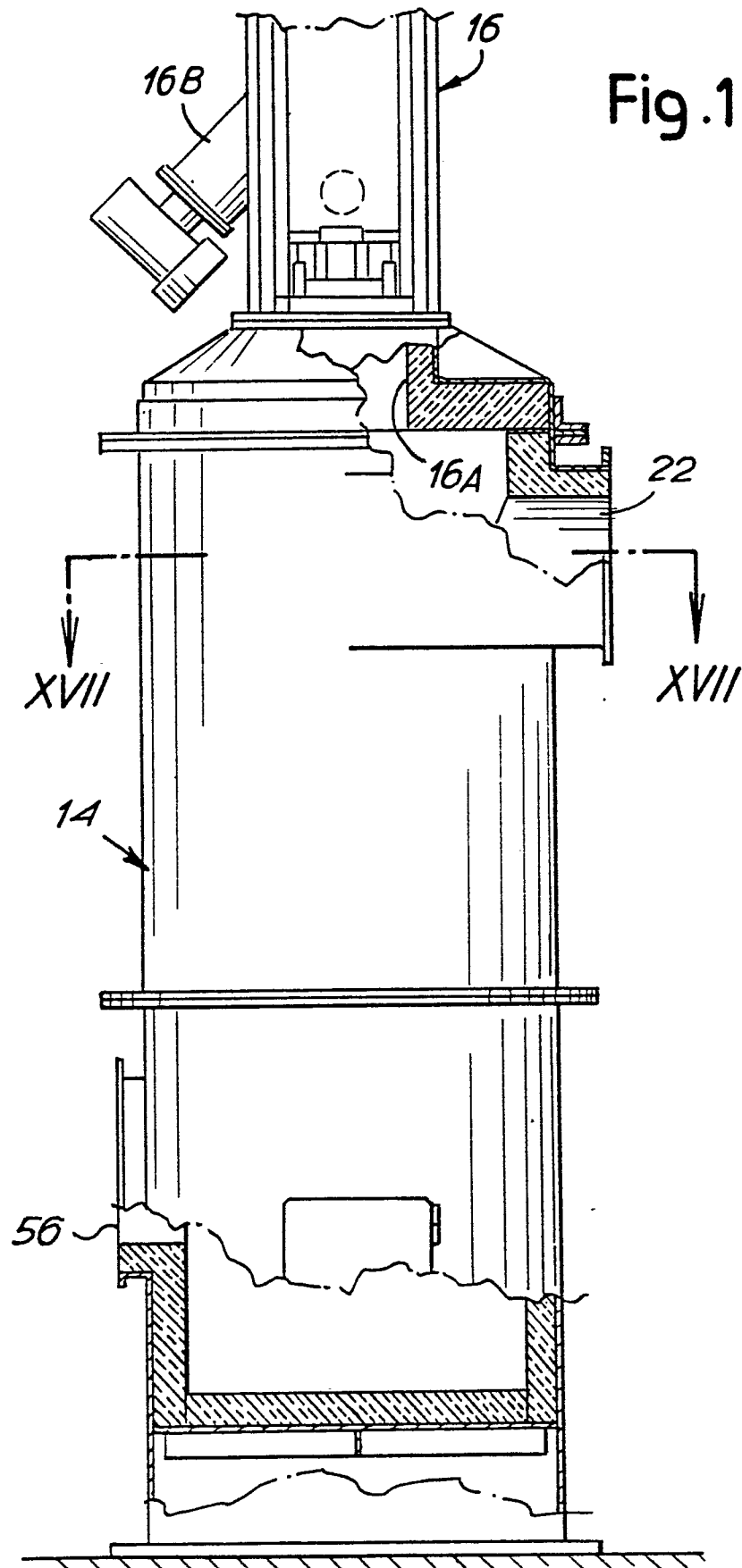
Fig. 15



9/10

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Fig.16



10/10

Fig.17

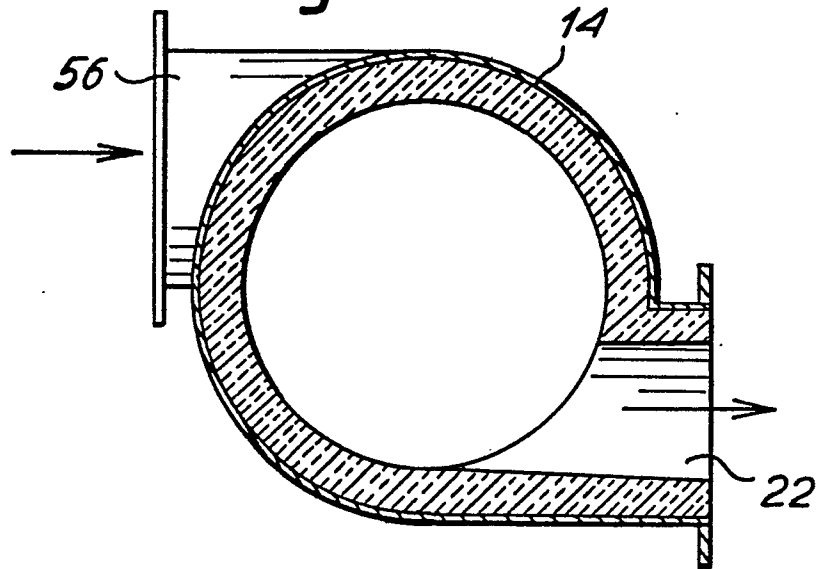
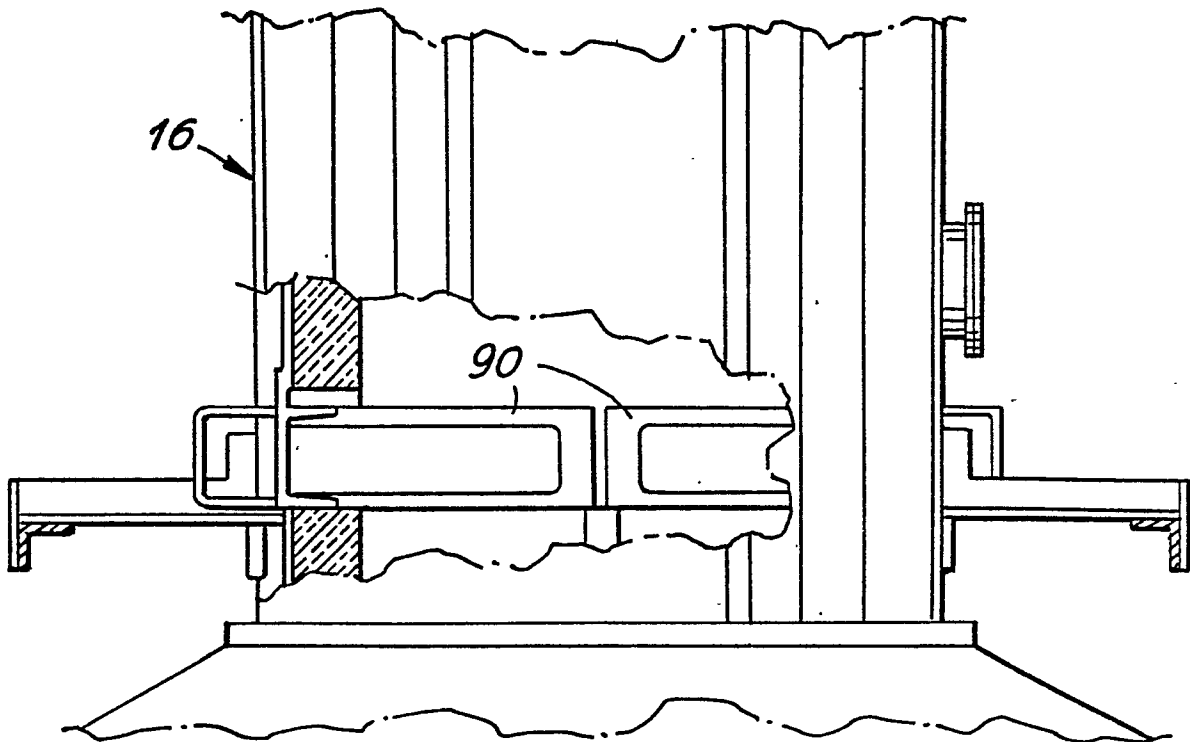


Fig.18





European Patent
Office

EUROPEAN SEARCH REPORT

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Application number

EP 82 11 2021

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06-04-1983	Examiner SARRE K.J.K.TH.
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EP 82 11 2021

Page 2

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Place of search THE HAGUE		Date of completion of the search 06-04-1983	Examiner SARRE K.J.K.TH.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			