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IMPROVEMENTS TO HOODS FOR ASPIRATION
OF SECONDARY FUMES IN STEEL MILLS
AND FOUNDRIES

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This invention concerns improvements to hoods for aspiration of secondary fumes in steel mills and foundries.

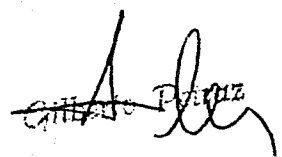
The invention also concerns hoods for aspiration of secondary fumes in steel mills and foundries which adopt such improvements.

The invention concerns, in particular, hoods for aspiration of secondary fumes which are of the type described in European Patent Application published under No.0063669 (priority: IT 83366 A/81) in the name of the present applicant.

Many attempts to overcome the problem of the collection of secondary fumes produced in steel mills are known. Some of these attempts have been developed to the stage of configuration of embodiments comprising actual chambers within which the furnaces, and arc furnaces in particular, are disposed.

For instance, US 3,806,622 is known which discloses an installation cooperating with an arc furnace and enclosing it completely. This installation, however, envisages the arc furnace as being positioned on wheels and being movable but does not visualise the possibility of acting with a bridge crane except for moving the furnace itself.

US 3,993,898, which is also known, discloses once more an



1 installation enclosing the smelting furnace and a ladle which
2 can move on rails.

3 US 3,938,788 is also known and discloses an installation
4 enclosing an arc furnace but cooperating with a crane at the
5 same time. The lengthwise trolleys of the crane cooperate with
6 movable panels which serve to close and plug appropriate
7 openings made in the installation itself. This type of crane
8 is substantially stationary and has its trolleys able to move
9 along the crane itself.

10 DT OS 2.511.387 is also known and discloses once more
11 substantially the teaching of US 3,938,788.

12 US 4,088,824 discloses an integral installation which,
13 however, envisages a movable ladle beneath it.

14 FR 2.381.107 discloses a box-like embodiment of a complex
15 type, which, like the other cited installations, concerns only
16 the furnace.

17 EP-A-0006084 discloses an embodiment in which a hood is
18 solidly fixed to the trolley of a bridge crane and can move
19 together with that trolley. This hood can cooperate with a
20 stationary aspiration duct. The invention is restricted to
21 applications to metallurgical vessels such as crucibles,
22 ladles, etc., since the trolley mentioned cannot bear hoods of
23 great sizes, such as those needed to collect fumes produced by
24 electric arc furnaces.

25 EP-A-0003357 teaches a system in which the furnace is shut
26 within an enclosure formed with two casings which can be
27 opened. These casings are opened for the entry and exit of the
28 charging or casting vessel. The collection of fumes while
29 these casings are opened is entrusted to a hood solidly fixed
30 to the bridge crane, and this hood can be placed so as to
31 correspond and cooperate with a stationary aspiration duct.
32 This system, however, entails various drawbacks and short-
33 comings. A first drawback lies in the fact that owing to the

great distance between the vessel, or furnace, and the hood the flow of air aspirated is of necessity considerable. Another drawback consists of the absence of sealing elements, in the lower part of the hood, which would be able to prevent the exit of fumes from the side of entry of the cables. Moreover, the cited patent has a system of closure of the hood by means of a movable portion solidly fixed to the trolley.

This system cannot ensure a proper seal on the closure side owing to the requirements for positioning the trolley. As a result a considerable flow of aspirated air is needed to obtain good efficiency of collection of fumes.

Patent DE-B-1.228.287 teaches a system with a hood of modest dimensions positioned immediately above a vessel, such as a ladle or crucible, and able to move with that vessel. Owing to its dimensions and positioning this hood cannot be very efficient, bearing in mind the fact that the flow of fumes to be aspirated has a high upwards speed owing to the high temperature. As a result the flow to be aspirated is very great. Moreover, the invention cannot be applied to the collection of fumes produced by a smelting furnace.

DE-B-1.217.028 discloses an embodiment suitable only for vessels of small sizes, the embodiment not being applicable to smelting furnaces. US-A-2,923,227 teaches a system like the two preceding systems and applicable to small metallurgical vessels which are being moved.

European Patent Application No. 0063669 (priority: IT 83366 A/81) in the name of the present applicant which we cited earlier discloses hoods solidly fixed to the bridge crane charging the furnace, the hoods being capable of being connected to a lengthwise duct by preferential inlet means which can be closed.

The fact that the duct is positioned lengthwise allows the duct to be located in the middle between two bays of a shed so

1 as to serve two hoods or sets of hoods placed on opposite
2 sides of the duct. In this way it is possible to serve plants
3 located on the two sides of the duct in one and the other bays
4 respectively, the plants being served by two separate bridge
5 cranes.

6 In the cited patent application the hoods can move with
7 their bridge crane and comprise means to close the openings
8 for the movement of the trolley and the cables bearing the
9 charging or casting vessels. Moreover, these hoods comprise
10 specific means suitable for connection, possibly with the
11 interposition of sealing means, to the stationary inlets in
12 the lengthwise aspiration duct.

13 It is a purpose of the present invention to improve the
14 efficiency of the hoods described earlier by the present
15 applicant in the cited patent application.

16 Another purpose of the invention is to provide means which
17 enable a certain collection of fumes to be carried out even
18 when the movable hoods together with the relative bridge crane
19 are not positioned in correspondence with their working zone.

20 It is a further purpose of the invention to improve the
21 efficiency of collection of fumes by providing possibly
22 movable curtain means and/or directional screen means suitable
23 for achieving better channelling of the fumes from the zone of
24 their production to the hoods.

25 Furthermore, the improvements of the invention can be
26 applied not only in the case of hoods serving furnaces not
27 shut within a soundproof enclosure but also in the case of
28 furnaces shut within a soundproof enclosure.

29 According to the invention the hood consists of two parts,
30 of which one can move together with a bridge crane, whereas
31 the other part, also called the "exhaust collector", is
32 positioned above and is stationary and solidly fixed to the
33 lengthwise aspiration duct.

1 When the hood is in its working position, the exhaust
2 collector forms the plurality of the upper part of the hood.

3 When the hood is absent from its working position, the
4 collector stays in position above the zone producing the fumes
5 and thus ensures a given collection of fumes at all times. The
6 purpose of this is to ensure better conditions within the
7 production sheds where the furnaces or other metallurgical
8 vessels are located.

9 Moreover, with the embodiment according to the improvements
10 of the invention the extra weight burdening the bridge crane
11 and due to the hoods is reduced, while the load on the
12 structures bearing the roof of the shed is much less than the
13 load with a traditional hood.

14 Shutter means or their equivalent may be positioned between
15 the exhaust collector and the aspiration duct so as to
16 regulate the flow aspirated or to shut off the aspiration.

17 In the lower zone of the movable part of the hoods the
18 invention envisages the ability to employ curtains or other
19 flexible systems or systems which can be lowered. The purpose
20 of such curtains is to extend the edge for the starting of
21 collection of fumes as far downwards as possible and therefore
22 as near as possible to the source of fumes.

23 In an embodiment entailing an enclosure of the metallurgic-
24 al vessel it is possible to visualize means to collect or
25 deflect fumes which are positioned substantially on the centre
26 line of such enclosure. These fume collectors have the purpose
27 of directing the fumes towards that particular one of the two
28 hoods or sets of hoods, positioned respectively on one and the
29 other sides of the lengthwise duct conveying the fumes, which
30 is actually above the source of the fumes, the purpose being
31 to improve the collection of fumes still further.

32 Where curtains or other means which can be lowered or, in
33 any event, adjusted to determine the height for the beginning

1 of fume collection are employed, it is possible for the
2 functioning of such means to be automated, for instance in
3 such a way that they are lowered only when the hood is in the
4 aspiration position.

5 Advantageously the provision of curtain means or screen
6 means which can be lowered and raised achieves the purpose of
7 a reduced overall vertical size of the hood when the latter is
8 not in its working position.

9 Such reduced overall size obviates collisions with other
10 structures which may be located in the sheds, such as the
11 transformer supplying an arc furnace, for instance, when the
12 hoods are moved.

13 The invention is therefore obtained with improvements to
14 hoods for aspiration of secondary fumes in steel mills and
15 foundries, which hoods are suitable to cooperate with smelting
16 furnaces, converters, crucibles, etc. for the aspiration of
17 fumes emitted by the same and comprise:

- 18 - movable hood means fitted to and solidly fixed to crane or
19 bridge crane means,
- 20 - stationary aspiration duct means,
- 21 - means for momentary connection of the movable hood means to
22 the stationary aspiration duct means,
- 23 - at least one opening which allows the passage of a trolley
24 of the bridge crane and is comprised in the movable hood
25 means, and
- 26 - means for momentary closure of such opening,

27 the improvements being such that the momentary connection
28 means include at least stationary exhaust collector means for
29 independent collection of fumes when the movable hood means
30 move away, and that the exhaust collector means comprise an
31 opening having a plan section at least equal to the section of
32 the top opening in the movable hood means and cooperate
33 momentarily with the latter, and that the exhaust collector

1 means constitute the plurality of the top portion of the hoods
2 which aspirate secondary fumes.

3 The invention is also embodied with hoods for aspiration of
4 secondary fumes in steel mills and foundries, which hoods are
5 suitable to cooperate with smelting furnaces, converters,
6 crucibles, etc. for the aspiration of fumes emitted by the
7 same and adopt the above improvements.

8 We shall describe hereinafter a preferred embodiment of the
9 invention as a non-restrictive example with the help of the
10 attached figures, in which:

11 Figs.1 give two views, a front view and a side view
12 respectively, of an application of the improvements of
13 the invention to a furnace not surrounded by an
14 enclosure;

15 Figs.2 show the application of the invention to a furnace
16 within a soundproof enclosure.

17 In the figures the same parts or parts having the same
18 functions bear the same reference numbers.

19 In Figs.1 improved hoods 10 according to the invention
20 comprise a lower portion 11 which is solidly fixed to a bridge
21 crane and within which a charging trolley 15 can enter.

22 The lower portion 11 comprises doors or other means 16-17
23 to close the openings required for the passage of the charging
24 trolley 15 and of cables bearing a charging skip 18 or ladle
25 19.

26 The upper portion of the hoods consists, instead, of a
27 stationary exhaust collector 12 communicating with a
28 lengthwise duct 13 positioned in this instance on the centre
29 line between two bays of a shed 20.

30 Thus a collection surface provided by the plan section of
31 the exhaust collector 12 itself is always positioned above a
32 furnace 21 or vessel from which the fumes are emitted.

33 Thus collection is ensured for the fumes, which are

1 gathered by the collector 12 and aspirated by the duct 13 even
2 when the lower portion 11 of the hood 10, solidly fixed to a
3 bridge crane 14, is not located in correspondence with the
4 furnace 21 or, in any event, with the position of collection
5 of fumes.

6 In the working position there is a small space between the
7 lower portion 11 and exhaust collector 12, but this space can
8 be closed by providing possible seal means. Such seal means
9 can be of various types and can consist, for instance, of
10 flexible skirts or other equivalent means which can be
11 provided on the collector 12 or on the movable portion 11 of
12 the hood 10.

13 One or more movable curtains 22 arranged on one or more
14 sides of the hood 10 can be envisaged in the lower part of the
15 movable portion 11 of the hood 10 (see the lines of dashes in
16 Fig.1a).

17 Movement of the curtains 22 may possibly be controlled
18 automatically, for instance by being governed by the position
19 of the movable portion 11 and therefore of the bridge crane 14
20 in relation to a charging zone 23 or casting zone 24.

21 The curtains 22 can be raised advantageously in this way
22 when the lower portion 11 of the hood 10 is not situated in
23 correspondence with such charging zone 23 or casting zone 24,
24 so that the curtains 22 will not come into contact with other
25 structures inside the shed 20.

26 According to a variant which is not shown here, the
27 curtains 22 can be embodied so as to cooperate with stationary
28 structures of the shed 20, such as the upright columns 29, for
29 example. In this way it will not be necessary for the curtains
30 22 to be movable or adjustable, for they will be cooperating
31 with the lower portion 11 of the hood 10 only in the working
32 position of the hoods 10 themselves.

33 Figs.2 show a variant relating to the application of the

1 improvements of the invention to a furnace 21 provided with a
2 soundproof enclosure. The enclosure consists of a surrounding
3 structure 25 which encloses the furnace 21 wholly. This
4 structure 25 contains also the charging skip 18 or ladle 19.

5 In this instance the enclosure 25 has an upper opening 27
6 through which the fumes can be collected by the hood 10. This
7 opening 27 may possibly comprise closure means 30 such as
8 doors, shutters or other equivalent means.

9 In this example, therefore, the lower portion 11 of the
10 hoods 10 which is solidly fixed to the bridge crane 14 will
11 have smaller dimensions than those shown in Figs.1 since this
12 portion 11 only needs to collect fumes from the opening 27 in
13 the top of the enclosure 25.

14 According to the improvements of the invention the
15 enclosure 25 comprises closure means 26, such as doors or
16 other equivalent means, which can be opened momentarily to
17 allow the ladle 19 or charging skip 18 and relative cables to
18 pass through. In contrast with known embodiments, the
19 improvements of the invention envisage the doors 26 alone as
20 being the only movable parts. In this way the movable parts
21 have a much lower weight than in known solutions. As a result
22 the relative controls are simpler, faster and more reliable.

23 Fig.2a also shows conveyor or deflector means 28. In this
24 case the conveyor means 28 are conformed as a substantially
25 V-shaped sector located in correspondence with the division
26 between the charging zone 23 and casting zone 24. These
27 conveyor means 28 have the purpose of assisting the conveying
28 of fumes which are produced in the casting zone 24 or charging
29 zone 23 respectively, towards the hood 10 positioned
30 respectively above one or the other of those zones. In this
31 way the conveying of the fumes is assisted.

32 We have described here some preferred embodiments of the
33 invention, but variants are possible for a person skilled in

Alberto Petrucci

1 this field without departing thereby from the scope of the
2 invention itself.

3 Thus the shapes and proportions can be changed. The
4 invention can be applied to only one bay of a shed 20, in
5 which case the lengthwise duct 13 will serve only one set of
6 hoods 11 and relative exhaust collectors 12 located on only
7 one side of the duct 13.

8 It is also possible to employ a soundproof enclosure 25 in
9 a case where casting takes place in the same bay as that in
10 which the furnace 21, or furnaces, is charged.

11 It is also possible to envisage the employment, in
12 cooperation with the hoods 10 of the invention, of air curtain
13 means which ensure a good seal between the lower portion 11
14 and the exhaust collector 12 and/or between the enclosure 25
15 and the lower portion 11 of the hoods 10.

16 Moreover, regulation means, such as shutters or other
17 means, can be envisaged which are intended to regulate the
18 flow aspirated by the individual exhaust collectors 12
19 whenever several collectors 12 are included and are served by
20 the same aspiration duct 13.

21 According to another variant the aspiration duct 13 can
22 also be visualized as having any required disposition other
23 than a lengthwise disposition.

24 These and other variants are all possible without departing
25 thereby from the scope of the invention.

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INDEX

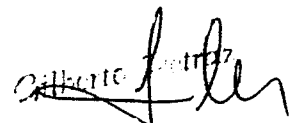
1	
2	10 - improved hoods
3	11 - lower movable portion of hoods
4	12 - stationary exhaust collector
5	13 - duct
6	14 - bridge crane
7	15 - trolley
8	16 - closure means
9	17 - closure means
10	18 - charging skip
11	19 - ladle
12	20 - shed
13	21 - furnace
14	22 - curtain or screen
15	23 - charging zone
16	24 - casting zone
17	25 - enclosure
18	26 - doors
19	27 - top opening
20	28 - conveyors
21	29 - columns
22	30 - closure means.

Gilberto Petraz

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CLAIMS

- 2 1 - Improvements to hoods (10) for aspiration of secondary
3 fumes in steel mills and foundries, which hoods (10) are
4 suitable to cooperate with smelting furnaces, converters,
5 crucibles, etc. for the aspiration of fumes emitted by the
6 same and comprise:
- 7 - movable hood means (11) fitted to and solidly fixed to crane
8 or bridge crane means (14),
 - 9 - stationary aspiration duct means (13),
 - 10 - means for momentary connection of the movable hood means
11 (11) to the stationary aspiration duct means (13),
 - 12 - at least one opening which allows the passage of a trolley
13 (15) of the bridge crane (14) and is comprised in the
14 movable hood means (11), and
 - 15 - means (16-17) for the momentary closure of such opening,
16 the improvements being such that the momentary connection
17 means include at least stationary exhaust collector means (12)
18 for independent collection of fumes when the movable hood
19 means (11) move away, and that the exhaust collector means
20 (12) comprise an opening having a plan section at least equal
21 to the section of the top opening in the movable hood means
22 (11) and cooperate momentarily with the latter (11), and that
23 the exhaust collector means (12) constitute the plurality of
24 the top portion of the hoods (10) which aspirate secondary
25 fumes.
- 26 2 - Improvements to hoods (10) for aspiration of secondary
27 fumes in steel mills and foundries as claimed in Claim 1, by
28 which there are means to regulate the flow aspirated which are
29 comprised between the exhaust collector (12) and the duct
30 (13).
- 31 3 - Improvements to hoods (10) for aspiration of secondary
32 fumes in steel mills and foundries as claimed in Claim 1 or 2,



1 which comprise at least momentary seal means between the
2 exhaust collector (12) and the movable hood means (11).

3 4 - Improvements to hoods (10) for aspiration of secondary
4 fumes in steel mills and foundries as claimed in any claim
5 hereinbefore, which comprise auxiliary means (22-28) to convey
6 fumes that cooperate at least momentarily with the lower
7 portion of the movable hood means (11).

8 5 - Improvements to hoods (10) for aspiration of secondary
9 fumes in steel mills and foundries as claimed in Claim 1 or 4,
10 by which the conveyor means (22) are solidly fixed to the
11 movable hood means (11).

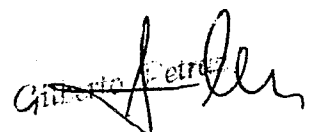
12 6 - Improvements to hoods (10) for aspiration of secondary
13 fumes in steel mills and foundries as claimed in Claim 4 or 5,
14 by which the conveyor means (22) can be regulated in relation
15 to the ground.

16 7 - Improvements to hoods (10) for aspiration of secondary
17 fumes in steel mills and foundries as claimed in Claim 4 or 5,
18 by which the conveyor means (22) are stationary.

19 8 - Improvements to hoods (10) for aspiration of secondary
20 fumes in steel mills and foundries as claimed in any claim
21 hereinbefore, by which the hoods (10) are applied to a
22 smelting furnace (21) not contained within an enclosure (25)
23 (Figs.1).

24 9 - Improvements to hoods (10) for aspiration of secondary
25 fumes in steel mills and foundries as claimed in any of Claims
26 1 to 7 inclusive, by which the hoods (10) are applied to a
27 smelting furnace (21) contained within an enclosure (25),
28 which comprises at least one upper opening (27) for the
29 passage of fumes (Figs.2).

30 10 - Improvements to hoods (10) for aspiration of secondary
31 fumes in steel mills and foundries as claimed in Claims 1 and
32 9, by which the enclosure (25) of the furnace (21) comprises
33 doors (26) for the passage of a charging skip (18) or ladle



1 (19), the plurality of the enclosure (25) being stationary.
2 11 - Improvements to hoods (10) for aspiration of secondary
3 fumes in steel mills and foundries as claimed in Claims 9 and
4 10, which comprise means to provide at least a momentary seal
5 between the enclosure (25) and the movable hood means (11).
6 12 - Improvements to hoods (10) for aspiration of secondary
7 fumes in steel mills and foundries as claimed in any of Claims
8 9 to 11 inclusive, which comprise means (30) to close the
9 upper opening (27) to the passage of fumes.
10 13 - Hoods (10) for aspiration of secondary fumes in steel
11 mills and foundries, which hoods (10) are suitable to
12 cooperate with smelting furnaces, converters, crucibles, etc.
13 for the aspiration of fumes emitted by the same and adopt
14 improvements as claimed in any claim hereinbefore.

Gilberto Petros

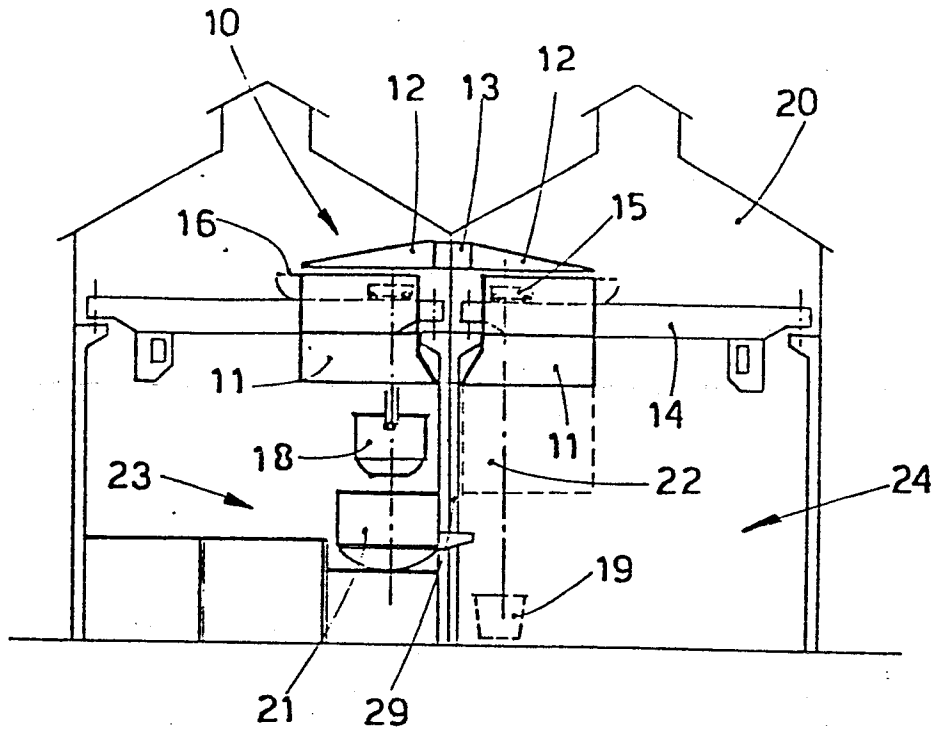



fig.1a

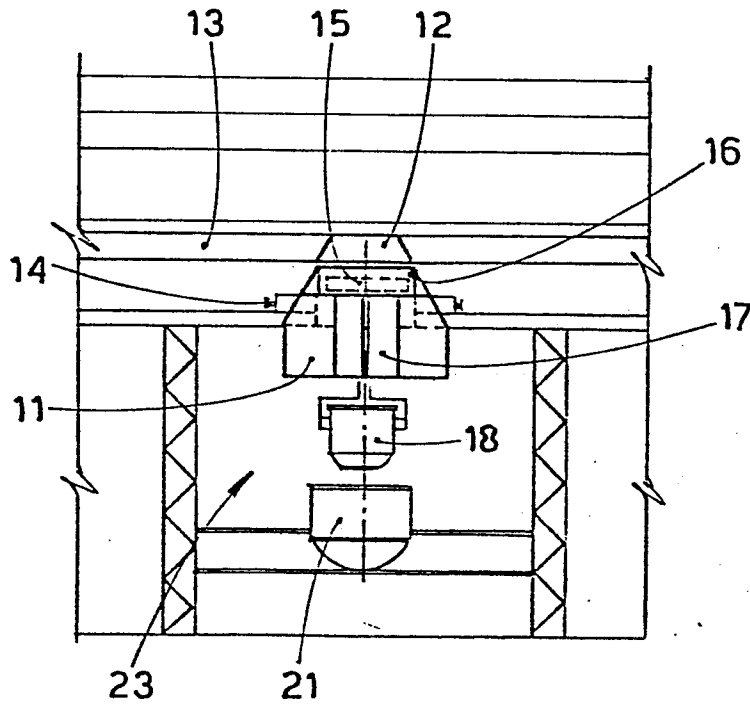


fig.1b

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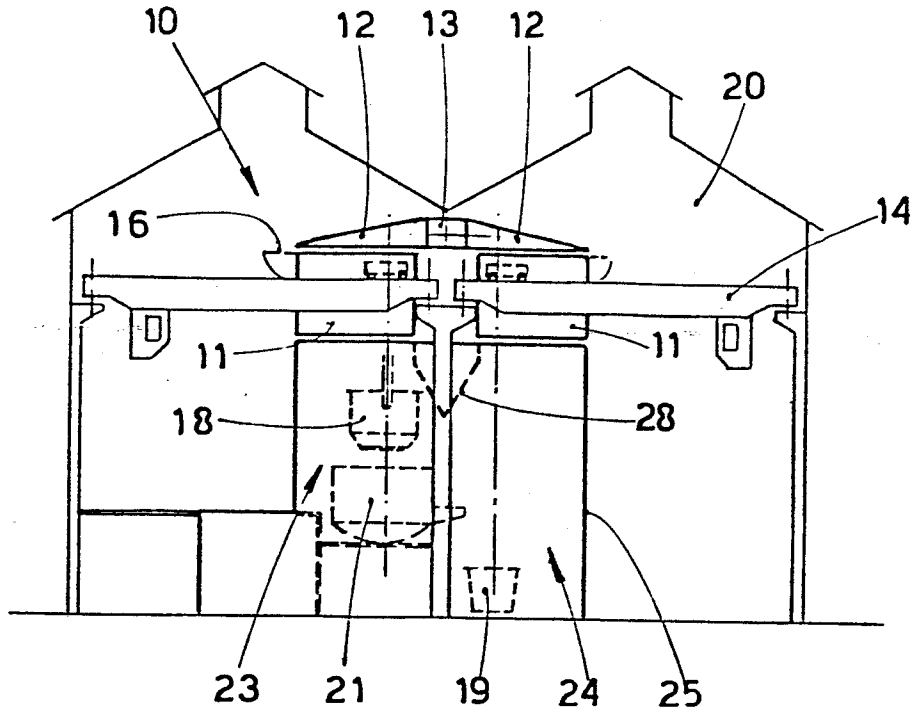


fig.2a

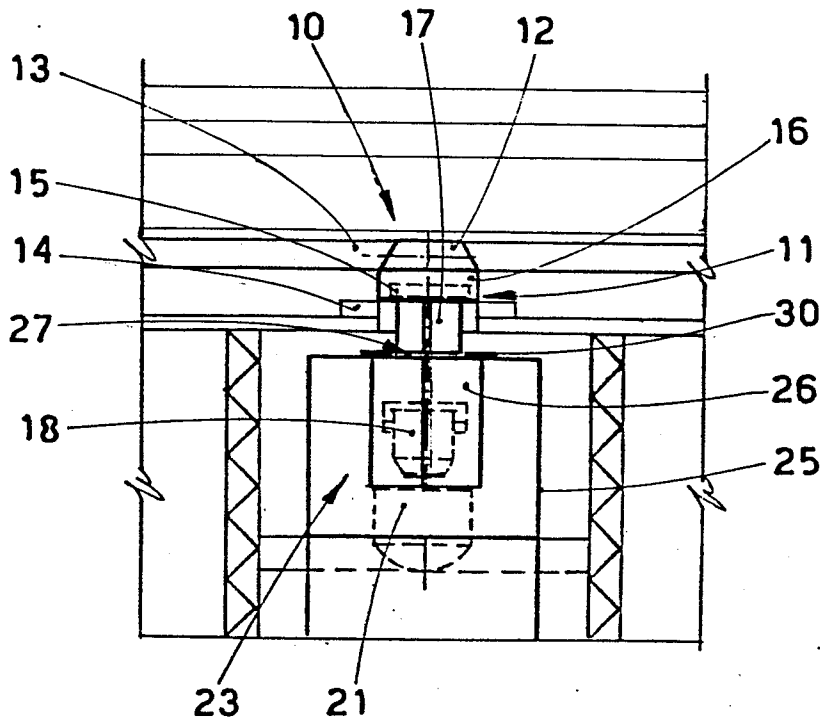


fig.2 b

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	EP-A-0 063 669 (DANECO-DANIELIECO-LOGIA)		F 27 D 17/00 F 27 B 14/08 B 22 D 41/00
A,D	EP-A-0 006 084 (VOEST-ALPINE)		
A,D	DE-B-1 228 287 (GUSSTAHLWERK OBERKASSEL)		
A,D	EP-A-0 003 357 (VEREINIGTE ÖSTERREICHISCHE EISEN- UND STAHLWERKE - ALPINE MONTAN AG)		
A,D	DE-B-1 217 028 (SIGMA OLOMOUC)		
A,D	US-A-2 293 227 (TUBBS)		
A,D	US-A-3 938 788 (F. JOSTEN)		F 27 B F 27 D B 22 D C 21 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16-08-1984	Examiner COULOMB J.C.
CATEGORY OF CITED DOCUMENTS		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	
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			