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(54) **MIXED CONSTRUCTION BRAZIER FOR SOLID FUEL FED STOVES**

(57) A brazier (1) for solid fuel stoves, comprising a containment element (2) which includes a bottom portion (3), delimiting a plurality of first through holes (TH1), a first perimeter wall (4) and a second perimeter wall (5), which define with the bottom portion (3) a containment zone (CZ) for a solid fuel. The brazier (1) also comprises a support element (6), configured to support and/or house the containment element (2), which includes a plurality of delimitation walls (7a, 7b, 7c, 7d, 7e) permanently

connected to each other. In particular, the bottom portion (3), the first perimeter wall (4) and at least one first portion or component (5a) of the second perimeter wall (5) are made in one piece in a first material while at least a second portion or component (5b) of the second perimeter wall (5) is made of a second material and is operatively connected to the first portion or component (5a) of the second perimeter wall (5).

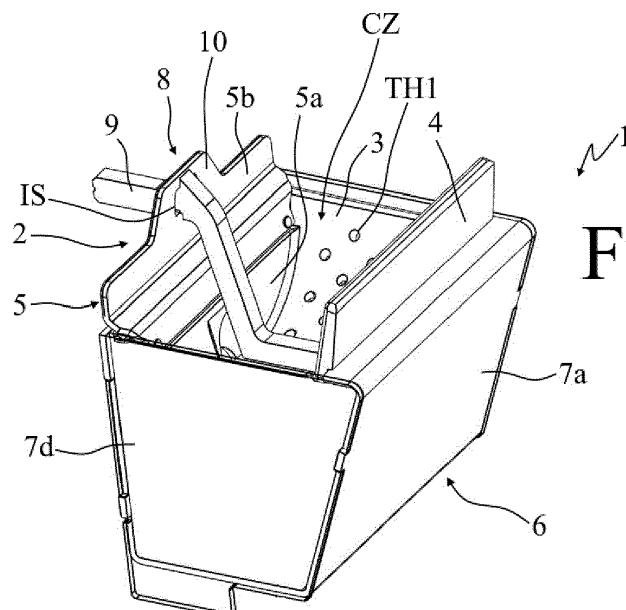


Fig. 1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a mixed construction brazier for solid fuel stoves as well as a method of making a brazier for solid fuel stoves.

STATE OF THE PRIOR ART

[0002] Stoves fed with solid fuels, in particular pellets but also wood chips, cereals, and vegetable waste in general, comprise a stove body which houses a burner.

[0003] A fuel storage compartment is also provided, which can be placed outside, or inside the stove body itself: the fuel, taken from the aforementioned compartment usually by a screw conveyor, or the like, is gradually fed inside of the burner.

[0004] The burner of the stove includes a fuel collection tray, more commonly called brazier, provided with a perforated bottom, through which the combustion air enters the combustion chamber.

[0005] The brazier usually has a square, rectangular or cylindrical shape, and is equipped with vertical walls that delimit the brazier, and serve to contain the ashes.

[0006] Typically, these braziers are made by joining a containment element inserted or housed in a support element. These elements are, in general, made by means of suitably cut and/or bent, or printed, steel metal sheet portions and connected to each other by welding.

[0007] This procedure, in addition to being particularly laborious, is also economically rather costly.

[0008] Consider, for example, the execution of all the steps necessary to prepare and create a burner using steel metal sheet portions, such as cutting, deburring, calendering, masking, welding and cleaning.

[0009] The need is therefore felt for a brazier for solid fuel stoves which allows the disadvantages of the prior art listed above to be overcome.

OBJECTS OF THE INVENTION

[0010] The technical aim of the present invention is therefore to improve the state of the art in the sector of solid fuel stoves and, more particularly, in the sector of braziers for solid fuel stoves.

[0011] Within the scope of this technical aim, it is an object of the present invention to overcome the disadvantages set forth above.

[0012] Another object of the present invention is to provide a brazier for solid fuel stoves, constructively simpler than braziers of the known type.

[0013] Another object of the present invention is to provide a brazier for solid fuel stoves which is constructively cheaper than braziers of the known type.

[0014] A further object of the present invention is to make available a brazier for solid fuel stoves, which is more practical and functional from the point of view of

use.

[0015] This aim and these objects are achieved by a brazier for solid fuel stoves according to claim 1.

[0016] This aim and these objects are also achieved by the method of making a brazier for solid fuel stoves according to claim 15.

[0017] The dependent claims refer to preferred and advantageous embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Other features and advantages of the invention will be more evident from the description of an example of embodiment of a solid fuel brazier, illustrated by way of example in the attached drawings in which:

figure 1 is a perspective view of a brazier according to an example of embodiment of the present invention,

figure 2 is another perspective view of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 3 is a side view of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 4 is a perspective view of the containment element of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 5 is a side view of the containment element of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 6 is a top view of the containment element of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 7 is a cross-sectional view of the containment element of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 8 is a perspective view of the support element of the brazier according to the example of embodiment of the present invention shown in figure 1,

figure 9 is a side view of the brazier according to the example of embodiment of the present invention shown in figure 1.

[0019] In the accompanying drawings, identical parts or components are identified by the same reference numbers.

EXAMPLES OF EMBODIMENT OF THE INVENTION

[0020] With reference to the attached figures, the numeral 1 indicates as a whole a brazier for solid fuel stoves according to a non-limiting example of embodiment of the present invention.

[0021] According to the present invention, the brazier 1 is suitable for being used to contain various types of

solid fuels such as biomass, for example wood in pieces or pellets or the like, however, other types of solid fuels could also be used.

[0022] By biomass it is intended any biodegradable substance deriving from products, waste and/or residues of animal and/or vegetable biological origin deriving from agriculture, forestry and related industries, including fishing and aquaculture, cuttings and prunings deriving from public and private green areas, as well as any biodegradable substance deriving from industrial and urban waste.

[0023] The brazier 1 according to the present invention comprises a containment element 2 which includes a bottom portion 3, delimiting a plurality of first through holes TH1, a first perimeter wall 4 and a second perimeter wall 5, which define with the bottom portion 3 a containment zone CZ for a solid fuel.

[0024] The brazier 1 according to the present invention also comprises a support element 6, configured to support and/or house the containment element 2, which includes a plurality of boundary walls 7a, 7b, 7c, 7d, 7e, for example made in suitably cut and/or bent or printed metal sheet, mutually permanently connected, for example by welding or other suitable joining method.

[0025] In particular, the bottom portion 3, the first perimeter wall 4 and at least one first portion or component 5a of the second perimeter wall 5 are made in one piece in a first material while at least one second portion or component 5b of the second perimeter wall 5 is made of a second material and is operatively connected to the first portion or component 5a of the second perimeter wall 5.

[0026] Preferably, the first material comprises cast iron or cast iron alloys while the second material comprises steel or steel alloys.

[0027] More in detail, cast iron is very economical to produce, has excellent wear resistance, good workability as well as excellent fusibility and the possibility of creating very complex shapes using simple melting and casting techniques. This allows for considerable advantages, for example, compared to the use of a material such as steel, whose hot forging and cold machining are energy-intensive and require rework, storage and increased production times.

[0028] In general, the use of steel would involve many processes, i.e., the cutting of the portions, with the creation of all the foreseen holes and/or openings, the deburring, the calendering, the masking, the welding of the relative portions together and the cleaning of the shadows deriving from the welds using special equipment. As can be understood, steel therefore requires a large number of processes.

[0029] For these reasons, the bottom portion 3, the first perimeter wall 4 and at least one first portion or component 5a of the second perimeter wall 5 are made in a single cast iron piece, by melting and casting in a suitably shaped mold, thus allowing to decrease the manufacturing time as well as the processing costs with respect to the state of the prior art.

[0030] Basically, by making the bottom portion 3, the first perimeter wall 4 and the at least one first portion or component 5a of the second perimeter wall 5 in a single cast iron piece, compared to the use of the second material, such as steel, the cutting, bending, calendering, welding and cleaning phases are saved.

[0031] However, in the case of very complex shapes, the first material, and in particular cast iron, requires finishing operations which lengthen and increase the overall manufacturing cost.

[0032] For this reason, the at least one second portion or component 5b of the second perimeter wall 5 is made of a second material, i.e., steel, since for this portion or component there is a machining that requires precision, which is more compatible with this second material, such as for example a laser processing. On the contrary, the realization of this second portion or component 5b in the first material by casting would not be able to guarantee the necessary precision.

[0033] It should be considered that in this way further reworkings are avoided, such as for example any finishing milling, which would lengthen the production times and increase the manufacturing cost of the brazier 1.

[0034] The brazier 1 according to the present invention comprises means for cleaning the plurality of first through holes TH1.

[0035] The cleaning means 8 comprise a spatula 9 for cleaning the plurality of first through holes TH1 and a support component 10, included in or delimited on the second perimeter wall 5, which defines an insertion seat IS configured to support the spatula 9 in rotation or movement.

[0036] The support component 10 consists of the second portion or component 5b of the second perimeter wall 5 and is therefore made with the second material.

[0037] In the event that this support component 10 consists of the second portion or component 5b of the second perimeter wall 5, the latter is operatively connected, for example by means of suitable connection means 11, such as screws or rivets, with the first portion 5a of the second perimeter wall 5.

[0038] It should therefore be considered that the support component 10 does not require welding and cleaning operations to be used in the brazier 1, but is operationally connected in a simple way to the first portion or component 5a by means of the connection means 11.

[0039] In particular, the first portion or component 5a of the second perimeter wall 5 can comprise or delimit an internal shoulder 5c for the support component 10 or, more particularly, for one of its lower edges 10a when in use.

[0040] If desired, in turn, the support component 10 can comprise or delimit an external shoulder 10d configured to allow the abutment of the containment element 2 on the support element 6 or, more particularly, on at least one boundary wall 7a, 7b, 7c, 7d, 7e thereof.

[0041] As far as the spatula 9 is concerned, according to the non-limiting example of embodiment of the present

invention shown in the figures, it is substantially "S" shaped according to a plurality of segments 9a, 9b, 9c consecutive to each other.

[0042] If desired, according to another non-limiting example of embodiment of the present invention, the spatula 9 could also be substantially U-shaped, again according to a plurality of segments consecutive to each other, for example five consecutive segments.

[0043] In more detail, the spatula 9 can comprise a first portion 9a, designed to be connected to actuation means, for example, a crank mechanism, or a mechanism of another type, provided in a stove.

[0044] Consecutively to the first section 9a, the spatula 9 can comprise a second connecting section 9b, and a third section 9c, designed to lap the upper, in use, surface of the bottom portion 3 to clean the plurality of first through holes TH1.

[0045] From a constructive point of view, the spatula 44 can be made of metallic material, for example steel metal sheet.

[0046] At the connection or passage area between the first section 9a and the second section 9b, the spatula 9 can advantageously comprise an indentation 9d, useful for coupling with the insertion seat IS.

[0047] In more detail, according to the non-limiting example of embodiment of the present invention shown in the figures, the insertion seat IS comprises an upper, in use, section US shaped for example according to an arc of circumference, and a lower section LS, shaped for example according to an arc of circumference, which engage with the indentation 9d of the spatula 9.

[0048] According to the non-limiting example of embodiment of the present invention shown in the figures, the upper, in use, section US has a shorter length than the lower, in use, section LS.

[0049] As can be understood, the insertion seat IS has, according to the non-limiting example of embodiment shown in the figures, a particular configuration and, for this reason, the second portion or component 5b of the second perimeter wall 5 or in any case the support component 10 is made of the second material, which is advantageously more suitable for precision machining.

[0050] The spatula 9 can thus be supported in a rotatable or displaceable manner in its rotation or movement, necessary for cleaning the upper, in use, surface of the bottom portion 3.

[0051] From a functional point of view, the spatula 9 can also be easily extracted from the insertion seat IS, and therefore completely removed from the brazier 1, for cleaning and/or maintenance reasons, without having to disassemble parts of the stove for this purpose.

[0052] In more detail, the spatula 9 can be easily extracted and removed, and possibly replaced, by removing from the stove the unit comprising the support element 6 and the containment element 2, which, for this purpose, can be disassembled from a stove.

[0053] As regards the first portion 5a of the second perimeter wall 5, it can advantageously comprise a win-

dow W, for example obtained on a hollow portion 5a1 included or delimited on this first portion 5a, configured to convey air into the brazier 1 and/or to place of the ignition means in communication with the brazier 1.

[0054] According to the non-limiting example of embodiment of the present invention shown in the figures, the window W has a substantially elliptical configuration, however according to other embodiments of the present invention, it could also have a different configuration, for example circular, rectangular or square.

[0055] As regards, on the other hand, the plurality of first through holes TH1, they can advantageously be distributed homogeneously on the bottom portion 3, i.e., with a constant numerical density along its entire extension.

[0056] According to the non-limiting example of embodiment of the present invention shown in the figures, the plurality of first through holes TH1 is arranged along several rows of through holes TH1 parallel to each other with respect to a longitudinal development direction of the bottom portion 3, with each through hole TH1 of a specific row offset with respect to the corresponding through hole TH1 of the row preceding and/or following it. This allows to obtain a homogeneous distribution of the plurality of first through holes TH1 in order to optimize the cleaning and/or the conveyance of the air of the brazier 1.

[0057] Moreover, the plurality of first through holes TH1 preferably comprises main through holes MTH1 and secondary through holes STH1.

[0058] Preferably, the main through holes MTH1 are arranged substantially on a central portion 3a of the bottom portion 3 and advantageously have an inlet opening having a smaller width than the outlet opening so as to facilitate the passage of the ash, which, in use, it is deposited on the bottom portion 3, towards the support element 6.

[0059] The secondary through holes STH1 can, on the other hand, be arranged near or around the free ends FE1, FE2 of the bottom portion 3.

[0060] Preferably, the secondary through holes STH1 have an inlet opening of the same width as the outlet opening so as to optimize, in use, the conveyance of the air in the bottom portion 3.

[0061] According to one version of the present invention, the bottom portion 3 can have a progressively decreasing thickness starting from its central portion 3a towards its free ends FE1, FE2.

[0062] The bottom portion 3 is curved with a concavity, in use, facing upwards so as to configure, with the perimeter walls 4, 5, a cradle conformation for the containment element 2.

[0063] This configuration is particularly advantageous as it allows the containment element 2 to be easily supported and/or inserted in the support element 6.

[0064] The bottom portion 3 can have a smaller width at its center line than its width at the free ends FE1, FE2.

[0065] In other words, the containment element 2 can have a flared and upwardly tapered configuration so as

to allow easy insertion into the support element 6 or the operative association of the same containment element 2 with the support element 6.

[0066] Structurally, according to the non-limiting example of embodiment of the present invention shown in the figures, the first and second perimeter walls 4, 5 each comprise a respective terminal portion TP1, TP2 proximal and adjacent to the bottom portion 3 configured as an arc of circumference.

[0067] With regard to the first perimeter wall 4, it comprises or preferably delimits an external abutment 4c configured to allow the abutment of the containment element 2 on the support element 6.

[0068] The first perimeter wall 4 also comprises or delimits a plurality of second through holes TH2 configured to convey air into the brazier 1 so as to facilitate, in use, the combustion of a solid fuel positioned in the containing zone CZ.

[0069] According to the non-limiting example of embodiment of the present invention shown in the figures, the plurality of second through holes TH2 is arranged along several rows of through holes TH2 parallel to each other with respect to a longitudinal development direction of the first perimeter wall 4, with each through hole TH2 of a specific row offset with respect to the corresponding through hole TH2 of the row preceding and/or following it. This allows to obtain a homogeneous distribution of the plurality of second through holes TH2 in order to optimize the conveyance of the air in the brazier 1.

[0070] As regards the support element 6, it is open at the top and comprises at least two abutment portions 6a, 6b configured to support the containment element 2.

[0071] At least one abutment portion 6a can be defined by a folded free end FE of a boundary wall 7a of the support element 6. This abutment portion 6a is configured to engage with the external abutment 4c, if present, of the first perimeter wall 5 so as to allow easy support of the containment element 2.

[0072] At least one boundary wall 7a, 7b, 7c, 7d, 7e of the support element 6 defines at least one through opening TO1, TO2, for example of a circular or rectangular or even square shape, configured to convey air into the brazier 1 and/or to place ignition means in communication with the brazier 1.

[0073] If several through openings TO1, TO2 are provided, they can also have different shapes, for example a first through opening TO1 of circular shape and a second through opening TO2 of rectangular shape or vice versa.

[0074] According to the non-limiting example of embodiment of the present invention shown in the figures, the boundary wall 7a, in use, lateral and proximal to the second perimeter wall 5 delimits two through openings TO1, TO2 of circular shape.

[0075] In particular, the through opening TO1 is arranged so as to be substantially aligned with and/or corresponding to the window W of the second perimeter wall 5, if provided.

[0076] In general, according to the non-limiting example of embodiment of the present invention shown in the figures, the support element 6 has a trapezoidal configuration.

[0077] According to other non-limiting embodiments of the present invention, the support element could also have other configurations, for example box-shaped, parallelepiped or cylindrical.

[0078] The support element 6 can comprise a first element 12, for example substantially U-shaped and made of steel bent metal sheet, which comprises or constitutes a front, in use, boundary wall 7a, a rear, in use, boundary wall 7b and a bottom, in use, boundary 7c of the support element 6 as well as one or more second elements 13, for example made of steel metal sheet, which comprise or constitute the lateral, in use, boundary walls 7d, 7e of the support element 6.

[0079] The first element 12 and the one or more second elements 13 are mutually permanently connected by welding so as to form the support element 6.

[0080] To engage the first element 12 and the one or more second elements 13, for example before welding, the first element 12 and the one or more second elements 13 can advantageously comprise one or more teeth or protrusions 12a, 13a, for example at the lateral edges of the same, configured to mutually engage with respective recesses 12b, 13b included or delimited in the first element 12 and in one or more second elements 13, for example at the lateral edges of the same.

[0081] The method of use of the brazier 1 according to the present invention is, in the light of what has been described, completely intuitive.

[0082] The fuel is fed so as to deposit on the bottom portion 3 of the containment element 2.

[0083] Once ignition has been carried out, for example through the first through opening TO1 and/or through the second through opening TO2, the combustion air is fed so as to pass through the support element 6 and lap the fuel deposited on the bottom portion 3.

[0084] When needed, the spatula 9 is actuated so as to clean the plurality of first through holes TH1 of the bottom portion 3.

[0085] An object of the present invention is, consequently, also a solid fuel stove comprising a brazier 1 according to the present invention or according to non-limiting examples of embodiment of the present invention.

[0086] Furthermore, an object of the present invention is also a method of making a brazier 1 for solid fuel stoves.

[0087] This method initially comprises the step of providing a first material selected from cast iron or cast iron alloys.

[0088] The step of melting the first material and the step of casting the first material into a suitably shaped mold are then provided.

[0089] Subsequently, the step of forming in one piece a bottom wall 3 delimiting a plurality of first through holes TH1, a first perimeter wall 4 and at least a first portion or

component 5a of a second perimeter wall 5 of a containment element 2 is provided.

[0090] Subsequently, the method according to the present invention comprises the step of providing a second material selected from steel or steel alloys and then the step of making a second portion or component 5b of the second perimeter wall 5 with the second material.

[0091] The step of operatively connecting, for example by means of suitable connecting means 11, such as screws or rivets, the second portion or component 5b with the first portion or component 5a of the second perimeter wall 5 is then envisaged.

[0092] Finally, the method according to the present invention comprises the step of making a support element 6 by permanently connecting to each other, for example by welding, a plurality of boundary walls 7a, 7b, 7c, 7d, 7e in suitably cut and/or bent or printed metal sheet and, therefore, operatively removably associating the support element 6 and the containment element 2.

[0093] Preferably, the forming step involves forming the bottom portion 3 curved with a concavity, in use, facing upwards so as to configure, with the perimeter walls 4, 5, a cradle conformation for the containment element 2.

[0094] The step of operatively connecting involves the operative connection of the second portion or component 5b with the first portion or component 5a of the second perimeter wall 5 so that the containment element 2 has a flared and upwardly tapered configuration to allow easy insertion or operative association thereof in or with the support element 6.

[0095] The brazier 1 according to the present invention, as well as the method of making a brazier 1 according to the present invention, allow to obtain a brazier for solid fuel stoves constructively simpler than braziers of the known type.

[0096] Furthermore, this brazier 1 is constructively cheaper than braziers of the known type. In fact, according to the non-limiting example of embodiment in which the first material is cast iron and the second material is steel, the construction of the brazier 1 becomes much cheaper.

[0097] It should also be considered that the brazier 1 according to the present invention is more practical and functional from the point of view of use and the method of making this brazier 1 allows its manufacturing much faster than known manufacturing methods.

[0098] It has thus been seen how the invention fully achieves the proposed objects.

[0099] Modifications and variations of the invention are possible within the scope of protection defined by the following claims.

Claims

1. Brazier (1) for solid fuel stoves, comprising:

- a containment element (2) which includes a

bottom portion (3), delimiting a plurality of first through holes (TH1), a first perimeter wall (4) and a second perimeter wall (5), which define with said bottom portion (3) a containment zone (CZ) for a solid fuel, and

- a support element (6), configured to support and/or house said containment element (2), which includes a plurality of boundary walls (7a, 7b, 7c, 7d, 7e) mutually permanently connected, said bottom portion (3), said first perimeter wall (4) and at least a first portion or component (5a) of said second perimeter wall (5) being made in one piece in a first material while at least one second portion or component (5b) of said second perimeter wall (5) is made of a second material and is operatively connected to said first portion or component (5a) of said second perimeter wall (5),

wherein said first material is or comprises cast-iron or cast-iron alloys while said second material is or comprises steel or steel alloys,

said brazier (1) comprising cleaning means (8) of said plurality of first through holes (TH1), wherein said cleaning means (8) comprise a spatula (9) for cleaning said plurality of first through holes (TH1) and a support component (10), included in or delimited on said second perimeter wall (5), which defines an insertion seat (IS) configured to support said spatula (9) in rotation or movement.

2. Brazier (1) according to the preceding claim, wherein said support component (10) consists of said second portion or component (5b) of said second perimeter wall (5) and is therefore made with said second material, said support component (10) being operatively connected with said first portion (5a) of said second perimeter wall (5).
3. Brazier (1) according to any one of the preceding claims, wherein said bottom portion (3), said first perimeter wall (4) and at least a first portion or component (5a) of said second perimeter wall (5) are made in one piece by casting and pouring into a suitably shaped mold.
4. Brazier (1) according to any one of the preceding claims, wherein said boundary walls (7a, 7b, 7c, 7d, 7e) are made of suitably cut and/or bent or printed metal sheet.
5. Brazier (1) according to any one of the preceding claims, wherein said first portion or component (5a) of said second perimeter wall (5) comprises or delimits an internal shoulder (5c) for said support com-

- ponent (10) and/or said support component (10) comprises or delimits an external shoulder (10d) configured to allow the abutment of said containment element (2) on said support element (6).
6. Brazier according to any one of the preceding claims, wherein said first portion or component (5a) of said second perimeter wall (5) or said first perimeter wall (4) comprises or delimits a window (W) configured to convey air in said brazier (1) and/or for placing ignition means in communication with said brazier (1).
7. Brazier (1) according to any one of the preceding claims, wherein said first perimeter wall (4) comprises or delimits an external abutment (4c) configured to allow the abutment of said containment element (2) on said support element (6).
8. Brazier (1) according to any one of the preceding claims, wherein said bottom portion (3) is curved with a concavity, in use, facing upwards so as to configure, with said perimeter walls (4, 5), a cradle conformation for said containment element (2).
9. Brazier (1) according to any one of the preceding claims, wherein said first and said second perimeter wall (4, 5) each comprise a respective terminal portion (TP1, TP2), proximal and adjacent to said bottom portion (3), configured as an arc of circumference.
10. Brazier (1) according to any one of the preceding claims, wherein said containment element (2) has a flared and tapered upward configuration so as to allow the easy insertion or operative association of the same in or with said support element (6).
11. Brazier (1) according to any one of the preceding claims, wherein said support element (6) is open on the top and comprises at least two abutment portions (6a, 6b) configured to support said containment element (2).
12. Brazier (1) according to the preceding claim, wherein at least an abutment portion (6a) is defined by a folded free end (FE) of a boundary wall (7a) of said support element (6).
13. Brazier (1) according to any one of the preceding claims, wherein at least one boundary wall (7a, 7b, 7c, 7d, 7e) of said support element (6) defines at least one through opening (TO1, TO2) configured to convey air into said brazier (1) and/or to place ignition means in communication with said brazier (1).
14. Solid fuel stove comprising a brazier (1) according to any one of the preceding claims.

15. Method for making a brazier (1) according to any one of the preceding claims, comprising the steps of:

providing a first material chosen from cast-iron or cast-iron alloys,
melting said first material,
casting said first material into a suitably shaped mold,
forming in one piece a bottom wall (3) delimiting a plurality of first through holes (TH1), a first perimeter wall (4) and at least a first portion or component (5a) of a second perimeter wall (5) of a containment element (2),

characterized in that it comprises the steps of:

providing a second material chosen from steel or steel alloys,
making a second portion or component (5b) of said second perimeter wall (5) with said second material,
operatively connecting said second portion or component (5b) with said first portion or component (5a) of said second perimeter wall (5),
making a support element (6) by permanently connecting to each other a plurality of boundary walls (7a, 7b, 7c, 7d, 7e) in suitably cut and/or bent or printed metal sheet,
operatively removably associating said support element (6) and said containment element (2).

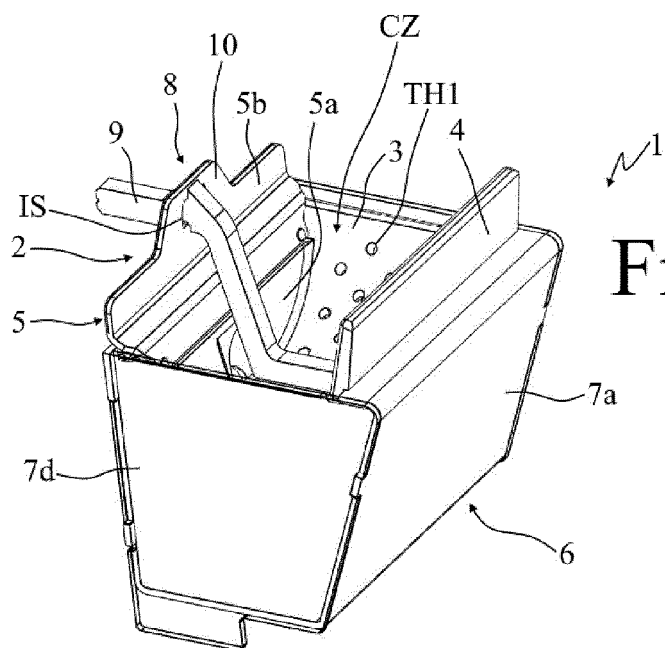


Fig. 1

Fig. 2

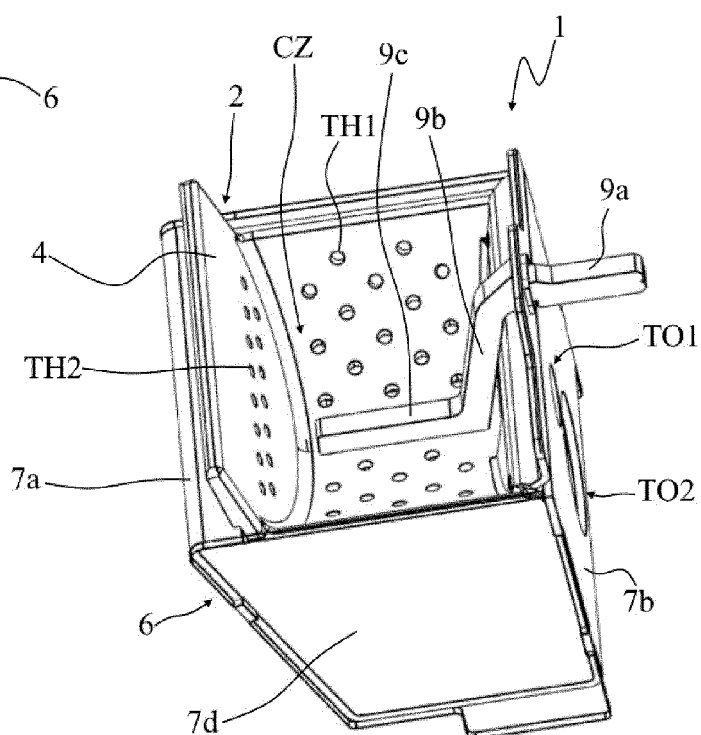
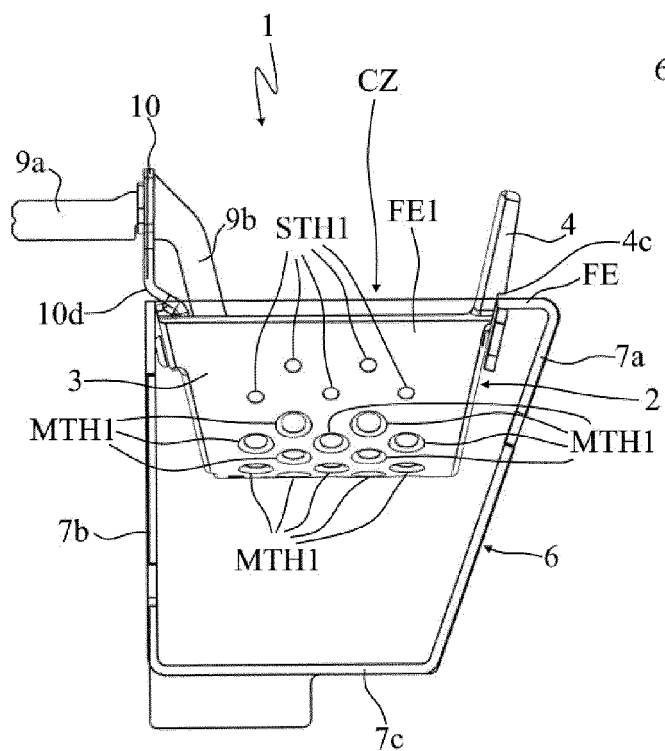


Fig. 3



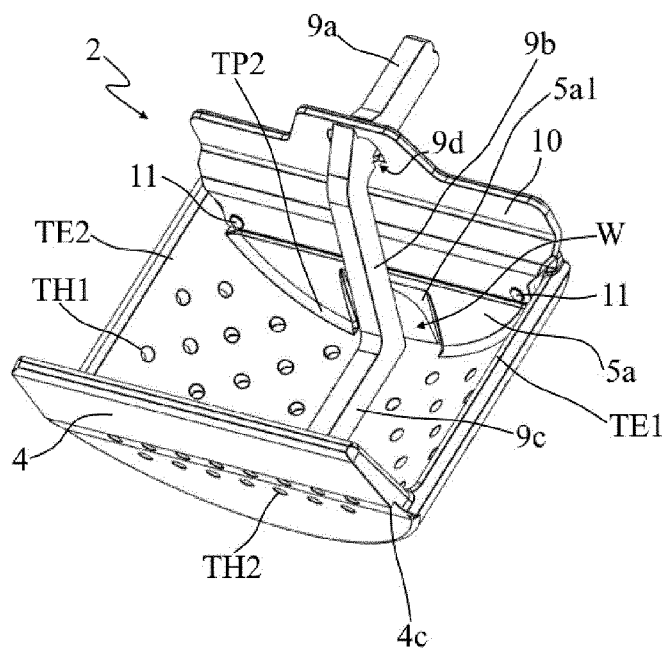


Fig. 4

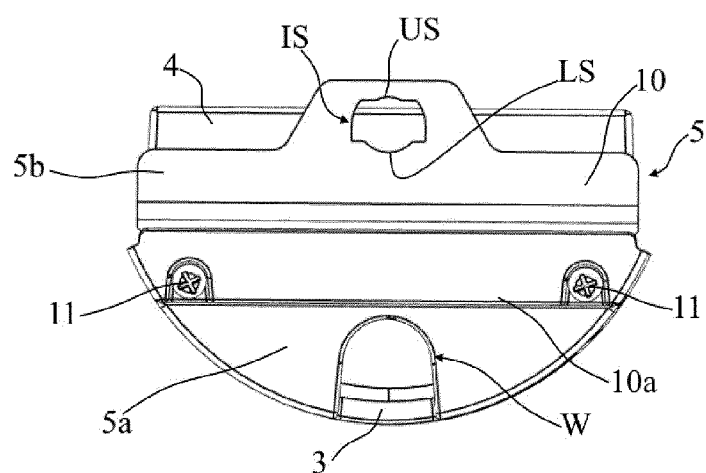


Fig. 5

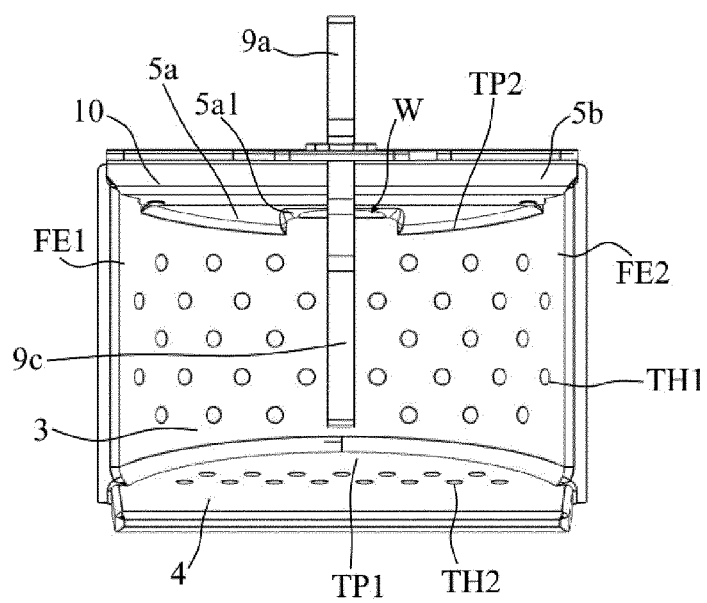


Fig. 6

Fig. 7

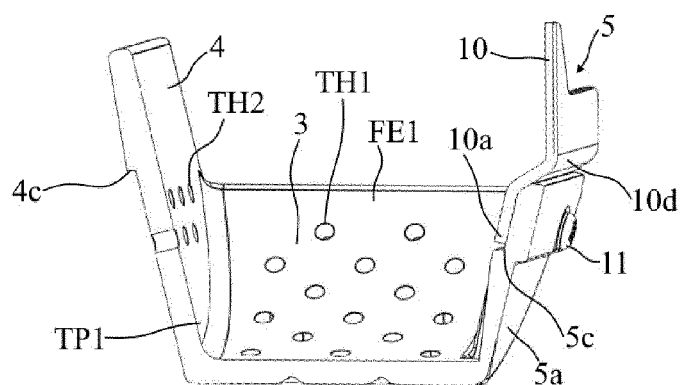


Fig. 8

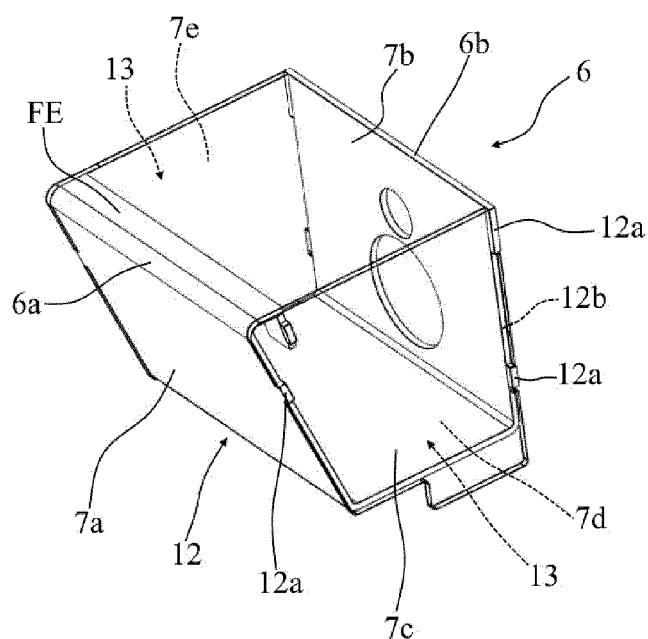
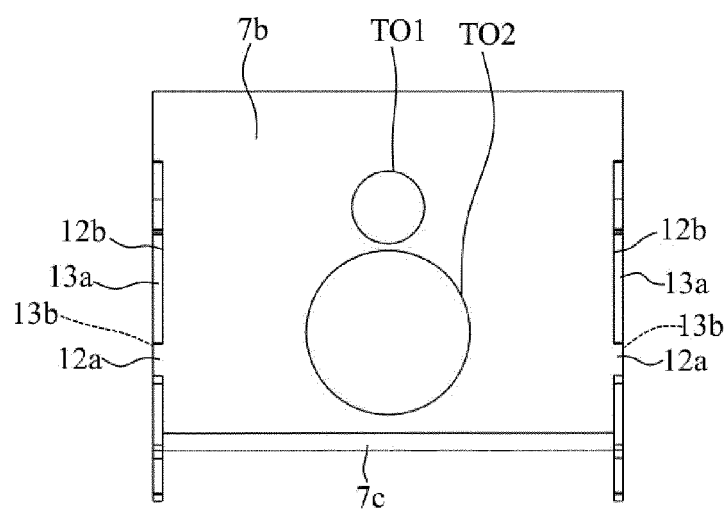


Fig. 9





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