

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 785 287 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.07.1997 Bulletin 1997/30

(51) Int Cl.⁶: **C21D 9/00**, F27B 9/00,
F27D 23/02

(21) Application number: **96830580.5**

(22) Date of filing: **13.11.1996**

(84) Designated Contracting States:
AT DE ES FR GB NL PT SE

(72) Inventor: **Barbero, Renato**
I-10070 San Carlo Canavese (Torino) (IT)

(30) Priority: **27.12.1995 IT TO951049**

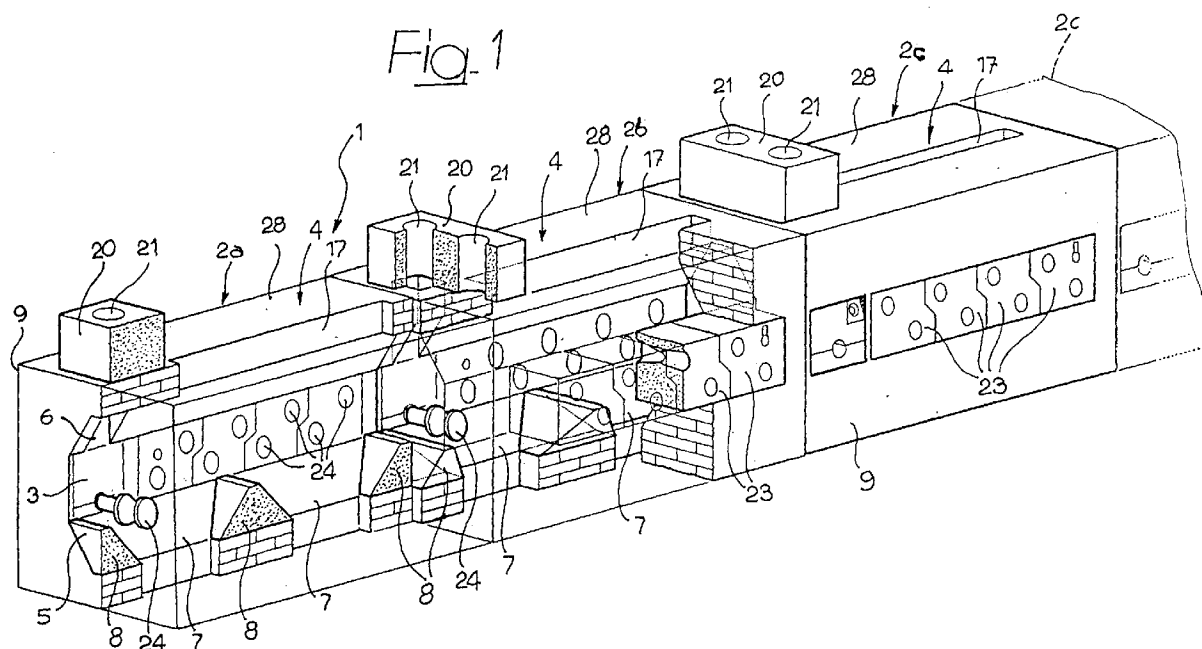
(74) Representative: **Buzzi, Franco et al**
c/o Buzzi, Notaro & Antonielli d'Oulx Srl,
Corso Fiume, 6
10133 Torino (IT)

(71) Applicant: **Siem di Barbero & C. Sas**
10070 San Carlo Cavanese (Torino) (IT)

(54) Gas furnace for continuous heating of metal bars

(57) A gas furnace (1) for continuous heating of metal bars (B), having a longitudinal heating tunnel (3) whose sole (5) is formed with longitudinal bottom apertures (7) for scale discharge, to which movable closure doors (10) are operatively associated. The bottom apertures (7) are downwardly tapered and the respective

closure doors (10) may be motor-driven. The ceiling (6) of the heating tunnel (3) is upwardly tapered and communicates superiorly with longitudinal top openings (17) to which tiltable closure lids (18) are operatively associated. Gas burner lateral seats (23) are arranged along two superimposed and offset rows.

**EP 0 785 287 A2**

Description

The present invention is generally related to combustion furnaces for the heating of metal pieces to be subsequently subjected to hot-working.

More particularly, the invention is directed to a gas furnace for continuous heating of metal bars, normally made of steel, of the type comprising a heat refractory material body defining a longitudinal heating tunnel having a sole and a ceiling, guide and support means of the bars through the heating tunnel, and gas burner seats provided along the lateral walls of the furnace body.

The object of the present invention is to provide an improved gas furnace of the above-referenced type, namely designed so as to enable practical and convenient removal of the scales, produced during treatment, from the lower part of the furnace.

A further object of the invention is to ensure in operation a higher thermal load inside the furnace tunnel, so as to achieve a more rapid heating, and additionally to provide easy tool access from the upper part of the furnace, in case of need.

The gas furnace according to the invention is mainly characterized in that the sole is formed with longitudinal bottom apertures for scale discharge, to which movable closure doors are operatively associated.

These bottom apertures are conveniently downwardly tapered from the heating tunnel towards the closure doors, and have conveniently a general frusto-pyramidal shape. Advantageously said closure doors are tiltable and motor driven.

According to another aspect of the invention, the ceiling is tapered from the heating tunnel upwardly, and communicates superiorly with longitudinal top openings. Tiltable closure lids are operatively associated to these top openings.

According to a further aspect of the invention, two superimposed rows of gas burner seats oriented transversally to the heating tunnel are provided along each lateral wall of the heating tunnel, the seats of each row being offset relative to the seats of the other row.

The furnace body is conveniently formed by longitudinal modular composable elements, so as to provide making up of furnaces of different lengths according to the user's need.

Additional features and advantages of the invention will become apparent from the following detailed description, with reference to the accompanying drawings purely provided by way of non-limiting example, in which:

figure 1 is a diagrammatic and partially sectioned perspective view of a gas furnace according to the invention,

figures 2 and 3 show in an enlarged scale respective details of figure 1,

figure 4 is a non-sectioned perspective view of the detail shown in figure 3,

figure 5 is a vertical section along line V-V of figure 4,

figure 6 is a vertical section along line VI-VI of figure 4, and

figure 7 is a fragmentary perspective view showing the operating system of the lower movable closure doors of the furnace.

Referring initially to figure 1, reference numeral 1 generally designates a gas furnace according to the invention, for the continuous heating of steel bars B (figures 5 and 6) which are to be subsequently subjected to hot-working.

The furnace 1 is formed by a number of longitudinal modular composable elements 2a, 2b, 2c, 2d.... connected to one another by any suitable means (not shown in the drawings) so as to define a longitudinal heating tunnel, generally designated as 3.

As shown in better detail in figures 2 through 6, depicting in particular the first and the second modular elements 2a, 2b, each of these modular elements comprises a generally parallelepipedal body 4 of heat-refractory material, surrounding and delimiting the corresponding portion of the heating tunnel 3, and defining a lower sole 5 and an upper ceiling 6.

According to a first aspect of the invention, the sole 5 is formed with longitudinal bottom apertures 7 spanning between lower transverse sections 8 and the lateral walls 9 of the body 4.

The bottom apertures 7 are downwardly tapered and have a general frusto-pyramidal configuration.

The function of these bottom apertures 7 is to allow downward discharge of the scales produced during operation of the furnace 1. To such effect, the bottom apertures 7 are closed inferiorly by respective movable closure doors, shown with dotted lines in figure 6 and in better detail in figure 7 with the related operating system.

The movable doors, indicated as 10, are hinged at the base of the furnace 1 around respective axes 11 oriented parallelly to the heating tunnel 3, so as to be tiltable between a raised closure position of the apertures 7, shown in figure 6 and with full line in figure 7, and a lowered opening position shown with dotted lines in figure 7. Tilting may be simultaneously operated by means of a motor-driven system comprising a motor (not shown) operating reciprocating rotation of a longitudinal rod 12 which carries toothed wheels 13, each of which is meshing with a transverse rack arm 15 pivoted at 16 to the bottom of a respective tilting door 10. Rotation of the rod 12 in the direction indicated by arrow F (figure 7) operates forward displacement of the rack arms 15 and thus closing angular motion of the doors 10 in the direction of arrow L, while rotation in the opposite direction indicated by arrow G produces opening angular motion of the doors 10 in the direction of arrow M. Accordingly the scales collected by the doors 10 can be periodically discharged and removed.

According to another feature of the invention, the

ceiling 6 is tapered from the heating tunnel 3 upwardly, and communicates superiorly with longitudinal top openings 17 formed in the upper wall 28 of the body 4. This arrangement of the ceiling 6 leads in operation to an improved heat irradiation on the bars B, and the presence of the openings 17 provides the possibility of access from above into the heating tunnel 3. The openings 17 are normally closed by lids 18 (figure 6) hinged at one side thereof around an axis 19 parallel to the longitudinal direction of the heating tunnel 3, so as to be tiltable in the direction of arrow N between a lowered closure position and a raised opening position.

The upper wall 28 of the body 4 of each modular element 2a-2d bears at least one chimney 20 provided with two vertical channels 21 for the outlet of the combustion smoke, which communicate through respective passages 22 (figure 5) with the ceiling 6 of the heating tunnel 3. The two-channel 21 arrangement allows, under the same flow rate of the combustion smoke, to remarkably reduce the height of the chimneys 20. Moreover, due to such arrangement each chimney 20 is adapted for application of double-release heat recuperators (not shown in the drawings) for pre-heating the combustion air by the combustion smoke.

The lateral walls 9 of the body 4 of each modular element 2a-2d are designed for application of gas burners, not shown in the drawings, through transverse passages 23 having respective tapered inner ends. According to a further aspect of the invention, these lateral passages 23 are arranged so as to provide positioning of the burners along two superimposed rows, with the burners of each row offset with respect to the burners of the other row. Moreover the configuration of the transverse passages 23 is such that the burners housed therein will substantially be oriented at 45° with respect to the bar B advancing along the heating tunnel 3, so as to provide a more uniform heating while preventing bending thereof. The burner arrangement along two superimposed and offset rows further enables, in the case of bars B having a quadrangular cross-section, to perform a more effective heat distribution over the four sides of the bars themselves.

Guiding and supporting of the bars B during advancement thereof along the heating tunnel 3 is provided by race rollers 24 rotatably carried by respective transverse shafts 25 overhanging from one of the lateral walls 9 of the body 4 of each modular element 2a-2d. The shafts 25 can normally be supported by a bearing basement (not shown in the drawings) arranged on the side of that lateral wall 9. As diagrammatically depicted in figures 5 and 6, the bars B bear along one longitudinal edge thereof upon the race rollers 24.

By virtue of the above-disclosed novel and peculiar features, the furnace 1 according to the invention provides the following advantages:

- easy scale discharge from the lower area,
- high thermal load for a more rapid heating,

- possibility of easy access from above in case of need.

Naturally the details of construction and the embodiments may be widely varied with respect to what has been disclosed and illustrated, without thereby departing from the scope of the present invention such as defined in the appended claims.

Claims

1. A gas furnace (1) for continuous heating of metal bars (B), comprising a heat refractory material body (4) defining a longitudinal heating tunnel (3) having a sole (3) and a ceiling (6), guide and support means (24) for the bars (B) through the heating tunnel (3), and gas burner seats (23) provided along the lateral walls (9) of said body (4), characterized in that the sole (5) is formed with longitudinal bottom apertures (7) for scale discharge, to which movable closure doors (10) are operatively associated.
2. Gas furnace according to claim 1, characterized in that said bottom apertures (7) are downwardly tapered from the heating tunnel (3) towards said closure doors (10).
3. Gas furnace according to claim 2, characterized in that said bottom apertures (7) have a generally frusto-pyramidal shape.
4. Gas furnace according to any of the preceding claims, characterized in that said closure doors (10) are tiltable.
5. Gas furnace according to any of the preceding claims, characterized in that said movable doors (10) are motor-driven.
6. Gas furnace according to any of the preceding claims, characterized in that the ceiling (6) is tapered from the heating tunnel (3) upwardly.
7. Gas furnace according to claim 6, characterized in that the ceiling (6) communicates superiorly with longitudinal top openings (17).
8. Gas furnace according to claim 7, characterized in that tiltable closure lids (18) are operatively associated to said longitudinal top openings (17).
9. Gas furnace according to any of the preceding claims, wherein the ceiling (6) communicates superiorly with chimneys (20) for the combustion smoke outlet, characterized in that each chimney (20) has two vertical side-by-side outlet channels (21) communicating with respective vertical passages (22)

of the ceiling (6) and adapted for the application of double-release heat recuperators.

10. Gas furnace according to any of the preceding claims, characterized in that two superimposed gas burner seats (23) oriented transversally to the heating tunnel (3) are provided along each lateral wall (9) of the body (4), the seats (23) of each row being offset relative to the seats (23) of the other row. 5
11. Gas furnace according to claim 10, designed for heating quadrangular bars (B) resting along one edge thereof along said guide and support means (24), characterized in that said gas burner seats (23) are oriented substantially at 45° towards the corresponding lateral faces of the bars (B). 10 15
12. Gas furnace according to claim 11, characterized in that said guide and support means are comprised of race rollers (24) overhanging, rotatably around respective transverse axes (25), from one lateral wall (9) of the body (4). 20
13. Gas furnace according to any of the preceding claims, characterized in that said refractory material body (4) is formed by longitudinal modular composable elements (2a-2d). 25

30

35

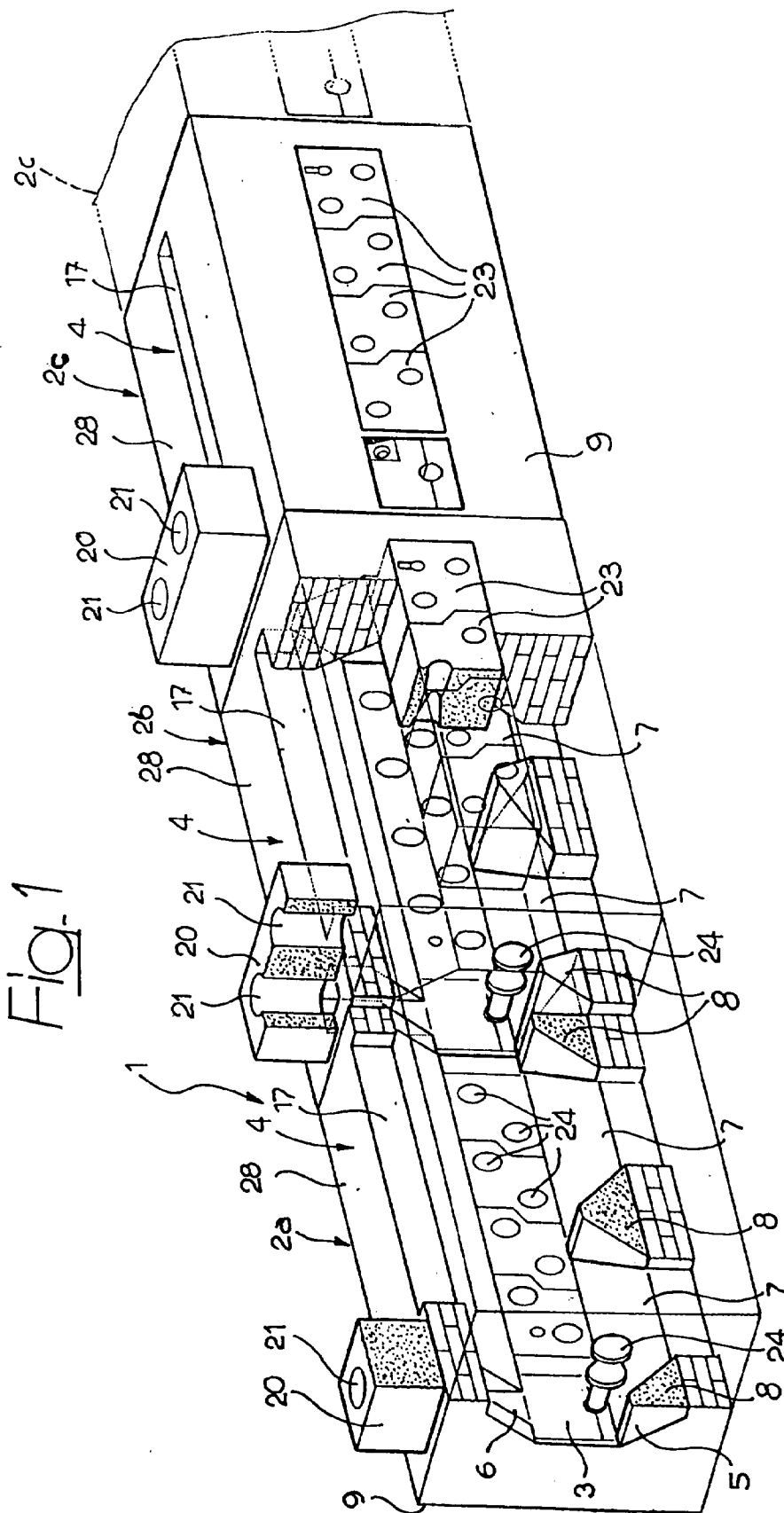
40

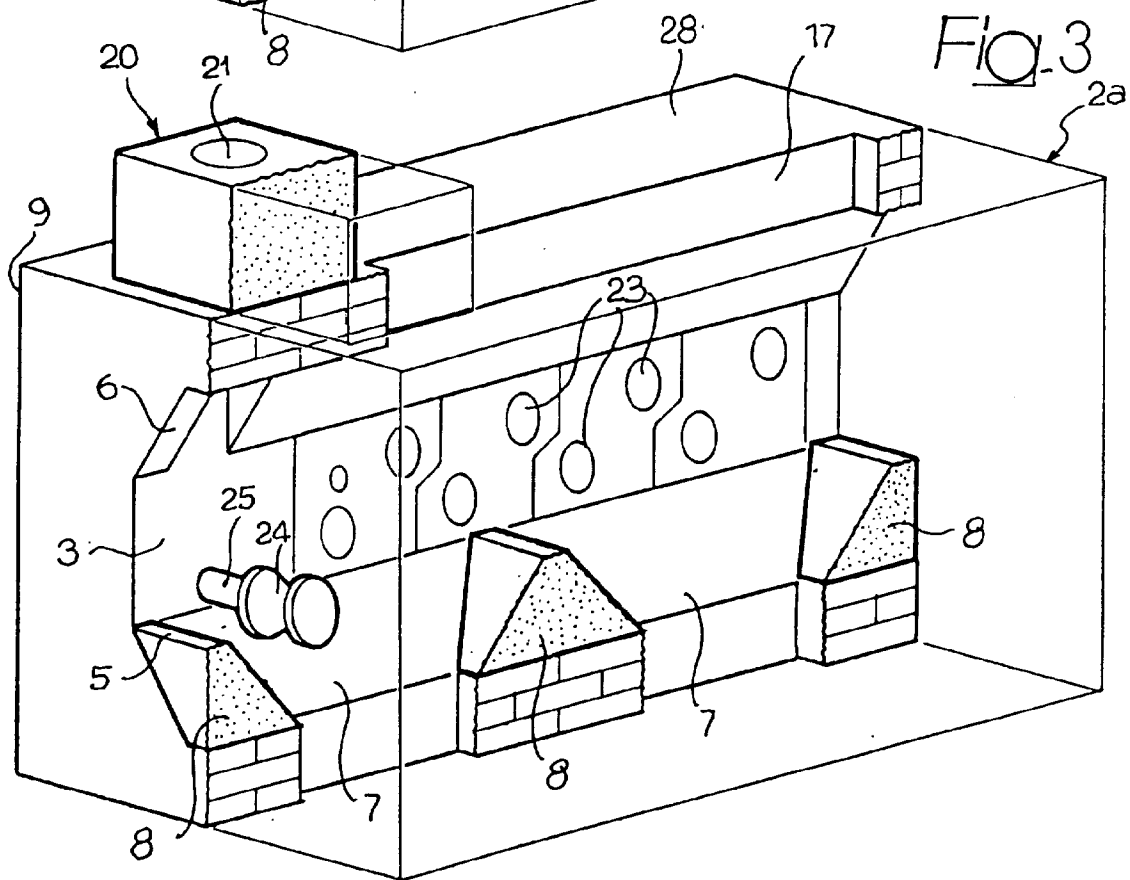
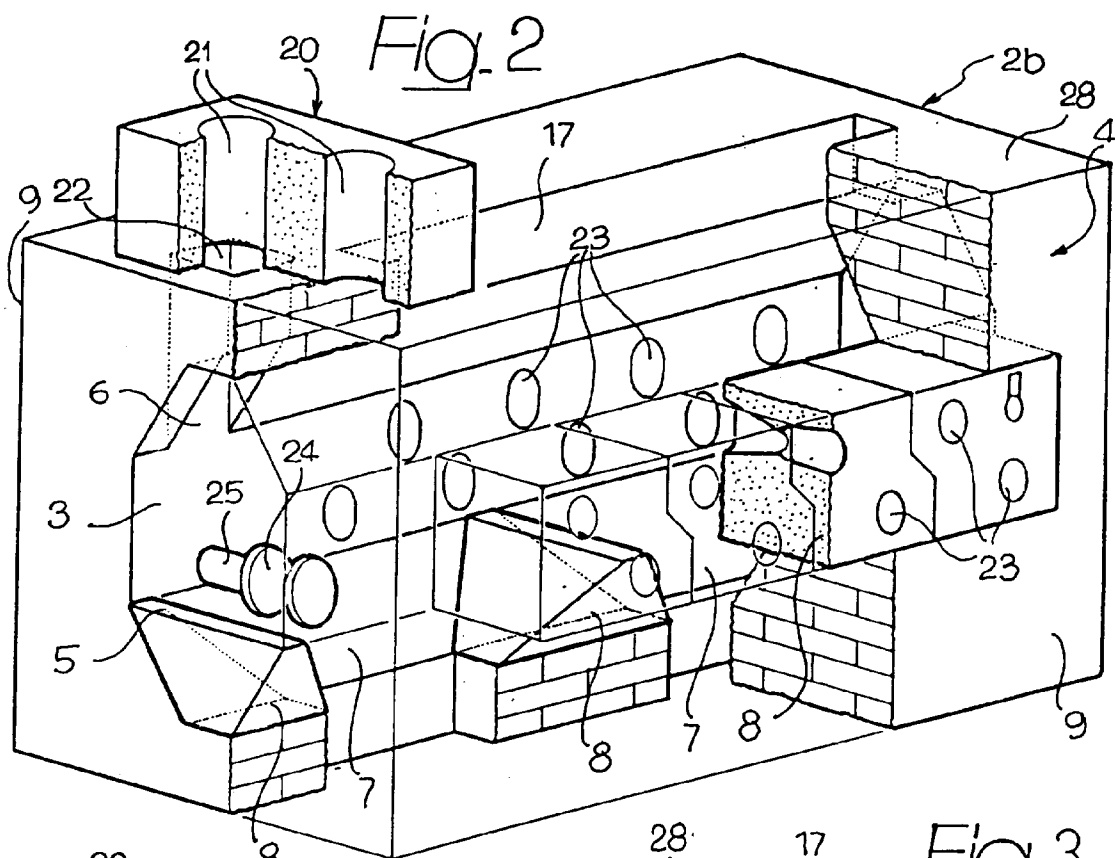
45

50

55

Fig. 1





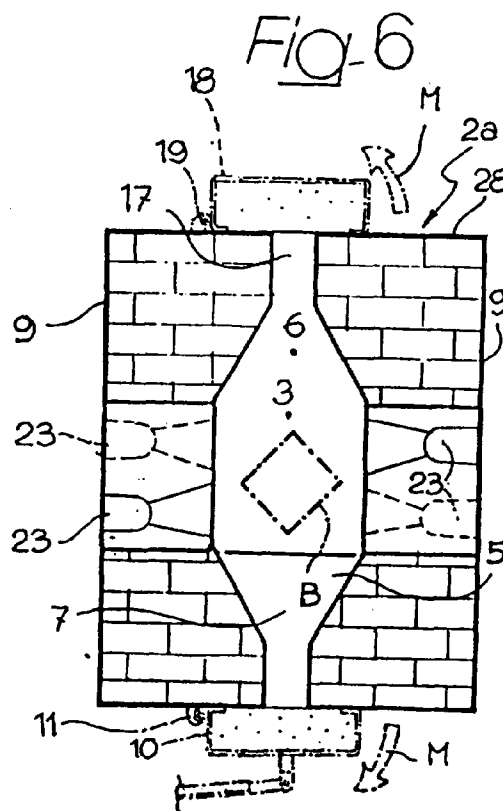
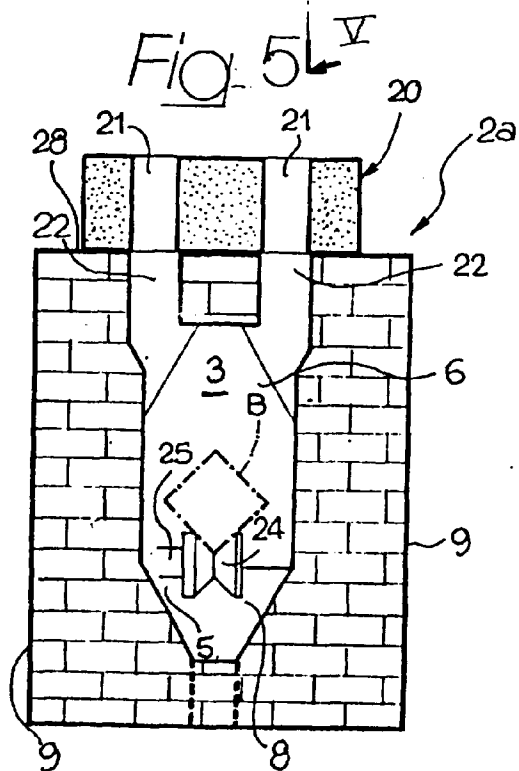
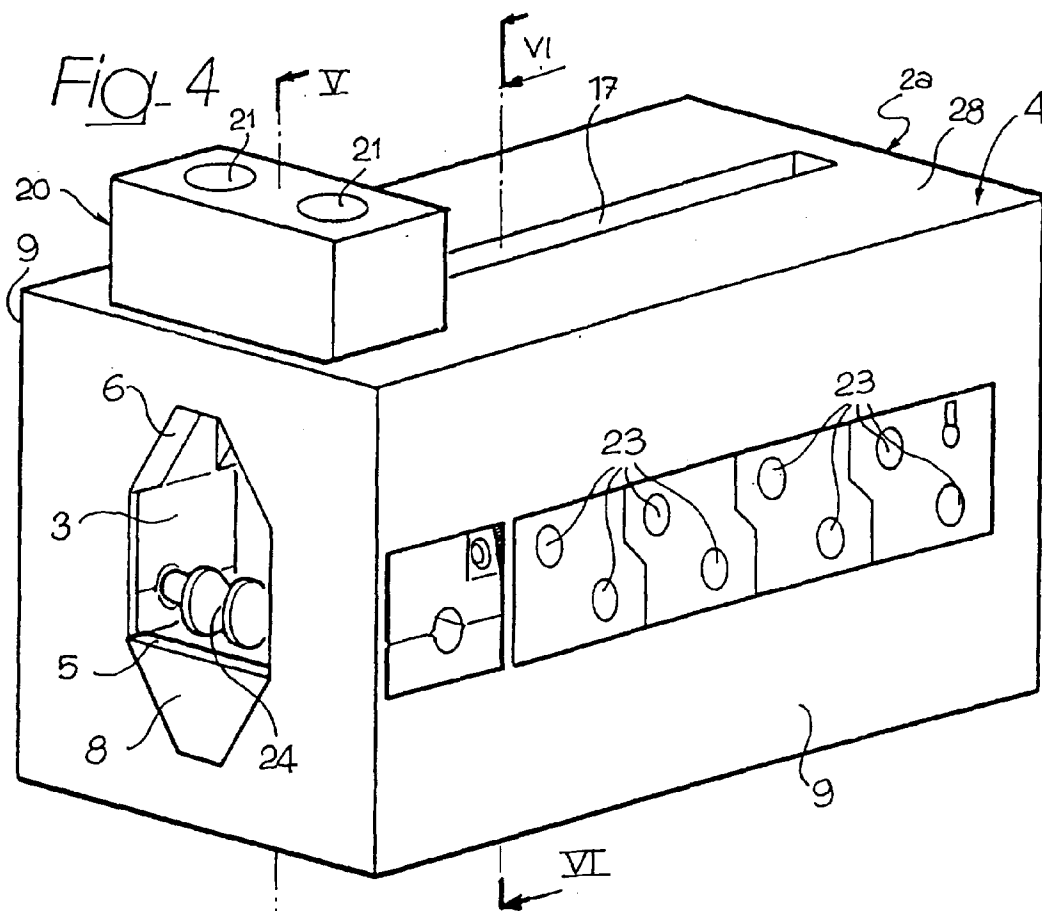


Fig. 7

