



(11) **EP 3 491 313 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.09.2020 Bulletin 2020/36

(21) Application number: **17765267.4**

(22) Date of filing: **13.07.2017**

(51) Int Cl.:
F26B 11/02^(2006.01) F26B 11/04^(2006.01)

(86) International application number:
PCT/IT2017/000141

(87) International publication number:
WO 2018/020523 (01.02.2018 Gazette 2018/05)

(54) **APPARATUS FOR DRYING AGGREGATES SUCH AS SAND**

VORRICHTUNG ZUM TROCKNEN VON AGGREGATEN, WIE ZUM BEISPIEL SAND

APPAREIL POUR LE SÉCHAGE D'AGRÉGATS TEL QUE SABLE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **27.07.2016 IT 201600078894**

(43) Date of publication of application:
05.06.2019 Bulletin 2019/23

(73) Proprietor: **Walter Tosto S.p.A.**
66100 Chieti Scalo (CH) (IT)

(72) Inventor: **FEBBO, Dino**
66100 Chieti Scalo (CH) (IT)

(74) Representative: **Tiburzi, Andrea**
Barzanò & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

(56) References cited:
GB-A- 136 379 GB-A- 1 174 945
JP-A- 2011 140 027 NL-A- 8 105 313
US-A- 1 882 405 US-A- 3 661 365
US-A- 3 938 785 US-A- 6 052 917

EP 3 491 313 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention relates to an apparatus for drying aggregates, such as sand and the like, with specific application to flows for submerged arc process and/or and electroslag weldings.

[0002] More specifically, the invention concerns an apparatus or oven, specially designed and manufactured for drying the flow to be used in welding, on various types of metal materials such as cast iron, copper alloys, nickel, steel and the like, but that can be used whenever it is necessary to use sand and/or flows with a high degree of drying (in the order of a few units of ml/100g).

[0003] In the following, the description will be directed to drying the flow for weldings, but it is clear that the same should not be considered limited to this specific use.

[0004] As is well known, for carrying out optimal weldings, it is necessary to leave some flow on the junction or surfaces, for example by voltaic arc, in order to isolate the electric arc and/or the welding bath from the surrounding oxygen.

[0005] In order to obtain an optimal welding it is also necessary that the same, as soon as it is realized, is isolated from any oxidizing agents, in particular, it is desirable that said junction or plating is insulated from water and moisture.

[0006] Ovens are available in the market capable of drying inert materials, in particular sand and/or flow, intended for the purpose above. However, said ovens are not always able to dry the flow in an optimal way.

[0007] It is apparent that this procedure is expensive in terms of technical result in case of, for some applications, it is necessary to obtain a welding as perfect as possible

[0008] Documents US3938785 A and JP2011140027 A disclose different drying apparatuses. Z

[0009] In the light of the above, it is an object of the present invention to propose a drying apparatus capable of optimally drying the flow, eliminating the moisture contained therein.

[0010] Another object of the invention is to allow the flow to be dried rapidly and efficiently as well as to propose an apparatus capable of keeping the flow dry and dosing the quantities required so that it can be positioned in an automated plant.

[0011] The present invention achieves these objects by means of an apparatus according to claim 1. The dependent claims describe optional embodiments also belonging to the invention.

[0012] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 shows a first see-through perspective view of an apparatus for drying flows according to the invention;

figure 2 shows a second see-through perspective

view of an apparatus according to figure 1; figure 3 shows a see-through side view of an apparatus according to figure 1; figure 4 shows a view along A-A section line of the apparatus according to figure 1.

[0013] In the various figures, similar parts will be indicated by the same reference numbers.

[0014] Referring to figures 1-4, it is seen an apparatus for drying inert materials 1, such as sand and the like, in particular for drying welding flows.

[0015] Said apparatus 1 essentially comprises a container 2, in which a loading unit 3, an intake unit 4, a drying unit 5 and a storage an offload unit 6 are contained.

[0016] In more detail, said container 2 has an opening 21 at the front with a relative door 22. In addition, said container 2 also has behind a compartment 23, which operation will be better defined below.

[0017] Said container 2 also includes a touch on screen type digital control panel 24', for controlling the operation of the apparatus 1, and a pushbutton 24", where there are an unload product button, an emergency mushroom and a RFID technology detection station.

[0018] Finally, said container 2 also includes wheels 25 to allow the displacement of said apparatus 1.

[0019] Said loading unit 3 comprises a loading hopper 31 driven by pneumatic actuators 32. The loading hopper 31 is accessible by opening the door 22 so that the sand or inert material to be dried can be manually loaded therein.

[0020] Said suction unit 4 comprises an aspirator 41, located in the upper portion of said apparatus 1, a suction pipe 42 (shown in figure 4), connected between said loading hopper 31 and said aspirator 41, and an outlet pipe 43.

[0021] Said aspirator 41 also includes means for controlling the level 411 of the flow contained therein, which in the embodiment of the present invention comprise a bar 412 and a detection member 413, such that when the flow in said aspirator 41 exceeds a predetermined level, said flow contacts with said detection member 413, causing the rotation of said bar 412 to stop, blocking the aspirator 41. Any other flow level detection systems may be implemented as an alternative to the described one.

[0022] Said suction unit 4 also includes a metering valve 44, arranged along said outlet pipe 43, for measuring the flow to be sent to the drying unit 5.

[0023] The drying unit 5, includes a drying drum or roller 51 having a cylindrical shape, such as to define an internal volume V, with the symmetry and rotation axis of the cylinder arranged horizontally. Said drying drum 51 is internally provided with a spiral screw 52, as a mixing member. Drying resistances are provided on the outer surface 53.

[0024] At the output of said drying drum 41 a unload flange 54 of the dried sand or inert, i.e. completely dehydrated, is provided.

[0025] Said drum 51 is rotated by means of motors 7, comprising an electric motor 71 and motions and return

transmissions members 72 including sprocket and chain systems.

[0026] Said outlet pipe 43 outgoing from said aspirator 41, is input connected to said drying drum 51.

[0027] Said storage and offload unit 6 comprises a rotating elevator member 61, which in this embodiment is a paddle wheel, capable of getting from said drum 51 predetermined drying quantities that pass through said unload flange 54. Said rotating elevator member 61, always rotating by means of said motor means 7, transports the flow taken from said drying drum 51 into an unload hopper 62, which then transfers it into a transfer screw 63, which has a spiral shape, arranged within a cylinder 64, contained within a containment box 64'.

[0028] Said cylinder 64 has openings 65 on the surface, which in this embodiment are 4, through which appropriate flow quantities may pass, reaching, by fall, a storage hopper 66, arranged at the bottom, provided with resistors 67. Said storage hopper 66 is arranged in correspondence with said compartment 23 for transferring the already dried flow.

[0029] Downstream said storage hopper 66 a discharge valve 68 is provided positioned in correspondence with said compartment 23 for discharging, if necessary, a suitable amount of sand or inert material.

[0030] The operation of the apparatus for drying inert materials 1 as described above is as follows.

[0031] The sand or the inert material to be dried is loaded manually by said loading hopper 31, by operating said pneumatic actuators 32.

[0032] The aspirator 41 draws the flow from said loading hopper 31, through said suction pipe 42. The metering valve 44 determines the amount of flow contained within said aspirator 41 to be transferred to said drying drum 51 through said outlet pipe 43. In case of the flow aspirated in the aspirator 41 exceeds the required amount, the means for controlling the level 411 block the suction from said loading hopper 31.

[0033] The drying drum 51 rotates by passing the flow through the screw 52. The drying resistors 53 heat the flow contained within the inner volume V of said drying drum 51 to a temperature of about 350 °C, thereby eliminating any moisture component.

[0034] Due to the continuous mixing of said screw 52 of said drying drum 51, together with the heating of said drying resistors 53, the flow is continually mixed within said drying drum 51 and heated, thereby obtaining an optimum drying.

[0035] Once the sand has run through the whole screw 52, it passes through said unload flange 54 to be transferred through said rotary elevator member 61 to said transfer screw 63 by means of said unload hopper 62.

[0036] The sand, now dried, is transported by said transfer screw 63 and passed through said openings 65.

[0037] Said sand, by fall, is collected in said storage hopper 66 and kept at a temperature of 120 °C by said resistors 67, thereby preventing it to absorb again any moisture for any reason.

[0038] Whenever collecting a preset amount of sand is necessary, the operator can act on the unload product button on the pushbutton 24", so that said discharge valve 68 gets out the required amount of flow.

5 **[0039]** In addition to the above, the apparatus for drying inert materials 1 comprises load cells arranged so as to maintain the control of the amount of flow contained within said drying drum 51 and within said storage hopper 66.

10 **[0040]** In addition, the apparatus for drying inert materials 1 can be inserted into a complex plant. Particularly, the output of said discharge valve 68 may be provided with a flow pusher for transferring the dried flow and its use, everything monitored and operated by an RFID data transfer system.

15 **[0041]** Also, it should be considered that all the units of said apparatus 1 can be readily controlled by said control panel 24'.

20 **[0042]** An advantage of the drying apparatus according to the present invention is to allow a quick drying of the flow or inert in general, allowing it to be maintained and dehydrated over time.

25 **[0043]** An additional advantage of the drying apparatus according to the present invention is to allow an optimum dosage of the dried flow.

Claims

1. Apparatus for drying aggregates (1), such as sand, comprising
 - a loading unit (3), for loading aggregates to be dried,
 - a drying unit (5), for drying said aggregates loaded in said loading unit (3), and
 - a storage and offload unit (6), arranged to draw said dried aggregates from said drying unit (5) and offload the same,
 wherein said drying unit (5) comprises
 - a drying drum (51), having an internal volume (V), in which said aggregates to be dried are collected,
 - mixing members (52) of said aggregates contained in said drying drum (51), and
 - heating means (53), for heating said internal volume (V) of said drying drum (51),
 wherein said storage and offload unit (6) comprises
 - a storage hopper (66), in which the aggregate dried by said drying drum (51) are contained, and
 - an elevator member (61), such as a paddle wheel, adapted to draw from said drying drum (51) a pre-defined amount of said aggregates,**characterized in that** the storage and offload unit (6) further comprises
 - heating resistors (67) for heating said aggregates contained in said storage hopper (66), a transfer screw (63), arranged above said drying drum (51), arranged to receive said aggregates from said elevator member (61), and
 - a cylinder (64), within which said transfer screw (63) is arranged, having one or more openings (65) on

the side surface, arranged in correspondence with said storage hopper (66), such that said dried aggregates can fall by gravity into said storage hopper (66) through said one or more openings (65).

2. Apparatus (1) according to claim 1, **characterized in that** said mixing members (52) comprise a screw (52), arranged inside said drying drum (51), to transport and to mix said aggregates contained in said drying drum (51).
3. Apparatus (1) according to claim 2, **characterized in that** said screw (52) has a spiral shape.
4. Apparatus (1) according to any one of the preceding claims, **characterized in that** said drying drum (51) is rotating.
5. Apparatus (1) according to any one of the preceding claims, **characterized in that** said drying drum (51) has a cylindrical shape, which symmetry and rotation axis is arranged in a horizontal position.
6. Apparatus (1) according to any one of the preceding claims, **characterized in that** said heating means (53) comprise a plurality of drying elements (53) arranged in close proximity to the external surface of said drying drum (51).
7. Apparatus (1) according to claim 1, **characterized in that** said storage and offload unit (6) comprises a discharge valve (68), for expelling a predetermined quantity of said aggregates from said hopper storage (66).
8. Apparatus (1) according to any one of the preceding claims, **characterized in that** said loading unit (3) comprises a loading hopper (31) for loading the aggregates to be dried.
9. Apparatus (1) according to any one of the preceding claims, **characterized in that** it comprises a suction unit (4), for transferring said aggregates from said loading unit (3) to said drying unit (5).
10. Apparatus (1) according to claim 9, **characterized in that** said suction unit (4) comprises an aspirator (41), a suction pipe (42) connected between said loading unit (3) and said aspirator (41), and an outlet pipe (43), connected between said aspirator (41) and said drying drum (51).
11. Apparatus (1) according to claim 10, **characterized in that** said aspirator (41) comprises means (411) for the control of the level of the aggregates contained in said aspirator (41) and **in that** said suction means (4) comprise a metering

valve (44), arranged along said outlet pipe (43), for determining the amount of aggregates to be transferred to said drying unit (5).

- 5 12. Apparatus (1) according to any one of the preceding claims, **characterized in that** it comprises a container (2) having a front opening (21) with a respective door (22) for the access to said loading unit (3), and a compartment (23), arranged in correspondence with said storage and offload unit (6).

Patentansprüche

- 15 1. Einrichtung zum Trocknen von Zuschlagstoffen (1) wie z.B. Sand, umfassend
eine Beschickungseinheit (3) zum Beschicken von
zu trocknenden Zuschlagstoffen,
eine Trocknungseinheit (5) zum Trocknen der in die
Beschickungseinheit (3) beschickten Zuschlagstoffe, und,
eine Speicher- und Entladeeinheit (6), die angeordnet
ist, um die getrockneten Zuschlagstoffe aus der
Trocknungseinheit (5) zu fördern und diese zu entladen,
wobei die Trocknungseinheit (5)
eine Trocknungstrommel (51), die ein Innenvolumen (V)
aufweist, in dem die zu trocknenden Zuschlagstoffe
gesammelt werden,
Mischelemente (52) der in der Trocknungstrommel
(51) enthaltenen Zuschlagstoffe und
Heizmittel (53) zum Erwärmen des Innenvolumens (V)
der Trocknungstrommel (51) umfasst,
wobei die Speicher- und Entladeeinheit (6)
einen Speichertrichter (66), in dem die durch die
Trocknungstrommel (51) getrockneten Zuschlagstoffe
enthalten sind, und
ein Höhenfördererelement (61), wie z.B. ein Schaufelrad,
umfasst, das angepasst ist, um eine vordefinierte
Menge der Zuschlagstoffe aus der Trocknungstrommel
(51) zu fördern,
dadurch gekennzeichnet, dass die Speicher- und
Entladeeinheit (6) weiter
Heizwiderstände (67) zum Erwärmen der in dem
Speichertrichter (66) enthaltenen Zuschlagstoffe,
eine Zuführschnecke (63), die oberhalb der
Trocknungstrommel (51) angeordnet ist, die
angeordnet ist, um die Zuschlagstoffe von dem
Höhenfördererelement (61) aufzunehmen, und
einen Zylinder (64) umfasst, in dem die Zuführschnecke
(63) angeordnet ist, der eine oder mehrere
Öffnungen (65) auf der Seitenfläche aufweist, die in
Entsprechung mit dem Speichertrichter (66) angeordnet
sind, so dass die getrockneten Zuschlagstoffe mittels
Schwerkraft durch die eine oder mehreren
Öffnungen (65) in den Speichertrichter (66) fallen
können.

2. Einrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mischelemente (52) eine Schnecke (52) umfassen, die innerhalb der Trocknungstrommel (51) angeordnet ist, um die in der Trocknungstrommel (51) enthaltenen Zuschlagstoffe zu transportieren und zu mischen. 5
3. Einrichtung (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** die Schnecke (52) eine Spiralform aufweist. 10
4. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Trocknungstrommel (51) rotiert. 15
5. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Trocknungstrommel (51) eine zylindrische Form aufweist, deren Symmetrie- und Rotationsachse in einer horizontalen Position angeordnet ist. 20
6. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Heizmittel (53) eine Vielzahl von Trocknungsaggregaten (53) umfassen, die in unmittelbarer Nähe der Außenfläche der Trocknungstrommel (51) angeordnet sind. 25
7. Einrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Speicher- und Entladeeinheit (6) ein Auslassventil (68) zum Ausstoßen einer vorbestimmten Menge der Zuschlagstoffe aus dem Trichterspeicher (66) umfasst. 30
8. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** Beschickungseinheit (3) einen Beschickungstrichter (31) zum Beschicken der zu trocknenden Zuschlagstoffe umfasst. 35
9. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine Saugereinheit (4) zum Zuführen der Zuschlagstoffe von der Beschickungseinheit (3) an die Trocknungseinheit (5) umfasst. 40
10. Vorrichtung (1) nach Anspruch 9, **dadurch gekennzeichnet, dass** die Saugereinheit (4) einen Aspirator (41), ein Saugrohr (42), das zwischen der Beschickungseinheit (3) und dem Aspirator (41) angeschlossen ist, und ein Auslassrohr (43) umfasst, das zwischen dem Aspirator (41) und der Trocknungstrommel (51) angeschlossen ist. 45
11. Einrichtung (1) nach Anspruch 10, **dadurch gekennzeichnet,**

dass der Aspirator (41) Mittel (411) zur Steuerung des Niveaus der in dem Aspirator (41) enthaltenen Zuschlagstoffe umfasst, und **dass** das Saugmittel (4) ein Dosierventil (44) umfasst, das entlang des Auslassrohrs (43) angeordnet ist, um die Menge der an die Trocknungseinheit (5) zuzuführenden Zuschlagstoffe zu bestimmen.

12. Einrichtung (1) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie einen Behälter (2) aufweisend eine vordere Öffnung (21) mit einer entsprechenden Tür (22) für den Zugang zu der Beschickungseinheit (3) und ein Fach (23) umfasst, das in Entsprechung mit der Speicher- und Entladeeinheit (6) angeordnet ist. 50

Revendications

1. Appareil destiné à sécher des agrégats (1), tels que du sable, comprenant une unité de chargement (3), destinée à charger des agrégats à sécher, une unité de séchage (5), destinée à sécher lesdits agrégats chargés dans ladite unité de chargement (3), et une unité de stockage et de déchargement (6), agencée pour prélever lesdits agrégats séchés de ladite unité de séchage (5) et décharger ceux-ci, dans lequel ladite unité de séchage (5) comprend un tambour de séchage (51), présentant un volume interne (V), dans lequel lesdits agrégats à sécher sont collectés, des éléments de mélange (52) desdits agrégats contenus dans ledit tambour de séchage (51), et des moyens de chauffage (53), destinés à chauffer ledit volume interne (V) dudit tambour de séchage (51), dans lequel ladite unité de stockage et de déchargement (6) comprend une trémie de stockage (66), dans laquelle les agrégats séchés par ledit tambour de séchage (51) sont contenus, et un élément d'ascenseur (61), tel qu'une roue à aubes, adapté pour prélever dudit tambour de séchage (51) une quantité prédéfinie desdits agrégats, **caractérisé en ce que** l'unité de stockage et de déchargement (6) comprend en outre des résistances chauffantes (67) destinées à chauffer lesdits agrégats contenus dans ladite trémie de stockage (66), une vis de transfert (63), agencée au-dessus dudit tambour de séchage (51), agencée pour recevoir lesdits agrégats à partir dudit élément d'ascenseur (61), et un cylindre (64), au sein duquel ladite vis de transfert (63) est agencée, présentant une ou plusieurs ouvertures (65) sur la surface latérale, agencé en corres-

- pondance avec ladite trémie de stockage (66), de sorte que lesdits agrégats séchés peuvent tomber par gravité à l'intérieur de ladite trémie de stockage (66) à travers ladite/lesdites une ou plusieurs ouvertures (65).
2. Appareil (1) selon la revendication 1, **caractérisé en ce que** lesdits éléments de mélange (52) comprennent une vis (52), agencée à l'intérieur dudit tambour de séchage (51), pour transporter et mixer lesdits agrégats contenus dans ledit tambour de séchage (51). 5
3. Appareil (1) selon la revendication 2, **caractérisé en ce que** ladite vis (52) présente une forme en spirale. 10
4. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit tambour de séchage (51) est rotatif. 15
5. Appareil (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit tambour de séchage (51) présente une forme cylindrique, dont l'axe de symétrie et de rotation est agencé dans une position horizontale. 20
6. Appareil (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits moyens de chauffage (53) comprennent une pluralité d'éléments de séchage (53) agencés à proximité immédiate de la surface externe dudit tambour de séchage (51). 25
7. Appareil (1) selon la revendication 1, **caractérisé en ce que** ladite unité de stockage et de déchargement (6) comprend une soupape de déchargement (68), destinée à expulser une quantité prédéterminée desdits agrégats dudit stockage de trémie (66). 30
8. Appareil (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite unité de chargement (3) comprend une trémie de chargement (31) destinée à charger les agrégats à sécher. 35
9. Appareil (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend une unité d'aspiration (4), destinée à transférer lesdits agrégats de ladite unité de chargement (3) vers ladite unité de séchage (5). 40
10. Appareil (1) selon la revendication 9, **caractérisé en ce que** ladite unité d'aspiration (4) comprend un aspirateur (41), un tuyau d'aspiration (42) raccordé entre ladite unité de chargement (3) et ledit aspirateur (41), et un tuyau de sortie (43), raccordé entre ledit aspirateur (41) et ledit tambour de séchage (51). 45
11. Appareil (1) selon la revendication 10, **caractérisé en ce que** ledit aspirateur (41) comprend des moyens (411) pour la commande du niveau des agrégats contenus dans ledit aspirateur (41) et **en ce que** lesdits moyens d'aspiration (4) comprennent une soupape de dosage (44), agencée le long dudit tuyau de sortie (43), destinée à déterminer la quantité d'agrégats à transférer vers ladite unité de séchage (5). 50
12. Appareil (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend un contenant (2) présentant une ouverture avant (21) avec une porte respectueuse (22) pour l'accès à ladite unité de chargement (3), et un compartiment (23), agencé en correspondance avec ladite unité de stockage et de déchargement (6). 55

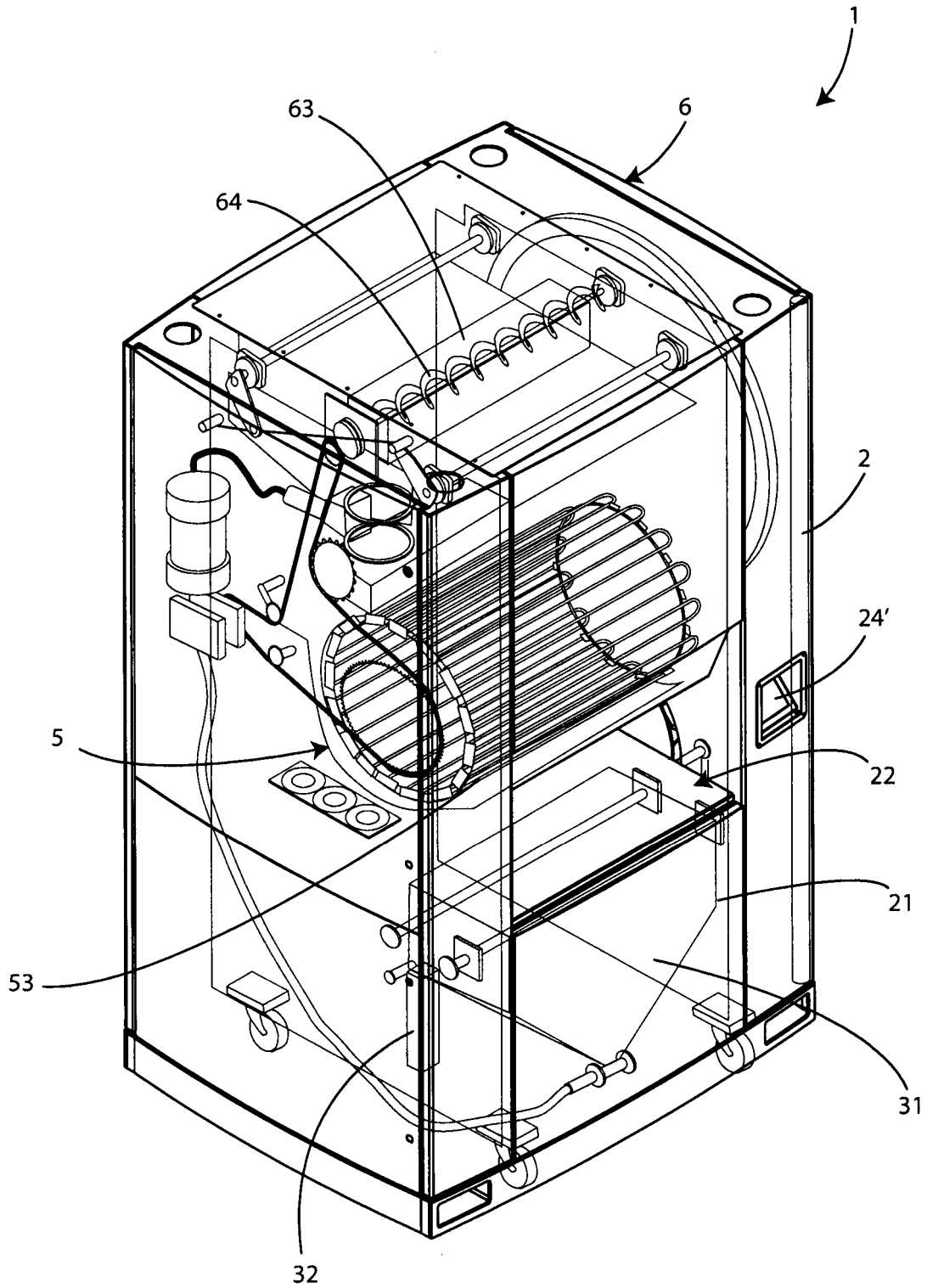


Fig. 1

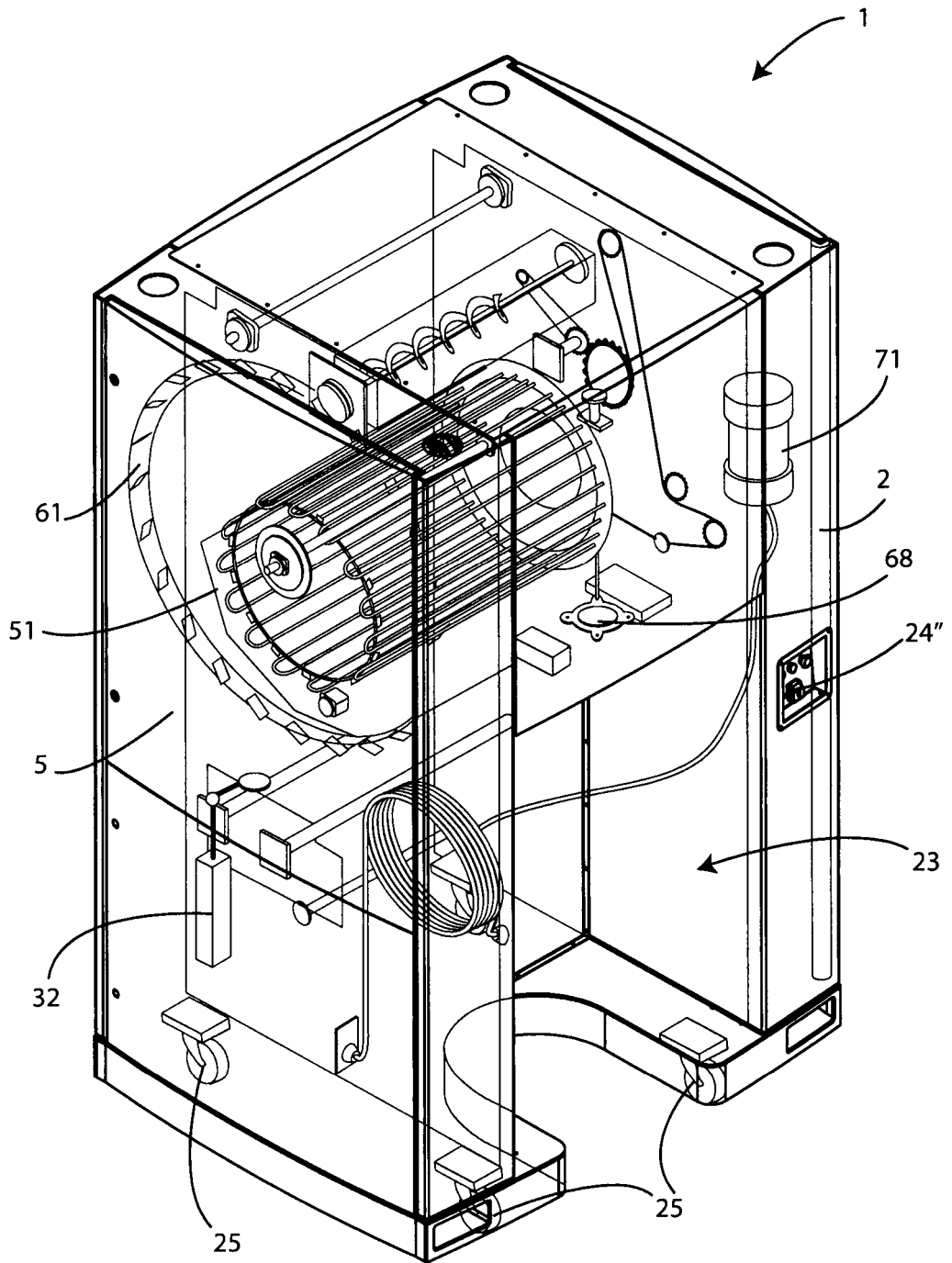


Fig. 2

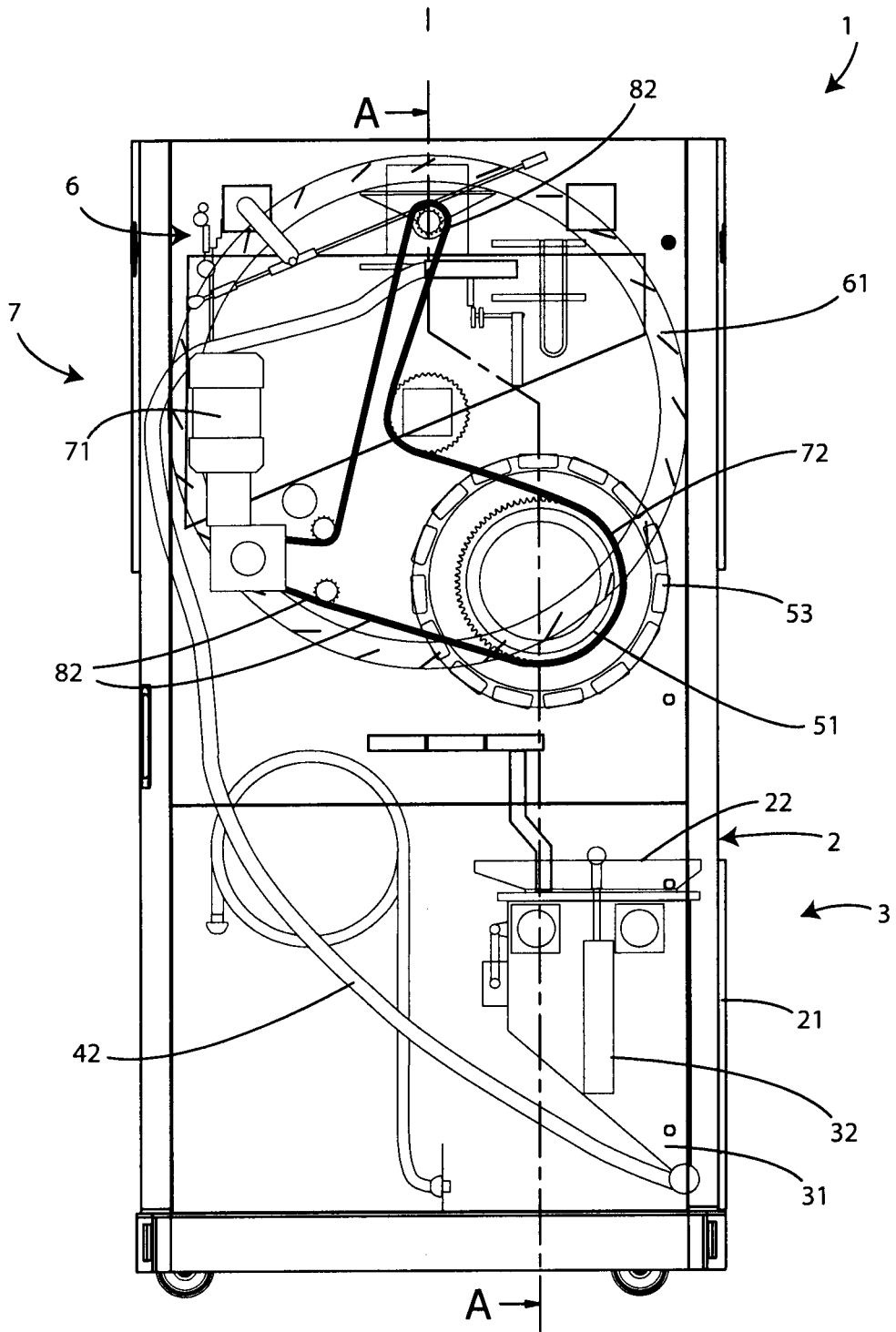


Fig. 3

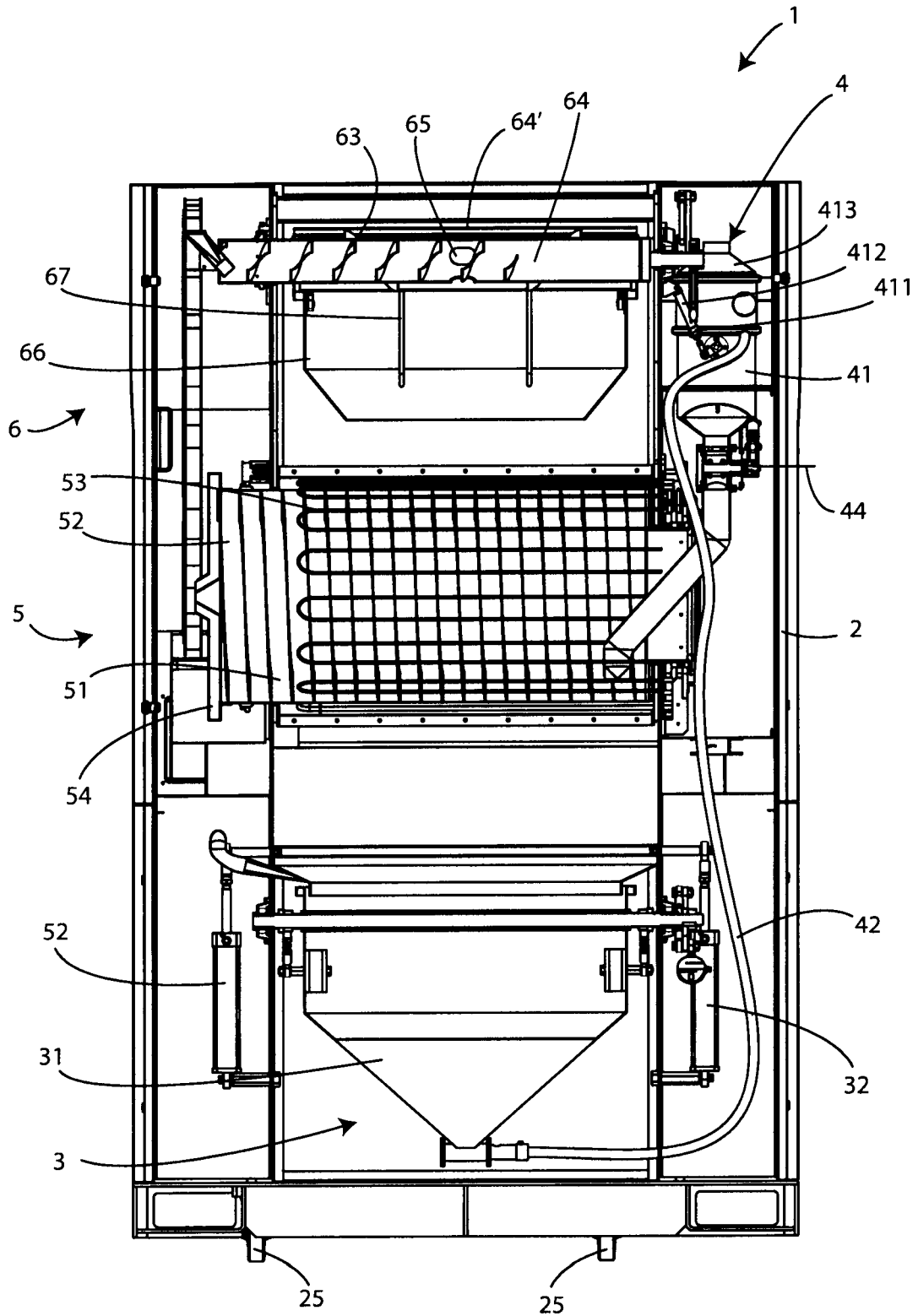


Fig. 4
Sez. A-A

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3938785 A [0008]
- JP 2011140027 A [0008]