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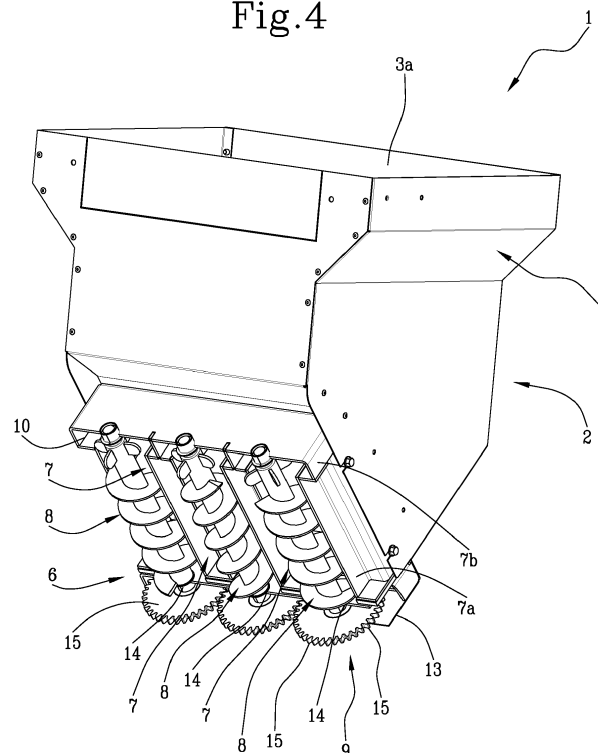
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(54) **FEEDING DEVICE FOR PELLET HEATING EQUIPMENT**

(57) A feeding device for pellet heating equipment, comprising: a pellet load compartment (2); a combustion chamber (4) having a brazier (5) inside which a flame is generated by the combustion of the pellet; and transfer means (6) of the pellet to move, in a controlled manner, predefined amounts of pellet along at least a feeding pipe (7) extending from the load compartment (2) to the com-

bustion chamber (4); the transfer means (6) comprise a plurality of screws (8) each of which developing within a respective feeding pipe (7); said screws (8) being mutually coupled by means of a motion transmission element (9) for simultaneously rotating the same screws (8) and define the movement of the pellet.

Fig.4



Description

[0001] The present invention relates to a feeding device for pellet heating equipment.

[0002] In particular, the present invention relates to a device for feeding wood pellets to a combustion chamber of a respective heating equipment, preferably a fireplace or pellet stove.

[0003] As known, there are feeding devices that automatically collect pellets stored in a load chamber and move them to a combustion chamber (burner). The feeding operation is performed in a controlled and automatic way by means of electronic management systems, in order to always guarantee the right amount of biofuel within the combustion chamber according to a pre-set temperature value.

[0004] Generally, the load chamber is made up of a hopper, equipped with a top inlet mouth through which pellets are manually fed.

[0005] At the opposite side of the inlet mouth, a pellet outlet mouth is formed from which a moving device departs, generally a screw, capable of collecting a certain amount of pellets and move them along the longitudinal development of the screw itself.

[0006] At the end of the travel distance defined by the screw a feeding pipe departs, inside which pellets are directed by falling towards an underlying brazier.

[0007] In this way, depending on the kilowatts that the burner must generate, the screw is made to rotate at a predetermined speed that corresponds to an appropriate amount of pellets.

[0008] In other words, the greater the need for fuel required by the burner, the higher the rotation speed for feeding a large amount of pellets.

[0009] Although able to feed the amount of pellets in a controlled manner, known feeding devices have important drawbacks and can be improved under several aspects.

[0010] These drawbacks are mostly due to the impossibility of controlling the width of the flame generated in the burner.

[0011] What must be taken into consideration is that pellets, while being fed in to the burner, gather by falling on a limited section of the burner itself, thus generating a flame having a limited width (width along the direction perpendicular to the falling direction of pellets) at the mentioned section. This drawback is even more evident in the case of certain pieces of heating equipment, such as fireplaces, which must generate a flame spread along most of the width of the fireplace in order to reproduce the effect of the traditional fireplace.

[0012] In addition, the impossibility of generating a "wide" flame in the burner, i.e. a flame extending along a horizontal direction, implies the construction of structures (chimneys or stoves) having a reduced width. This represents an important limitation as for the manufacturing of pellet heating equipment of various shapes and sizes.

[0013] In this context, the technical task underlying the present invention is to propose a feeding device for pellet heating equipment that overcomes the drawbacks of the prior art mentioned above.

[0014] In particular, the present invention aims at providing a device capable of generating a "wide" flame in the respective combustion chamber of the burner, namely a flame extending along a substantially horizontal direction.

[0015] Furthermore, the present invention aims at proposing a versatile feeding device which can be used in any pellet heating equipment and that allows to realize pieces of equipment of any shape and size.

[0016] The present invention also aims at providing a feeding device which is structurally simple and does not cost too much.

[0017] Finally, the present invention also aims at providing a pellet heating equipment comprising the device object of the present invention, which is capable of developing the typical flame of a traditional fireplace.

[0018] One or more of the above objects are achieved by means of a feeding device for pellet heating equipment, preferably for pellet fireplaces, in accordance with the present invention, as specified in the appended claims and/or having at least one of the following features, which in turn can be combined with such claims.

[0019] In a first aspect, as stated in claim 1, the invention relates to a feeding device for pellet heating equipment, comprising: a pellet load compartment; a combustion chamber featuring a brazier inside which flames are generated thanks to the pellet combustion; and pellet transfer means to move forward in a controlled way predetermined quantities of pellets along at least one feeding pipe extending from the load compartment to the combustion chamber. The transfer means comprise a plurality of screws, each of which developing within a respective feeding pipe. Screws are mutually coupled by means of a motion transmission element so as to rotate simultaneously and define the movement of the pellet.

[0020] In this way, pellets are advanced by multiple screws in order to feed a large area of the burner. The movement of pellets occurs simultaneously, given the presence of the transmission element connecting the screws to each other in order to always guarantee the feeding of fuel to the entire burner area.

[0021] A possible embodiment of a device according to the present invention may comprise at least one of the following technical aspects.

[0022] Preferably, the feeding pipe comprises a first end in fluid communication with the load compartment and a second end, opposite to the first, and having a pellet outlet mouth. The brazier is located below the outlet mouth to receive pellets falling from said pipe mouth.

[0023] It preferably comprises a plurality of pipes, non-communicating with each other and having their respective outlet mouths arranged alongside each other along a main development axis of said brazier.

[0024] In this way, pellets are fed into each pipe in a

controlled manner and with the same quantities for each screw.

[0025] Preferably, each outlet mouth has a substantially rectangular peripheral development; said mouths being arranged alongside each other with their respective longer sides aligned to define a single slot extending along all the main development axis of the brazier.

[0026] Preferably, said brazier comprises a tray structure, having an elongated shape and extending along said main development axis to contain pellets coming from said mouths.

[0027] In this way, the flame that is generated within the burner has an elongated shape and extends throughout the entire burner.

[0028] Preferably, the load compartment comprises a hopper having a pellet inlet opening and an outlet opening communicating with the first ends of said pipes. The first ends are mutually coupled along the outlet opening of the load compartment.

[0029] In such a way, each pipe draws the same amount of pellets from a single hopper.

[0030] Preferably it further comprises a box-shaped containment frame of said transmission element, having a plurality of through holes, each of which is in connection with a respective feeding pipe.

[0031] In this way, the transmission element remains in a confined area isolated from the pellet feeding pipe to prevent any pellet remains from interfering with the proper operation of the transmission element.

[0032] Preferably, the transmission element comprises a plurality of toothed wheels meshed with each other and each of which is keyed on a respective screw.

[0033] Preferably, it further comprises a motor provided with a rotating shaft engaged to one of said screws to rotate the screw itself along the respective longitudinal development axis; said motorized screw transmitting the rotation to the other screws by means of said transmission element.

[0034] In such a way, only one motor will make all screws rotate synchronously and at the same speed, these screws being directly connected to each other. This results in a very simple and compact structure, as well as in the possibility of feeding the same amount of fuel for each screw.

[0035] In a second aspect, the invention relates to a pellet heating equipment, preferably a pellet fireplace, containing the feeding device having at least one of the above-mentioned features or any combination of said features. The features of the present invention will be clarified by reading the following detailed description of an embodiment thereof, provided by way of illustration, and not limitation, of the more general claimed concepts. The following detailed description refers to the accompanying drawings, wherein

- figure 1 is a perspective and front view of a pellet heating equipment, in particular a pellet fireplace, according to the present invention;

- figure 2 is a rear perspective view of the equipment of figure 1, in which a feeding device according to the present invention is best illustrated;
- figure 3 is a detailed perspective view of a feeding device according to the present invention;
- figure 4 is a perspective view of the device of figure 3, some parts of which have been removed to better illustrate others; and
- figure 5 is a perspective and upper view of the device of figure 3, an area of which has been partly sectioned to better illustrate a few constructive details.

[0036] With reference to the attached figures, 1 generally refers to a feeding device for a pellet heating equipment 100.

[0037] More particularly, with particular reference to figures 1 and 2, the present invention is especially applied to a pellet heating equipment 100, such as pellet fireplaces of the type shown in the above-mentioned figures. However, it should be considered that the present invention can be used for any pellet heating equipment in which a widely-extended flame (wide flame) needs to be generated.

[0038] In particular, device 1 (better visible in figures 2 to 5) has a pellet load compartment 2 constituted by a hopper 3 having a pellet inlet opening 3a and an outlet opening 3b (figure 5). The inlet opening 3a is wider than the outlet opening 3b in order to allow the (manual or automatic) input of a large amount of pellets which is then stored in the hopper 3 and then smaller quantities are collected at the outlet opening 3b.

[0039] The device 1 further comprises a combustion chamber 4, shown in figure 1 and having a brazier 5 within which a flame is generated by the combustion of the pellet.

[0040] The brazier 5 preferably has a tray structure to contain the pellets and the flame generated by the combustion thereof. This structure has a substantially elongated shape extending along a predominant development axis "X". As shown in figure 1, the axis "X" extends horizontally, parallel to the ground, along the width of the brazier 5 and of the respective equipment 100.

[0041] Advantageously, note that the flame generated in the combustion chamber 4 extends along the whole length of the brazier 5 and hence along the mentioned axis "X". This causes the formation of a "wide" flame, i. e. which has a predominant development along the horizontal axis "X", similarly to the brazier 5.

[0042] The device 1 further comprises transfer means 6 of the pellet to move, in a controlled manner, predefined amounts of pellet along at least a feeding pipe 7 extending from the load compartment 2 to the combustion chamber 4.

[0043] In more detail, with reference to the detailed views of figures 4 and 5, the transfer means 6 comprise a plurality of screws 8 each of which develops within a respective feeding pipe 7.

[0044] Consequently, a plurality of pipes 7 are ar-

ranged one next to the other, each of which is arranged to contain a respective screw 8.

[0045] It is to be noted that each feeding pipe 7 comprises a first end 7a in fluid communication with the load compartment 2 (figure 5) and a second end 7b, opposite to the first 7a, and having a pellet outlet mouth 10 (figures 3 and 4). In this situation, the brazier 5 is positioned beneath the outlet mouth 10 in order to receive the falling pellet from the mouth itself. As it can be seen in figure 1, pipes 7 of the device 1 are separated from the combustion chamber 4 by suitable thermally insulating walls 11. Consequently, this figure does not show the mouths 10 from which the pellet is fed by falling to the brazier 5.

[0046] Advantageously, the pipes 7 are not communicating with each other and the respective outlet mouths 10 are mutually coupled along said development axis "X" of the brazier 5.

[0047] In this way, pellet feeding is constantly provided by the mouths 10 along the entire development of the brazier 5.

[0048] Preferably, the outlet mouths 10 have a substantially rectangular peripheral development and appear to be mutually aligned.

[0049] In other words, the mouths 10 are arranged with their respective longer sides of the rectangular development aligned with each other. In this situation, the mouths define a single slot 12 extending throughout the development axis "X" of the brazier 5.

[0050] With reference to figure 5, the outlet mouth 3b of the hopper 3 is in communication with the first ends 7a of the pipes 7, which are also reciprocally arranged.

[0051] In this way, the pellet contained in the hopper 3 is taken out in equal parts at the first ends 7a of the pipes 7 to be fed to the mouths 10.

[0052] As better shown in figure 4, screws 8 are mutually coupled by means of a motion transmission element 9 so they rotate simultaneously and define the movement of the pellet.

[0053] The attached figures show, by mere way of example and thus without limitation thereto, three screws 8 arranged alongside each other. However, it should be specified that the number of screws, and therefore the number of the respective feeding pipes 7, is defined according to the size of the flame that must be obtained in the respective brazier 5. Therefore, for a large-sized piece of equipment 100, a large number of screws 8 will be used, extending along the axis "X".

[0054] The transmission element 9 is preferably housed in a box-shaped frame 13 having a plurality of through holes 14, each of which is connected to a respective feeding pipe 7.

[0055] Each hole 14 allows the screw to pass from the box-shaped frame into the respective pipe 7.

[0056] Advantageously, the transmission element 9 comprises a plurality of toothed wheels 15 meshed with each other and each of which is keyed on a respective screw 8 (figure 4).

[0057] It should be noted, therefore, that the toothed

wheels 15 are closed within the box-shaped frame 13 to be separated from the pipe 7 and then protected from external agents or from any debris that may interfere with the proper motion transmission. The toothed wheels 15 allow to transfer the motion according to an impartial transmission ratio which determines the same rotation speed of the screws 8, hence the same pellet amount and feeding speed within each pipe 7.

[0058] Preferably, a motor 16 (figure 2) is provided and equipped with a rotating shaft (not shown in the attached figures) engaging one of the screws 8 to rotate the screw 8 itself along the respective longitudinal development axis.

[0059] The motorized (conveyor) screw transmits the rotation to the other (driven) screws 8 by means of the aforesaid transmission element 9. Consequently, a single motor 16 feeds pellets from the outlet mouths 10 in a simultaneous and synchronous way.

[0060] Therefore, the feeding of the pellet into the brazier 5 takes place steadily along the entire development of the brazier 5 itself.

[0061] The invention attains the intended purposes. In particular, the device 1 allows to obtain a "wide" flame combustion, i.e. extending along the horizontal axis "X". Consequently, the device 1 finds advantageous application for equipment 100, such as pellet fireplaces, thus capable of creating the same typical wide flame of the fireplace.

[0062] In addition to that, the device 1 is particularly versatile, capable of defining the flame width according to the number of envisaged screws 8. Therefore, for large-sized equipment 100, a plurality of screws 8 and respective feeding channels 7 are used depending on the size of the flame to be obtained.

[0063] Finally, the device 1 is structurally simple and cost-effective because of the presence of only one motor that can feed all the screws 8 inside the respective pipes 7.

Claims

1. Feeding device for pellet heating equipment, comprising:

- a pellet load compartment (2);
- a combustion chamber (4), having a brazier (5) within which a flame is generated by the combustion of the pellet; and
- transfer means (6) of the pellet to move, in a controlled manner, predefined amounts of pellet along at least a feeding pipe (7) extending from the load compartment (2) to the combustion chamber (4); **characterized in that** said transfer means (6) comprise a plurality of screws (8) each of which developing inside a respective feeding pipe (7); said screws (8) being mutually coupled by means of a motion transmission el-

ement (9) to simultaneously rotate the screws (8) themselves and define the movement of the pellet.

2. Device according to the previous claim, **characterized in that** said feeding pipe (7) comprises a first end (7a) in fluid communication with the load compartment (2) and a second end (7b), opposite the first (7a) and having a pellet outlet mouth (10); said brazier (5) being arranged below the outlet mouth (10) to receive the pellet falling from said mouth (10) of the pipe (7). 5
3. Device according to the previous claim, **characterized in that** it comprises a plurality of pipes (7), non-communicating with each other and having their respective outlet mouths (10) arranged alongside each other along a main development axis (X) of said brazier (5). 10 15
4. Device according to the previous claim, **characterized in that** each outlet mouth (10) has a substantially rectangular peripheral development; said mouths (10) being arranged alongside each other with their respective longer sides aligned to define a single slot (12) extending along all the main development axis (X) of the brazier (5). 20 25
5. Device according to the previous claim, **characterized in that** said brazier (5) comprises a tray structure, having an elongated shape and extending along said main development axis (X) to contain the pellet coming from said mouths (10). 30
6. Device according to any one of claims 2 to 5, **characterized in that** said load compartment (2) comprises a hopper (3) having an inlet opening (3a) of the pellet and an outlet opening (3b) in communication with the first ends (7a) of said pipes (7); said first ends (7a) being mutually approached along the outlet opening (3b) of the load compartment (2). 35 40
7. Device according to any one of the previous claims, **characterized in that** it further comprises a box-shaped containment frame (13) of said transmission element (9), having a plurality of through holes (14) each of which in connection with a respective feeding pipe (7). 45
8. Device according to any one of the previous claims, **characterized in that** said transmission element (9) comprises a plurality of toothed wheels (15) meshed with each other and each of which is keyed on a respective screw (8). 50 55
9. Device according to the previous claim, **characterized in that** it further comprises a motor (16) provided with a rotating shaft engaged to one of said screw

(8) to rotate the screw itself along the respective longitudinal development axis; said motorized screw (8) transmitting the rotation to the other screws (8) by means of said transmission element (9).

10. Pellet heating equipment, comprising a feeding device (1) according to one or more of the previous claims.

Fig.1

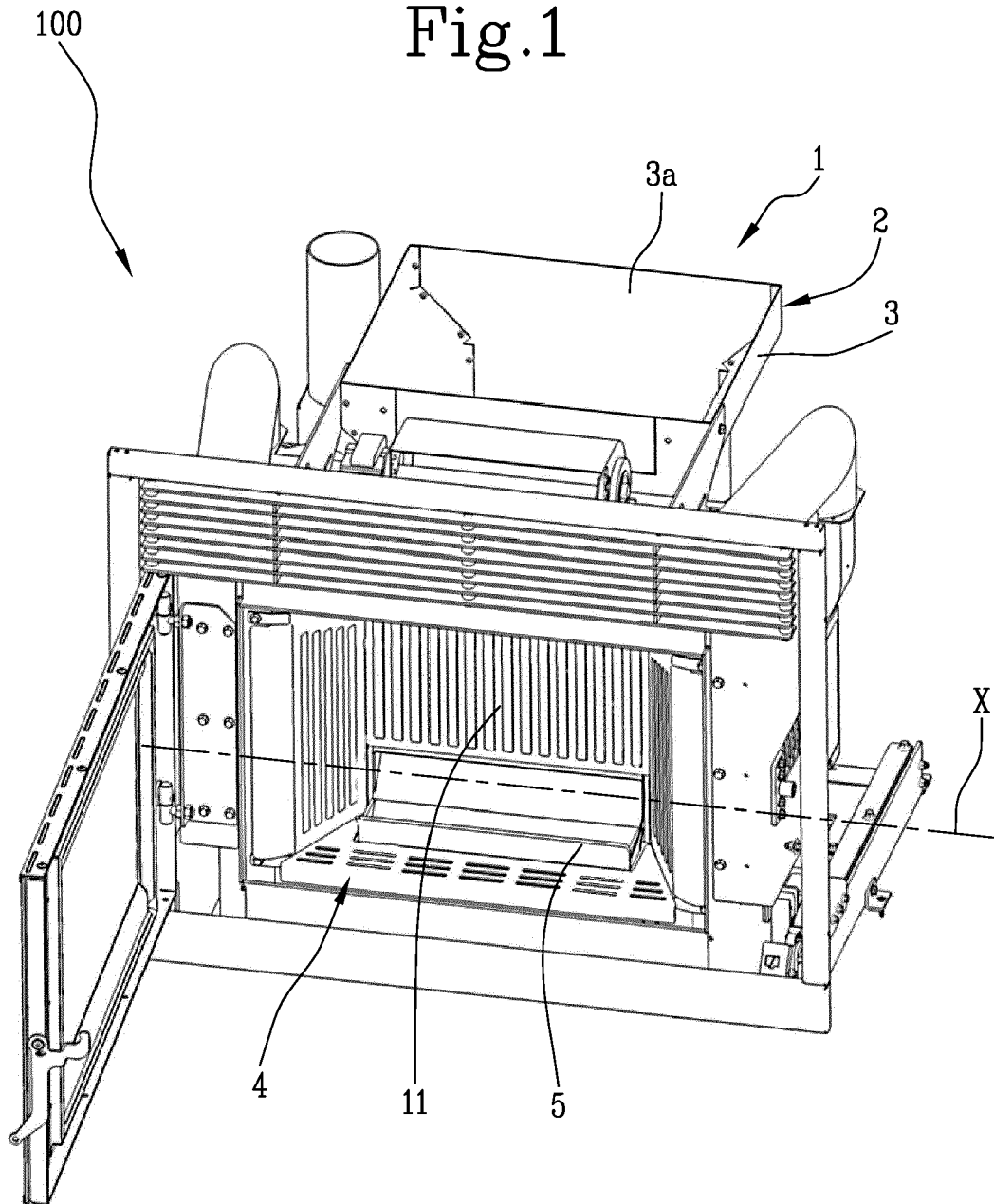


Fig.2

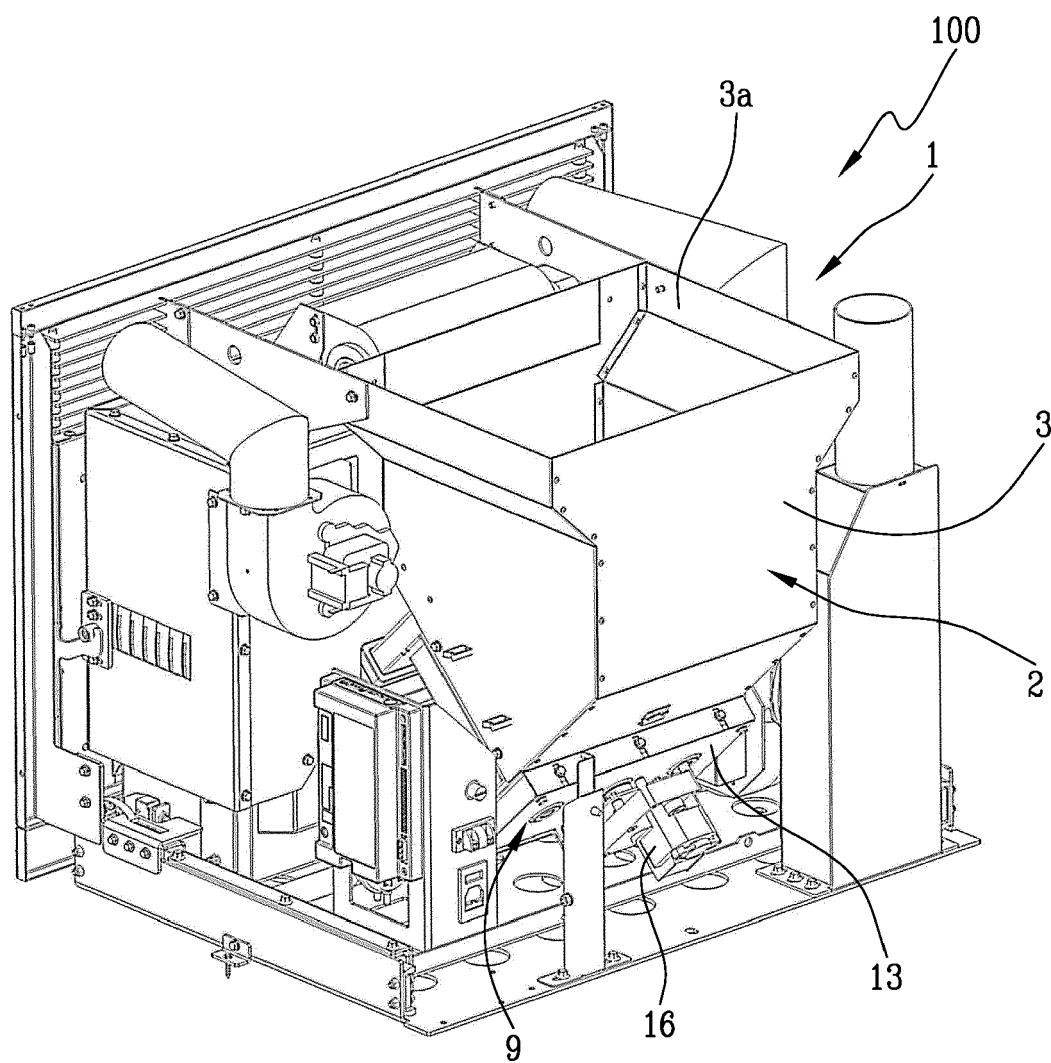


Fig.3

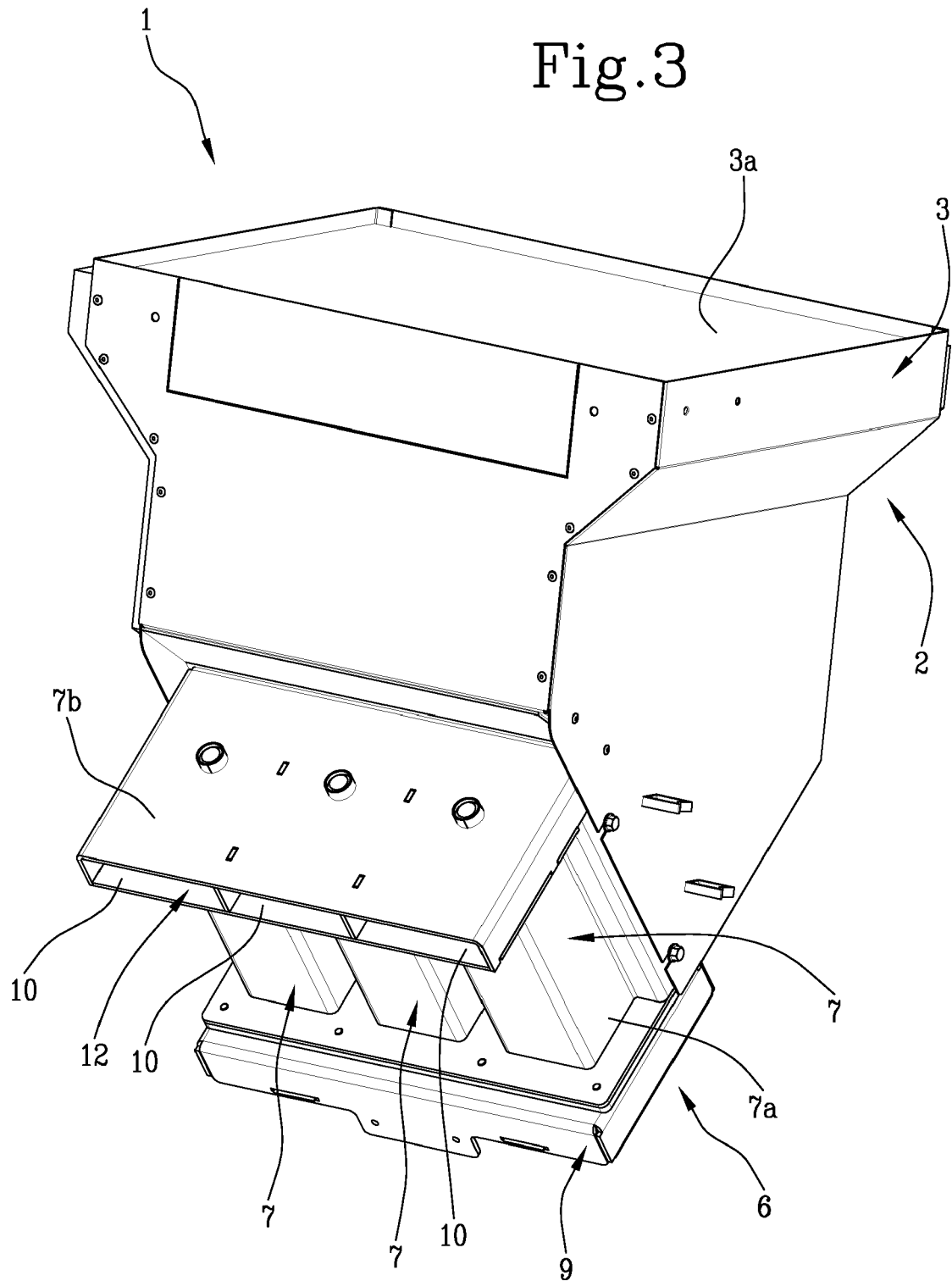


Fig.4

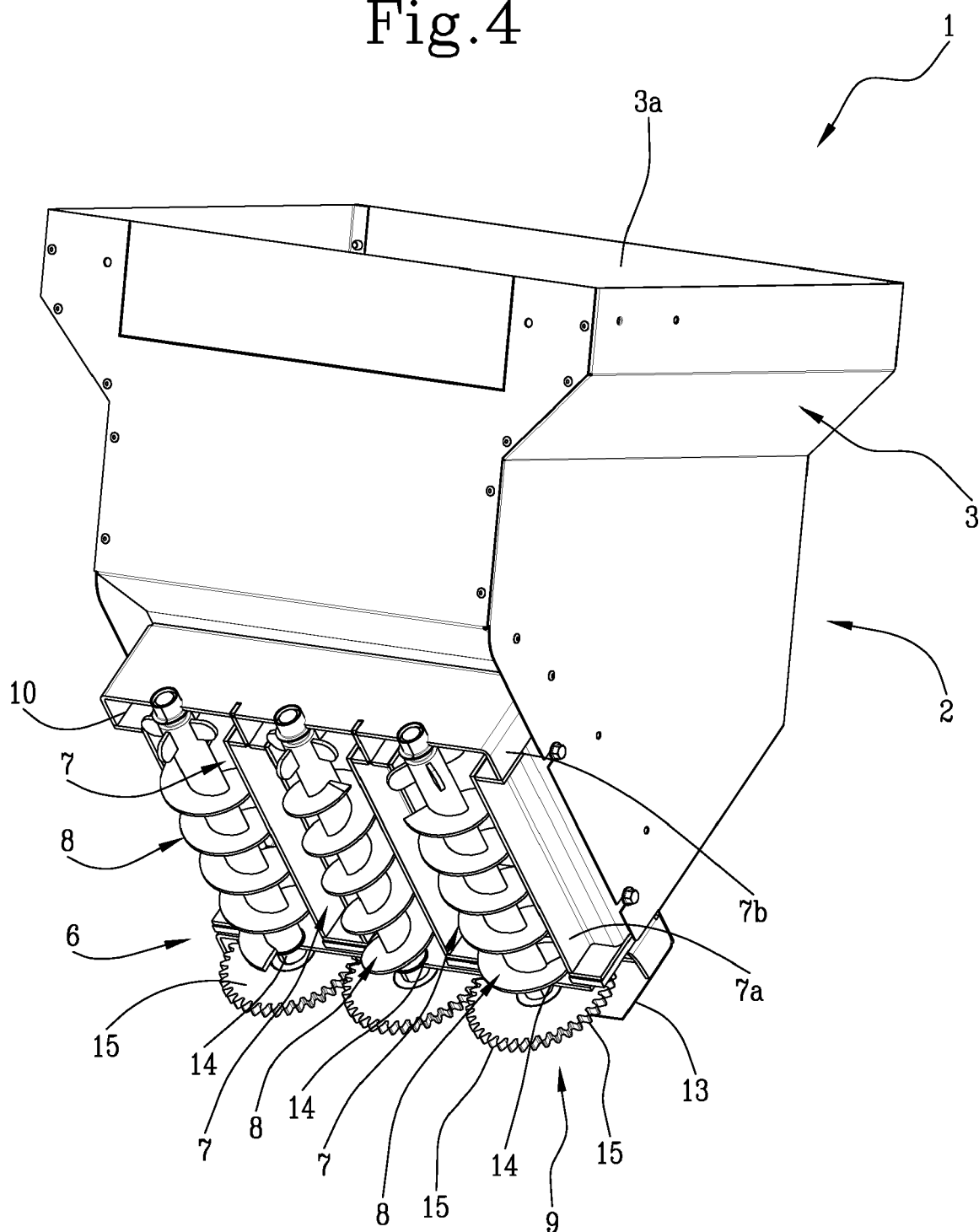
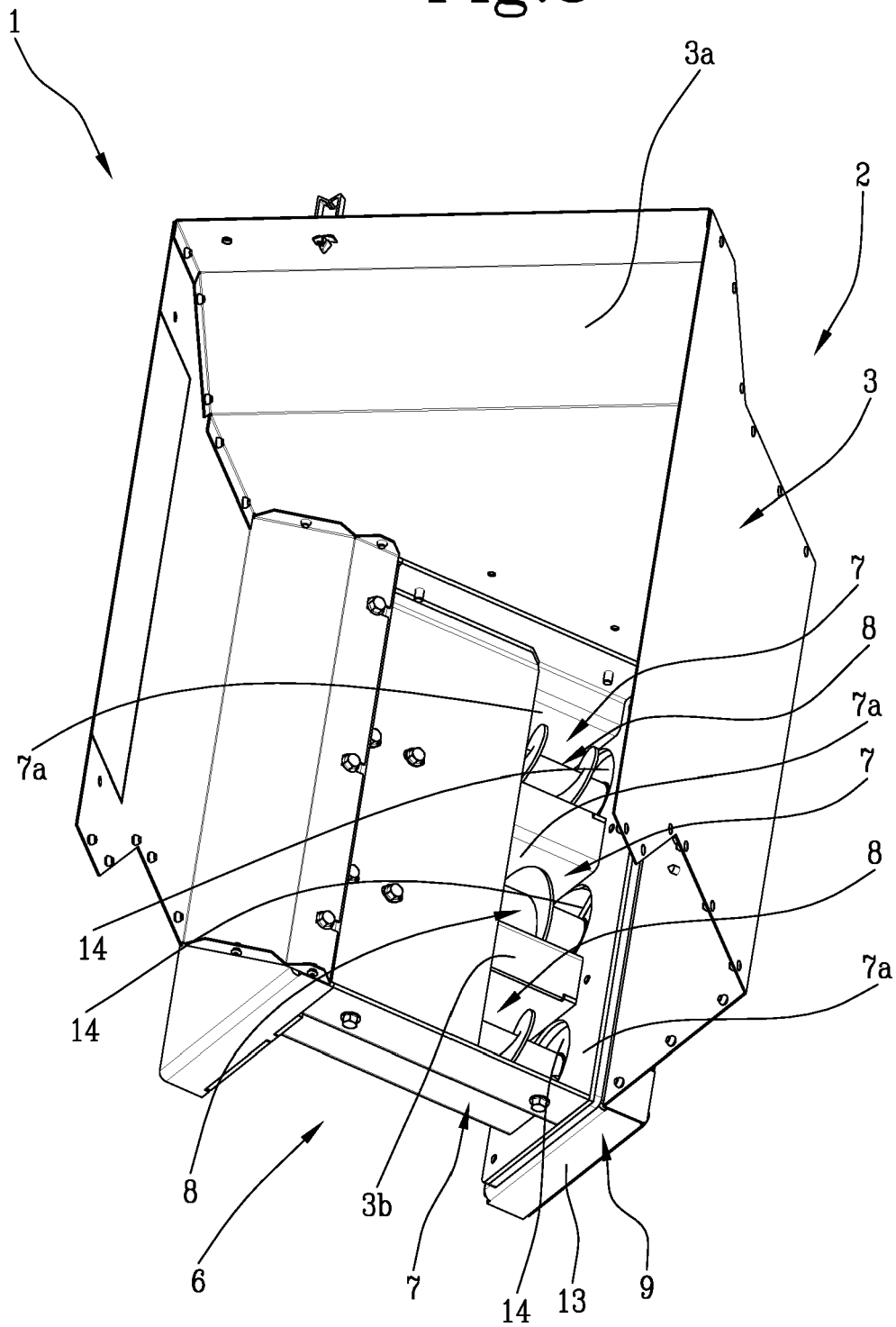


Fig.5





EUROPEAN SEARCH REPORT

Application Number
EP 17 16 8610

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A	* figure 1 *	2-10	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F23K F23B
Place of search		Date of completion of the search	Examiner
Munich		15 September 2017	Christen, Jérôme
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 16 8610

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82