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(71) Applicant: **Iris Ympäristö Oy**
30100 Forssa (FI)

(72) Inventor: **Mikkola, Petteri**
31130 Koijärvi (FI)

(74) Representative: **Aaltonen, Janne Lari Antero et al**
Moosedog Oy
Vähäheikkiläntie 56 C
20810 Turku (FI)

(54) APPARATUS AND METHOD FOR PROCESSING MATERIAL

(57) Disclosed is an apparatus (100) for processing a material, comprising a feeder (102) configured to receive the material and a press module (104) operatively coupled to the feeder, wherein the press module comprises a body. The body has a volume of space for receiving the material from the feeder and a first end (104A) and a second end (104B) opposite to the first end. Further, the body comprises a pressing means (204) configured to press and move the material received in the volume of space towards the first end of the body. The apparatus further comprises a sieve (106,300) having a first side (106A) and a second side (106B) opposite to the first side, wherein the sieve is arranged at the first end of the body, the second side of the sieve faces the first end of the body, and the sieve is configured to receive the material in a pressed form from the first end of the body via the second side of the sieve and to eject the material in a processed form via the first side of the sieve. The apparatus also comprises cleaning means (108) arranged to clean the second side of the sieve.

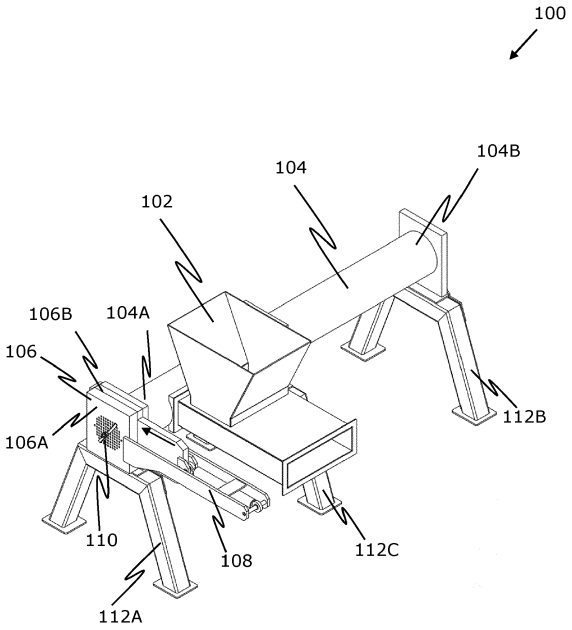

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates generally to processing of materials; and more specifically, to apparatus and methods for processing of materials, for example, bituminous materials.

BACKGROUND

[0002] In recent past, developments in the construction industry has led to innovation of various new techniques and equipment to improve upon the current construction scenario. Generally, materials, such as bitumen and asphalt, are used for construction purposes, such as for construction of road pavements, bituminous waterproofing products, roofing felts, and the like. Asphalt is typically a mixture of construction aggregates, for example, crushed stone, gravel, sand and so forth whereas bitumen is a by-product of crude petroleum that is used to bind the asphalt together to form asphalt concrete used for construction. Now, such materials used while construction of various structures possess reusability characteristics without losing any value but are generally left unused. A majority of existing asphalt and bituminous materials can be recycled, which provides cost benefits by reducing a need to purchase raw materials as well reducing the cost associated with waste transport and disposal. Moreover, recycling asphalt also reduces the need to use non-renewable resources, such as oil and gravel, and further reduces waste sent to landfill, as well as reducing the emissions created through asphalt processing plants.

[0003] Typically, asphalt recycling is performed via in-place (i.e. onsite) and offsite methods. Deteriorated asphalt materials are generally recycled via two processes, namely, onsite recycling (e.g. both hot and cold techniques) and offsite recycling. Hot-onsite recycling involves softening the surface through heating and then relaying the existing road. Cold in-place recycling involves removing a road portion to a certain level, pulverizing it, mixing it with an additive, and then the recycled asphalt is laid, compacted, and resealed. One of the problems associated with such in-place (onsite) and offsite methods is that such methods require use of multiple equipment to perform asphalt recycling. Therefore, such methods are expensive as well as time consuming.

[0004] Moreover, another problem associated with recycled bituminous materials, generally procured from pavements or bitumen-based roofs is the presence of moisture in the mixture. These damp bitumen crumbs typically slow down the asphalt making process, and further requires multiple machinery and work phases. This increases not only the operational cost but also the time required for procuring usable bituminous material. Conventionally, aforementioned problem of presence of moisture in the mixture is typically solved by conventional heating of the mixture, removing the moisture via such heating, dehumidifying by introducing dry air to the mixture, and optionally altering the dewpoint temperature. However, heating the mixture can lead to various unwanted reactions between the constituents or even possible state change of the constituents of the mixture. Also, the dehumidification process is less effective in comparison to the conventional heating, and hence leaves a scope for improvement.

[0005] Therefore, in light of the foregoing discussion, there exists a need to overcome one or more aforementioned drawbacks associated with conventional methods of processing the bituminous materials.

SUMMARY

[0006] The present disclosure seeks to provide an apparatus for processing a material. The present disclosure also seeks to provide a method of processing a material in an apparatus. The present disclosure seeks to provide a solution to the existing problem of inefficient processing of materials. An aim of the present disclosure is to provide a solution that overcomes at least partially the problems encountered in prior art, and provide the apparatus and the method for efficient and cost-effective processing the material to be further used for construction purposes.

[0007] In one aspect, the present disclosure provides an apparatus for processing a material, the apparatus comprising

- a feeder configured to receive the material;
- a press module operatively coupled to the feeder, wherein the press module comprises a body
  - having a volume of space for receiving the material from the feeder,
  - having a first end and a second end opposite to the first end, and
  - comprising a pressing means configured to press and move the material received in the volume of space towards the first end of the body;
- a sieve having a first side and a second side opposite to the first side, wherein the sieve is arranged at the first end of the body, and wherein the second side of the sieve faces the first end of the body, and wherein the sieve is configured to receive the material in a pressed form from the first end of the body via the second side of the sieve and to eject the material in a processed form via the first side of the sieve; and
- cleaning means arranged to clean the second side of the sieve.

[0008] In another aspect, the present disclosure provides a method of processing a material in an apparatus, the method comprising

- receiving the material by a feeder of the apparatus;

- moving the material into a volume of space of a body of a press module of the apparatus, wherein the body has a first end and a second end opposite to the first end;
- pressing and moving the material received in the volume of space, towards the first end of the body of the press module;
- receiving, by a sieve arranged at the first end of the body, the material in a pressed form from the first end of the body, wherein the sieve comprises a first side and a second side, and wherein the sieve receives the material from the second side facing the first end of the body;
- ejecting the material in a processed form via the first side of the sieve; and
- cleaning the second side of the sieve by a cleaning means of the apparatus.

[0009] Embodiments of the present disclosure substantially eliminate or at least partially address the aforementioned problems in the prior art, and enable processing of materials efficiently, such that construction using the processed materials become faster. Moreover, the apparatus processes the material in such a manner that use of additional machinery to process such material is significantly reduced. Furthermore, such apparatus reduces an amount of manual effort and time required for processing the material. Thus, the present disclosure provides an improved apparatus and method that is cost effective, time saving without any compromise in quality of end product (i.e. the processed material), and thus efficient.

[0010] Additional aspects, advantages, features and objects of the present disclosure would be made apparent from the drawings and the detailed description of the illustrative embodiments construed in conjunction with the appended claims that follow.

[0011] It will be appreciated that features of the present disclosure are susceptible to being combined in various combinations without departing from the scope of the present disclosure as defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The summary above, as well as the following detailed description of illustrative embodiments, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the present disclosure, exemplary constructions of the disclosure are shown in the drawings. However, the present disclosure is not limited to specific methods and instrumentalities disclosed herein. Moreover, those skilled in the art will understand that the drawings are not to scale. Wherever possible, like elements have been indicated by identical numbers.

[0013] Embodiments of the present disclosure will now be described, by way of example only, with reference to the following diagrams wherein:

FIG. 1	is a perspective view of an apparatus, in accordance with an embodiment of the present disclosure;
FIG. 2A	is a side view of an apparatus, in accordance with an embodiment of the present disclosure;
FIG. 2B	is a top view of an apparatus, in accordance with an embodiment of the present disclosure;
FIG. 2C	is a front view of an apparatus, in accordance with an embodiment of the present disclosure;
FIG. 2D	is a longitudinal sectional view of an apparatus with a press module, in accordance with an embodiment of the present disclosure;
FIG. 3A	is a front view of a sieve of the apparatus of FIG. 1, in accordance with an embodiment of the present disclosure;
FIG. 3B	is a longitudinal sectional view of a sieve to depict an arrangement of apertures in the sieve, in accordance with an embodiment of the present disclosure;
FIG. 3C	is a front view of a sieve of an apparatus, in accordance with another embodiment of the present disclosure;
FIGs. 4A to 4E	is an exemplary scenario that illustrates various stages of processing a material in an apparatus, in accordance with an embodiment of the present disclosure; and
FIG. 5	is a flow chart of a method for processing a material in an apparatus, in accordance with an embodiment of the present disclosure.

[0014] In the accompanying drawings, an underlined number is employed to represent an item over which the underlined number is positioned or an item to which the underlined number is adjacent. A non-underlined number relates to an item identified by a line linking the non-underlined number to the item. When a number is non-underlined and accompanied by an associated arrow, the non-underlined number is used to identify a general item at which the arrow is pointing.

DETAILED DESCRIPTION OF EMBODIMENTS

[0015] The following detailed description illustrates embodiments of the present disclosure and ways in which they can be implemented. Although some modes of carrying out the present disclosure have been disclosed, those skilled in the art would recognize that other embodiments for carrying out or practising the present disclosure are also possible.

[0016] In one aspect, an embodiment of the present

disclosure provides an apparatus for processing a material, the apparatus comprising

- a feeder configured to receive the material;
- a press module operatively coupled to the feeder, wherein the press module comprises a body
    - having a volume of space for receiving the material from the feeder,
    - having a first end and a second end opposite to the first end, and
    - comprising a pressing means configured to press and move the material received in the volume of space towards the first end of the body;
- a sieve having a first side and a second side opposite to the first side, wherein the sieve is arranged at the first end of the body, and wherein the second side of the sieve faces the first end of the body, and wherein the sieve is configured to receive the material in a pressed form from the first end of the body via the second side of the sieve and to eject the material in a processed form via the first side of the sieve; and
- cleaning means arranged to clean the second side of the sieve.

[0017] In another aspect, an embodiment of the present disclosure provides a method of processing a material in an apparatus, the method comprising

- receiving the material by a feeder of the apparatus;
- moving the material into a volume of space of a body of a press module of the apparatus, wherein the body has a first end and a second end opposite to the first end;
- pressing and moving the material received in the volume of space, towards the first end of the body of the press module;
- receiving, by a sieve arranged at the first end of the body, the material in a pressed form from the first end of the body, wherein the sieve comprises a first side and a second side, and wherein the sieve receives the material from the second side facing the first end of the body;
- ejecting the material in a processed form via the first side of the sieve; and
- cleaning the second side of the sieve by a cleaning means of the apparatus.

[0018] The present disclosure provides an apparatus and a method for processing a material. The apparatus comprises the sieve having a set of apertures, where the material when pressed and passed through the sieve releases heat and loses moisture therein due to friction experienced by the material while passing through the sieve. Typically, conventional methods require a number of machineries to process the bituminous materials. In contradiction to conventional methods and conventional systems, the present disclosure provides an improved apparatus that single-handedly and efficiently processes the bituminous materials, removes moisture from the materials, and also accurately cuts the materials in plurality of sections with consistency, thereby saving power and time. Thus, the disclosed apparatus and method is cost effective as the conventional methods and systems require a greater number of equipment and manual labour for processing the materials. Moreover, as the processing by the method of the present disclosure is performed by the single apparatus that effectively reduces the amount of moisture in the material, the method is time saving. In other words, the present disclosure provides the apparatus and the method for processing the material that is cost effective, time saving and efficient.

[0019] The present disclosure provides an apparatus for processing a material. The material refers to any bituminous material such as bitumen, asphalt concrete and so forth. The material is potentially used for construction purposes, for example, construction of road pavements, bituminous waterproofing products, roofing felts, and the like. The apparatus comprises a feeder configured to receive the material. The feeder includes a first portion and a second portion. In an implementation, the first portion is arranged approximately perpendicular to the second portion of the feeder. The first portion of the feeder has an opening to receive the material therein. A shape of the first portion of the feeder is, for example, a trapezoidal shape, a cuboidal shape, a cubical shape, and so forth. Moreover, the first portion of the feeder comprises an upper end and a lower end. In an example, the material is received via the upper end. The lower end of the first portion of the feeder is coupled to the second portion of the feeder. The first portion of the feeder is a hollow structure, such that the material received from the upper end of the first portion of the feeder reaches to the second portion of the feeder via the lower end of the first portion of the feeder. Notably, a circumference (or a size) of the upper end of the first portion of the feeder is greater than a circumference (or size) of the lower end of the feeder (e.g. in a case where the feeder is trapezoidal in shape).

[0020] Furthermore, the apparatus comprises a press module operatively coupled to the feeder. The press module comprises a body having a volume of space for receiving the material from the feeder. The body of the press module is a hollow structure having the volume of space for receiving the material from the feeder. The body has a first end and a second end, such that the first end is opposite to the second end. The body is the body of the press module. The volume of space is defined between the first end and the second end of the body of the press module.

[0021] According to an embodiment, the body has an elongated form, for example it is made of an elongated structure. In an example, the elongate structure of the body is a cylindrical structure having the first end and the second end. The body of the press module is coupled to the second portion of the feeder in order to receive the

material from the feeder. Specifically, the feeder is coupled near the first end of the body of the press module. Hence, the material is received in the volume of space near the first end of the body of the press module via the feeder.

[0022] According to an embodiment, the feeder further comprises a first piston configured to move the received material into the volume of space of the body. The first piston is arranged in the second potion of the feeder. The received material in the first portion of the feeder reaches to the second portion of the feeder (e.g. under the influence of gravity). The first piston moves in a direction in the feeder such that the first piston pushes and moves the received material in the volume of space of the body of the press module. As the feeder is coupled near the first end of the body, the received material is pushed and moved near the first end of the body in the volume of space of the body. In an example, the first piston is a hydraulic piston, a pneumatic piston and the like. A shape of the first piston is typically compatible to a shape of the second portion of the feeder.

[0023] The body of the press module further comprises a pressing means configured to press and move the material received in the volume of space towards the first end of the body. The pressing means is arranged in the body of the press module between the first end and the second end such that the volume of space is left in the body for receiving the material from the feeder. Thus, the pressing means is arranged near the second end of the body of the press module. The pressing means enters the volume of space and presses and moves the material therein towards the first end of the body.

[0024] According to an embodiment, a shape of the pressing means is compatible to a shape of the body. The shape of the pressing means is elongated (i.e. it has an elongated form and is for example made of an elongated structure), similar to that of the body of the press module. For example, in a case where the body of the press module is the cylindrical structure, then in such cases, the pressing means is also the cylindrical structure arranged in the body of the press module. The pressing means is a solid structure unlike the body of the press module that is the hollow structure. The shape of the pressing means is such that it fits in the body of the press module, but is able to slide therein to press and move the material towards the first end of the body of the press module.

[0025] According to an embodiment, the pressing means is any one of: a hydraulic piston or a pneumatic piston. Optionally, the pressing means is a mechanical piston. More optionally, the hydraulic piston is an air operated hydraulic piston, a single acting hydraulic piston, a double acting hydraulic piston or a manual hydraulic piston. It will be appreciated that the hydraulic piston operates with a hydraulic cylinder that receives power to drive the hydraulic piston from a pressurized hydraulic fluid, such as oil.

[0026] According to an embodiment, the apparatus further comprises a hydraulic pump configured to drive the hydraulic piston to press and move the material received in the volume of space of the body. The hydraulic pump is configured to deliver a regulated flow of the pressurized hydraulic fluid to the hydraulic cylinder that drives the hydraulic piston to press and move the material received in the volume of space towards the first end of the body of the press module. The hydraulic pump is arranged towards the second end of the body at an end of the hydraulic piston, such that the hydraulic pump drives the hydraulic piston to move towards the first end of the body of the press module.

[0027] According to an embodiment, the pressing means is configured to apply a defined amount of pressure on the material to press and move the material in a first direction towards the first end of the body, and wherein a movement of the pressing means stops when a pressure applied to the material in the volume of space is more than the defined amount of pressure. The defined amount of pressure applied by the pressing means potentially depends upon the flow of the pressurized hydraulic fluid to the hydraulic cylinder that drives the hydraulic piston to press and move the material received in the volume of space. The hydraulic pump delivers the regulated flow of the pressurized hydraulic fluid to the hydraulic cylinder, such that the hydraulic cylinder drives the hydraulic piston to apply the defined amount of pressure on the material in order to press and move the material in the first direction towards the first end of the body. The first direction is an axial direction from the second end of the body to the first end of the body of the press module. The movement of the pressing means in the first direction stops when the pressure applied to the material in the volume of space is more than the defined amount of pressure, for example, when the hydraulic pump delivers an unregulated flow of the pressurized hydraulic fluid to the hydraulic cylinder that potentially causes the hydraulic piston to apply the pressure on the material that is more than the defined amount of pressure. Advantageously, such a mechanism of the pressing means to stop, when the pressure applied to the material in the volume of space is more than the defined amount of pressure prevents any accidental damage that may occur to the apparatus.

[0028] Moreover, the apparatus comprises a sieve having a first side and a second side opposite to the first side. The sieve is arranged at the first end of the body, and the second side of the sieve faces the first end of the body. The sieve is configured to receive the material in a pressed form from the first end of the body via the second side of the sieve and eject the material in a processed form via the first side of the sieve. The first side and the second side of the sieve are generally planar surfaces, such that the second side is coupled to the first end of the body. The received material in the volume of space of the body is pressed and move towards the first end of the body by the pressing means. The pressing means further presses the material that is received by

the second side of the sieve coupled to the first end of the body in the pressed form. Moreover, the pressing means is arranged to apply the defined amount of pressure to the material in the volume of space until the material is ejected, i.e. exits from the first side of the sieve in the processed form. Optionally, the pressing means presses and moves the material received in the volume of space up to certain distance in the body of the press module, such as to prevent any physical damage that is potentially caused to the sieve if the pressing means reaches and exerts pressure to the second side of the sieve while pressing and moving the material to enter the sieve. More optionally, a width of the sieve that is defined as a distance between the first side and the second side of the sieve is in a range of 70 millimeters (mm) to 130 mm. In an example, the width of the sieve is from 70, 80, 90, 100, 110 or 120 mm up to 80, 90, 100, 110, 120 or 130 mm. Therefore, some material that is potentially left in the width of the sieve is ejected from the first side of the sieve once a new batch of material is pressed and moved in the sieve.

[0029] According to an embodiment, the sieve comprises a set of apertures, wherein the set of apertures extend from the first side of the sieve to the second side of the sieve, and wherein a diameter of each aperture of the set of apertures is larger at the first side as compared to the second side of the sieve. The set of apertures extend from the first side of the sieve to the second side of the sieve, such as along the width of the sieve between the first side and the second side. The diameter of each aperture of the set of apertures is larger at the first side as compared to the second side of the sieve to prevent any blockage of the material within the set of apertures. The material that is in the pressed form enters from the second side of the sieve having the set of apertures and thus, the material acquires a shape and circumference of the set of apertures at the second side of the sieve. As the diameter of each aperture of the set of apertures at the first side is larger as compared to the second side of the sieve, the material that has acquired the shape and the circumference (or size) of the set of apertures at the second side is able to pass easily through the set of apertures at the first side of the sieve. Thus, the material that is ejected from the first side of the sieve is in the processed form having the shape and the circumference as that of the set of apertures at the second side of the sieve.

[0030] According to an embodiment, the diameter of each aperture of the set of apertures is in a range of 8 millimeters to 16 millimeters at the first side of the sieve, and in a range of 7 millimeters to 15 millimeters at the second side of the sieve. Such differential diameter of each aperture of the set of apertures at either side (i.e. the first side and the second side of the sieve) enables easy passage and further enables to establish a desired form of the pressed material. Moreover, the material passing through the set of apertures heats up due to friction experienced by the material while passing through the set of apertures. The material in the pressed form when passed through the set of apertures experiences the friction due high pressure and small volume of the set of apertures by which the material is required to pass through. Thus, the diameter of each aperture of the set of apertures at the first side and the second side is diligently selected to ensure that the material experiences friction while passing through the sieve. Notably, if the diameter of the set of apertures is relatively small as compared to the range of the diameters of the set of apertures, the sieve may get blocked by the material due to the material unable to exit the sieve. Due to the small size of the set of apertures. On the other hand, if the diameter of the set of apertures is relatively large as compared to the range of the diameters of the set of apertures, the friction may not generate enough, thus, the material may not get heated enough. In an example, the diameter of each aperture of the set of apertures at the first side of the sieve is from 8, 10, 12 or 14 mm up to 10, 12, 14 or 16 mm. In another example, the diameter of each aperture of the set of apertures at the second side of the sieve is from 7, 9, 11 or 13 mm up to 9, 11, 13 or 15 mm. Beneficially, the heating up of the material due to the friction enables evaporation of moisture in the material. Thus, the processing of the material becomes efficient and time effective. Preferably the apertures are circular, however the formfactor of the apertures can be also for example square, triangular, oval etc. In such a cases the diameter refers to largest diameter of such non circular aperture.

[0031] According to an embodiment, the apparatus further comprises a cutter arranged at the first side of the sieve. The cutter is configured to cut the material, which is ejected from the first side of the sieve, into a plurality of sections. The cutter is arranged at the first side of the sieve, typically at a centre of the first side of the sieve. The cutter may rotate perpendicular to the axial direction (such as the first direction) of the body of the press module. As the material is ejected from the first side of the sieve, the cutter rotates and cuts the material into the plurality of sections. Cutter might be arranged, instead of the centre of the first side of the sieve to side of the sieve. In such setup a motor rotating the cutter is easier to keep clean than if it is in the center.

[0032] Moreover, the apparatus comprises a cleaning means arranged to clean the second side of the sieve. The cleaning means is arranged near the sieve of the apparatus. As the pressing means may press and move the material received in the volume of space up to certain distance in the body of the press module, such as to prevent any physical damage that is potentially caused to the sieve if the pressing means reaches and exerts pressure to the second side of the sieve, some amount of the material is potentially left at the second side of the sieve in the volume of space of the body. Thus, the cleaning means is arranged to clean the leftover material at the second side of the sieve.

[0033] According to an embodiment, the cleaning

means comprises a second piston that is configured to move in a second direction perpendicular to the first direction, to clean the second side of the sieve. The second piston of the cleaning means is for example, a hydraulic piston, a pneumatic piston, an eccentric piston and the like. Optionally, the hydraulic piston is an air operated hydraulic piston, a single acting hydraulic piston, a double acting hydraulic piston or a manual hydraulic piston and so forth. The second direction is a traverse direction that is perpendicular to the first direction (i.e. the axial direction) with respect to the body of the press module. The second piston moves in the second direction such that the leftover material at the second side of the sieve in the volume of space is cleared and thus, the material does not block the second side of the sieve.

[0034] Advantageously, the arrangement of the press module, the feeder and the sieve allow the material to be efficiently processed by the apparatus.

[0035] According to an embodiment, the apparatus further comprises at least two supporting components to provide support to the apparatus. The supporting components provide an adequate support and act as a base or legs to the apparatus. A first supporting component of the at least two supporting components is arranged near the first end of the apparatus, whereas a second supporting component of the at least two supporting components is arranged near the second end of the apparatus.

[0036] The present disclosure also relates to the method as described above. Various embodiments and variants disclosed above apply mutatis mutandis to the method.

[0037] According to an embodiment, the method further comprises cutting the material that is ejected from the first side of the sieve into a plurality of sections. According to another embodiment, the method further comprising applying a defined amount of pressure on the material for pressing and moving the material in a first direction towards the first end of the body by a pressing means of the press module, and wherein the moving of the pressing means stops when a pressure applied to the material in the volume of space is more than the defined amount of pressure.

DETAILED DESCRIPTION OF THE DRAWINGS

[0038] Referring to FIG.1, illustrated is a perspective view of an apparatus **100,** in accordance with an embodiment of the present disclosure. The apparatus **100** for processing a material comprises a feeder **102** configured to receive the material. The apparatus **100** further comprises a press module **104** operatively coupled to the feeder **102.** The press module **104** comprises a body having a volume of space for receiving the material from the feeder **102.** Moreover, the body has a first end **104A** and a second end **104B.** The first end **104A** is opposite to the second end **104B.** The body comprises a pressing means configured to press and move the material received in the volume of space towards the first end **104A** of the body. Furthermore, the apparatus **100** comprises a sieve **106** having a first side **106A** and a second side **106B** opposite to the first side **106A.** The sieve **106** is arranged at the first end **104A** of the body, and the second side **106B** of the sieve **106** faces the first end **104A** of the body. The sieve **106** is configured to receive the material in a pressed form from the first end **104A** of the body via the second side **106B** of the sieve **106** and to eject the material in a processed form via the first side **106A** of the sieve **106.** Moreover, the apparatus **100** comprises a cleaning means **108** arranged to clean the second side **106B** of the sieve **106.** Furthermore, the apparatus **100** comprises a cutter **110** arranged at the first side **106A** of the sieve **106.** The cutter **110** is configured to cut the material, which is ejected from the first side **106A** of the sieve **106,** into a plurality of sections. In this embodiment, the apparatus **100** comprises three supporting components, such as a first supporting component **112A,** a second supporting component **112B** and a third supporting component **112C** to provide support to the apparatus **100.**

[0039] Referring to FIG.2A, there is shown a side view of an apparatus **100** of FIG.1, in accordance with an embodiment of the present disclosure. In the FIG.2A, there is shown a first direction **202** that is an axial direction from the second end **104B** of the body to the first end **104A** of the body of the press module **104.** The pressing means (not shown) arranged in the body is configured to press and move the material received in the volume of space towards the first end **104A** of the body in the first direction **202.**

[0040] Referring to FIG.2B, there is shown a top view of an apparatus **100** of FIG.1, in accordance with an embodiment of the present disclosure. The apparatus **100** comprises the pressing means **204** arranged in the body of the press module **104.** The pressing means **204** is configured to press and move the material received in the volume of space towards the first end **104A** of the body in the first direction **202.**

[0041] Referring to FIG.2C, there is shown a front view of an apparatus of FIG.1, in accordance with an embodiment of the present disclosure. In FIG.2C, there is shown the first side **106A** of the sieve **106.** The sieve **106** comprises a set of apertures. Moreover, the sieve **106** is coupled to the first end **104A** of the body of the press module **104** via a first set of fasteners that are arranged in a first set of openings **206.** Further, the sieve **106** is coupled to the cleaning means **108** via a second set of fasteners that are arranged in a second set of openings **208.** The cleaning means **108** is arranged to clean the second side **106B** of the sieve **106.** The cutter **110** is arranged at the cleaning means **108** to cut the material that is ejected out of the first side **106A** of the sieve **106** into a plurality of sections.

[0042] Referring to FIG.2D, there is shown a longitudinal sectional view of the apparatus **100** with the press module **104,** in accordance with an embodiment of the present disclosure. The pressing means **204** moves in

the first direction **202** in the body of the press module **104** to press and move the material towards the first end **104A** of the body of the press module **104.** The pressing means **204** comprises a pusher plate **205.** The pusher plate **205** is connected to a body of the pressing means **204** with bolts to enable easy changing of the pusher plate **205** (as it wears out during the usage). Furthermore the pusher plate has protruding edge **207** which is tilted (forming angle between 10-45 degrees (or 20-30 degrees) between the inner surface and the protruding edge) towards the sieve **106.** This enables to groove the received material efficiently also from inner surface of the body (material which might have stuck there).

[0043] Referring to FIG.3A, there is shown a front view of a sieve **106** of the apparatus **100** of FIG.1, in accordance with an embodiment of the present disclosure. The sieve **106** comprises the set of apertures **302.** The set of apertures **302** extend from the first side **106A** of the sieve **106** to the second side **106B** of the sieve **106.** Moreover, a diameter of each aperture of the set of apertures **302** is larger at the first side **106A** as compared to the second side **106B** of the sieve **106** as shown in FIG.3B. Furthermore, the sieve **106** comprises the first set of openings **206** to couple the sieve with the first end **104A** of the body of the press module **104** via the first set of fasteners. Also, the sieve **106** comprises a second set of openings **208** to couple the cleaning means **108** to the sieve **106** via the second set of fasteners. As can be seen, the first set of openings **206** are larger than the second set of openings **208.**

[0044] Referring to FIG.3B, there is shown a longitudinal sectional view of the sieve **106** to depict an arrangement of the set of apertures in the sieve **106,** in accordance with an embodiment of the present disclosure. A width of the sieve **106** defines a distance between the first side **106A** and the second side **106B** of the sieve **106** is shown. In this embodiment, the width of the sieve is about 100 mm. The diameter **304A** of each aperture of the set of apertures **302** at the first side **106A** of the sieve **106** is larger as compared to the second side **106B.** In an exemplary implementation, the diameter **304A** of each aperture of the set of apertures at the first side **106A** is about 12 mm. The diameter **304B** of each aperture of the set of apertures at the second side **106B** of the sieve **106** is about 11 mm.

[0045] Referring to FIG.3C, there is shown a front view of a sieve **300** of an apparatus, in accordance with another embodiment of the present disclosure. A set of openings **306** of the sieve **300** are arranged in a circular manner. In this embodiment, the sieve **300** is circular in shape and has a diameter of about 500 mm.

[0046] Referring to figures FIG.4A to FIG.4E, there is shown exemplary scenario that illustrates various stages of processing a material in an apparatus, in accordance with an embodiment of the present disclosure. In FIG. 4A, there is shown a schematic illustration **400A** that depicts the material **402** is loaded in the feeder **102.** The feeder **102** comprises a first piston **404** configured to move the received material **402** into the volume of space of the body of the press module **104.**

[0047] FIG.4B is a schematic illustration **400B** that shows the first piston **404** moves the material **402** in to the volume of space of the body of the press module **104.** In this case, the material **402** previously received at the feeder **102** moves in the body of the press module **104** towards the first end **104A** of the body of the press module **104.**

[0048] FIG.4C is a schematic illustration **400C** depicting that the pressing means **204** pushes and moves the material **402** towards the first end **104A** of the body of the press module **104.** The material **402** enters the sieve **106** via the second side **106B** of the sieve and is ejected the first side **106A** of the sieve **106** in a processed form. The cutter (not shown in the FIG.4C) is configured to cut the material **402** that is ejected from the first side **106A** of the sieve **106** into the plurality of sections.

[0049] FIG.4D is a schematic illustration **400D** that shows the cleaning means **108** comprises the second piston **406** that is configured to move in the second direction **408** perpendicular to the first direction, to clean the second side **106B** of the sieve **106** by removing leftover material **410** of the material **402** from the second side **106B** of the sieve **106** in the volume of space of the body.

[0050] FIG.4E is a schematic illustration **400E** depicting that the second piston **406** moves in the volume of space of the body and pushes the leftover material **410** of the material **402** from the second side **106B** of the sieve **106** in the second direction **408.**

[0051] Referring to FIG.5, there is shown a flow chart of a method **500** for processing a material in the apparatus **100,** in accordance with an embodiment of the present disclosure. At step **502,** the material is received by the feeder of the apparatus. At step **504,** the material is moved into the volume of space of the body of the press module of the apparatus, wherein the body has the first end and the second end, and wherein the first end is opposite to the second end. At step **506,** the material received in the volume of space is pressed and moved towards the first end of the body of the press module. At step **508,** the material is received by the sieve arranged at the first end of the body, in the pressed form from the first end of the body, wherein the sieve comprises the first side and the second side, and wherein the sieve receives the material from the second side facing the first end of the body. At step **510,** the material is ejected via the first side of the sieve in the processed form. At step **512,** the second side of the sieve is cleaned by the cleaning means of the apparatus.

[0052] The steps **502** to **512** are only illustrative and other alternatives can also be provided where one or more steps are added, one or more steps are removed, or one or more steps are provided in a different sequence without departing from the scope of the claims herein.

[0053] Modifications to embodiments of the present disclosure described in the foregoing are possible without

departing from the scope of the present disclosure as defined by the accompanying claims. Expressions such as "including", "comprising", "incorporating", "have", "is" used to describe and claim the present disclosure are intended to be construed in a non-exclusive manner, namely allowing for items, components or elements not explicitly described also to be present. Reference to the singular is also to be construed to relate to the plural.

Claims

1. An apparatus (100) for processing a material (402), the apparatus comprising

- a feeder (102) configured to receive the material;
- a press module (104) operatively coupled to the feeder, wherein the press module comprises a body

  - having a volume of space for receiving the material from the feeder,
  - having a first end (104A) and a second end (104B) opposite to the first end, and
  - comprising a pressing means (204) configured to press and move the material received in the volume of space towards the first end of the body;

- a sieve (106, 300) having a first side (106A) and a second side (106B) opposite to the first side, wherein the sieve is arranged at the first end of the body, and wherein the second side of the sieve faces the first end of the body, and wherein the sieve is configured to receive the material in a pressed form from the first end of the body via the second side of the sieve and to eject the material in a processed form via the first side of the sieve; and
- cleaning means (108) arranged to clean the second side of the sieve.

2. The apparatus according to claim 1, wherein the apparatus (100) further comprises a cutter (110) arranged at the first side (106A) of the sieve (106, 300), and wherein the cutter is configured to cut the material (402), which is ejected from the first side of the sieve, into a plurality of sections.

3. The apparatus according to claim 1 or 2, wherein the feeder (102) further comprises a first piston (404) configured to move the received material (402) into the volume of space of the body.

4. The apparatus according to any one of the preceding claims, wherein the pressing means (204) is a pneumatic piston.

5. The apparatus according to any of the claims 1 to 3, wherein the pressing means (204) is a hydraulic piston and the apparatus (100) further comprises a hydraulic pump configured to drive the hydraulic piston to press and move the material (402) received in the volume of space of the body.

6. The apparatus according to any one of the preceding claims, wherein the pressing means (204) is configured to apply a defined amount of pressure on the material (402) to press and move the material in a first direction (202) towards the first end (104A) of the body, and wherein a movement of the pressing means stops when a pressure applied to the material in the volume of space is more than the defined amount of pressure.

7. The apparatus according to any of the preceding claims, wherein the cleaning means (108) comprises a second piston (406) configured to move in a second direction (408) perpendicular to the first direction (202), to clean the second side (106B) of the sieve (106, 300).

8. The apparatus according to any one of the preceding claims, wherein the apparatus (100) further comprises at least two supporting components to provide support to the apparatus.

9. The apparatus according to any one of the preceding claims, wherein the sieve (106, 300) comprises a set of apertures (302, 306), and wherein the set of apertures extend from the first side (106A) of the sieve to the second side (106B) of the sieve, and wherein a diameter (304A) of each aperture of the set of apertures is larger at the first side as compared to the second side of the sieve.

10. The apparatus according to claim 9, wherein the diameter (304A) of each aperture of the set of apertures (302, 306) is in a range of 8 millimeters to 16 millimeters at the first side (106A) of the sieve (106, 300), and in a range of 7 millimeters to 15 millimeters at the second side (106B) of the sieve.

11. The apparatus according to any one of the preceding claims, wherein the body has an elongated form.

12. The apparatus according to any one of the preceding claims, wherein a shape of the pressing means (204) is compatible to a shape of the body.

13. A method of processing a material in an apparatus (100), the method comprising

- receiving the material (402) by a feeder (102) of the apparatus;
- moving the material into a volume of space of

a body of a press module (104) of the apparatus, wherein the body has a first end (104A) and a second end (104B) opposite to the first end;
- pressing and moving the material received in the volume of space, towards the first end of the body of the press module;
- receiving, by a sieve (106, 300) arranged at the first end of the body, the material in a pressed form from the first end of the body, wherein the sieve comprises a first side (106A) and a second side (106B), and wherein the sieve receives the material from the second side facing the first end of the body;
- ejecting the material in a processed form via the first side of the sieve; and
- cleaning the second side of the sieve by a cleaning means (108) of the apparatus.

14. The method according to claim 13, further comprising cutting the material (402) that is ejected from the first side (106A) of the sieve (106, 300) into a plurality of sections.

15. The method according to claim 13 or 14, further comprising applying a defined amount of pressure on the material (402) for pressing and moving the material in a first direction (202) towards the first end (104A) of the body by a pressing means (204) of the press module (104), and stopping the movement of the pressing means when a pressure applied to the material in the volume of space is more than the defined amount of pressure.

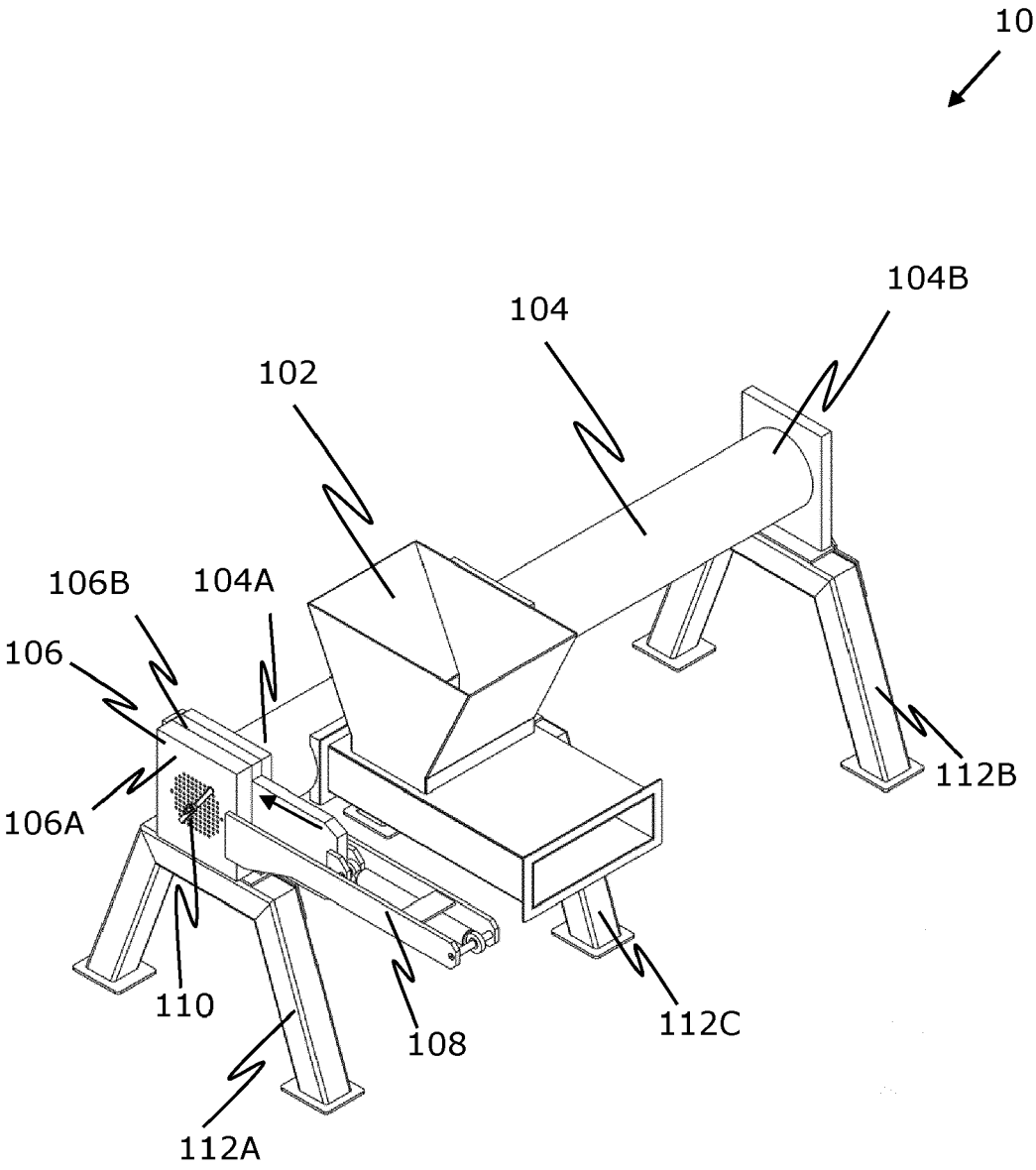

FIG. 1

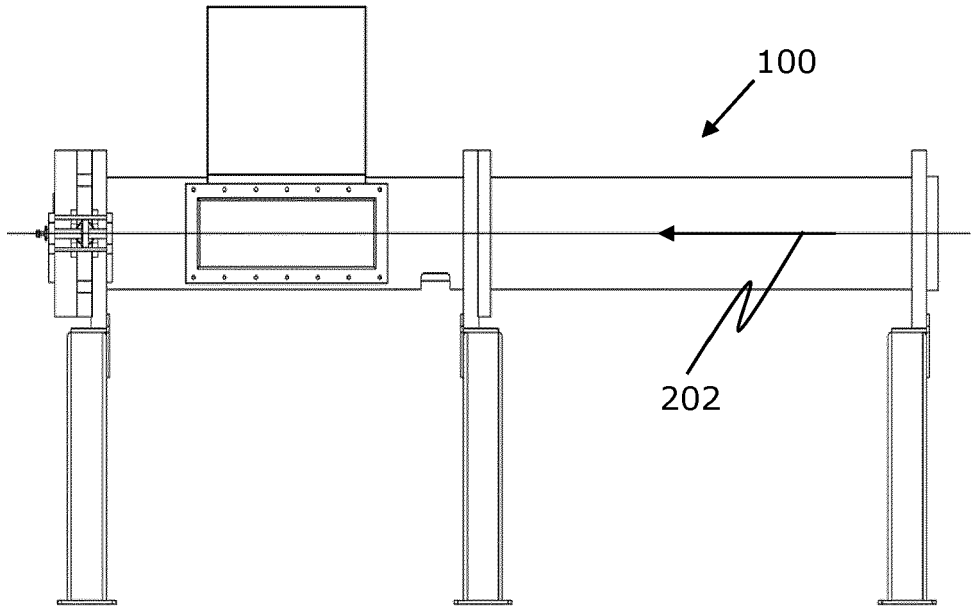

FIG. 2A

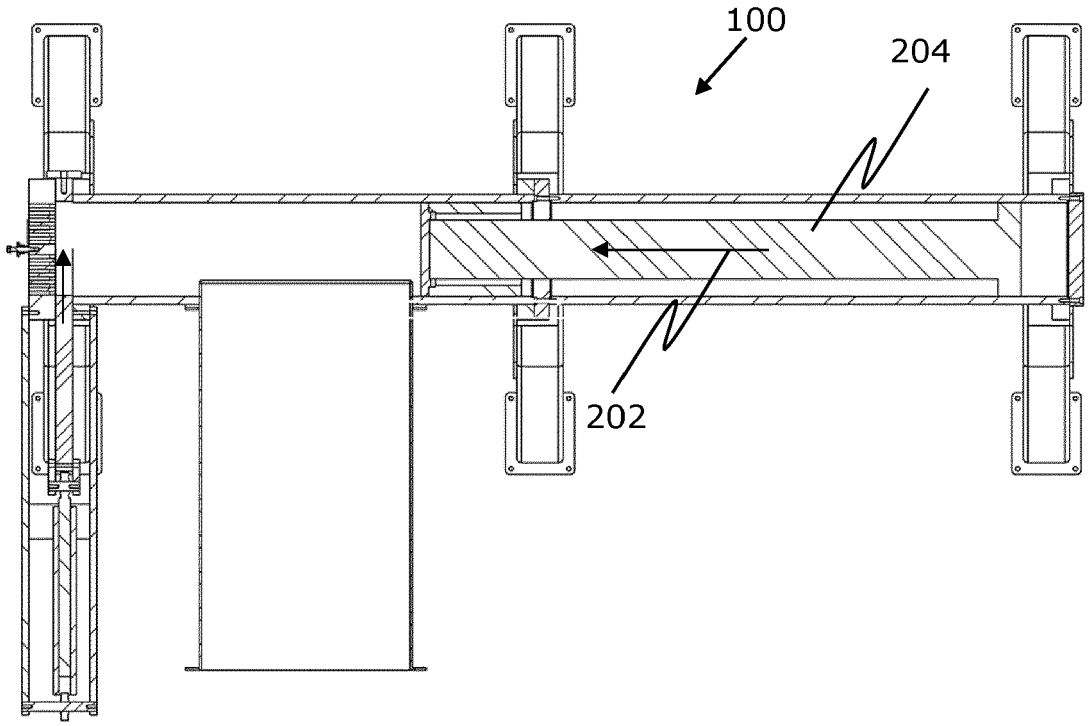

FIG. 2B

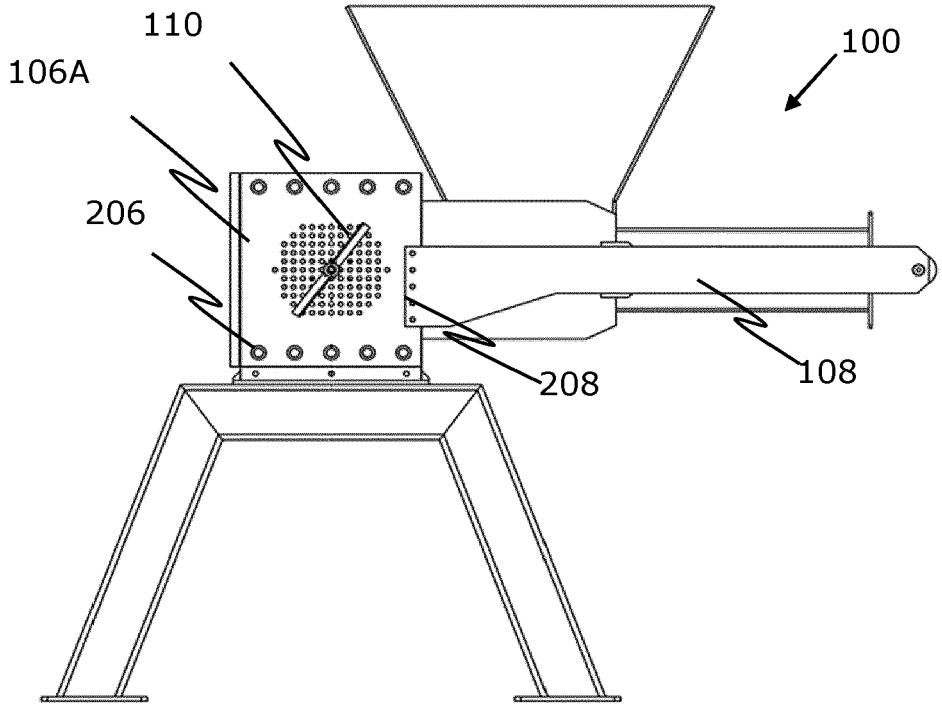

FIG. 2C

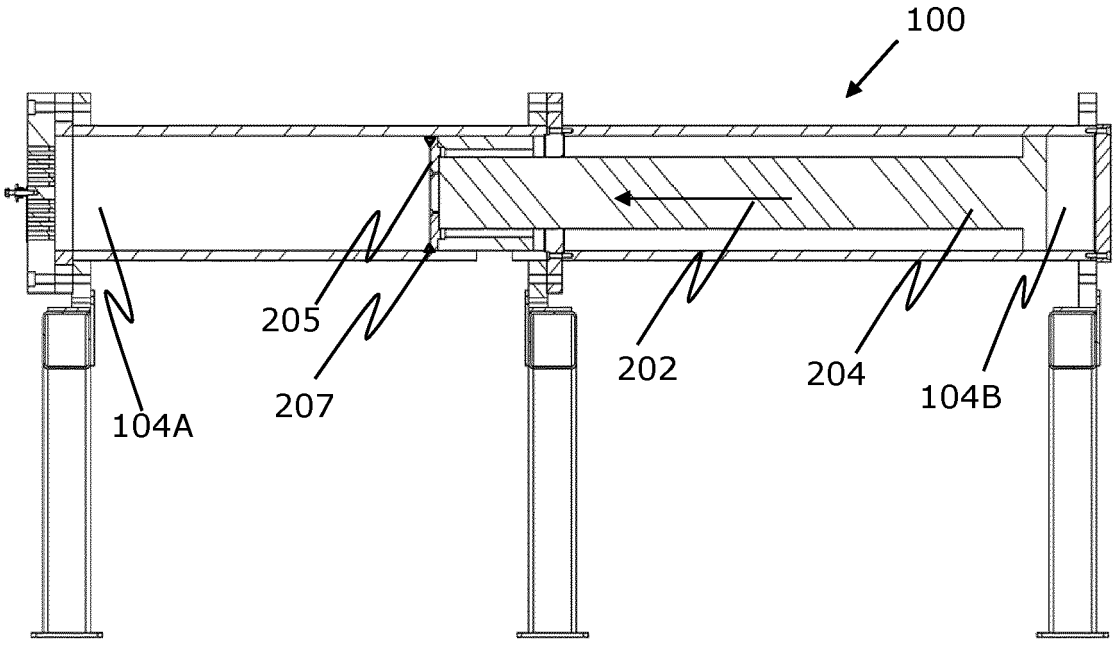

FIG. 2D

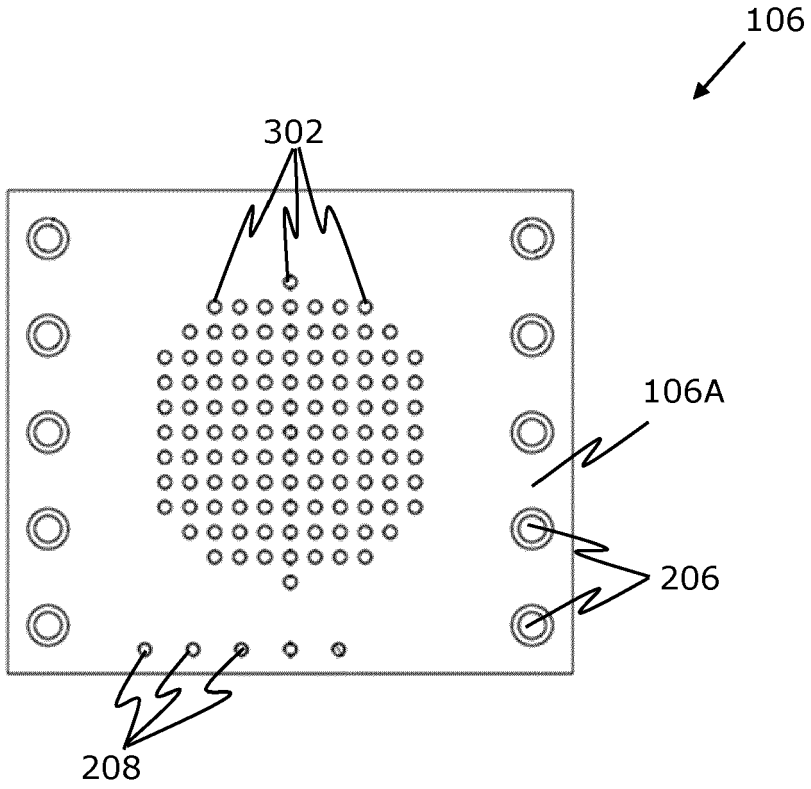

FIG. 3A

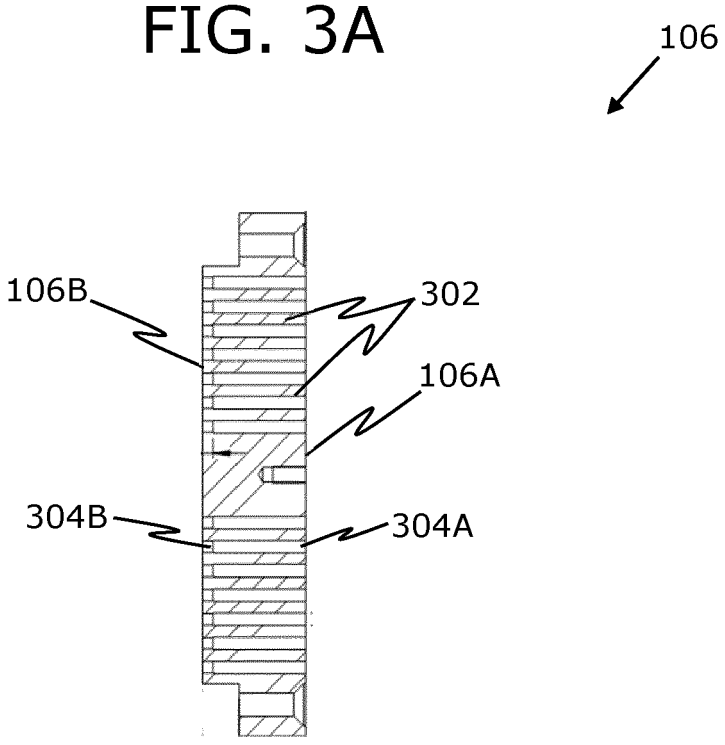

FIG. 3B

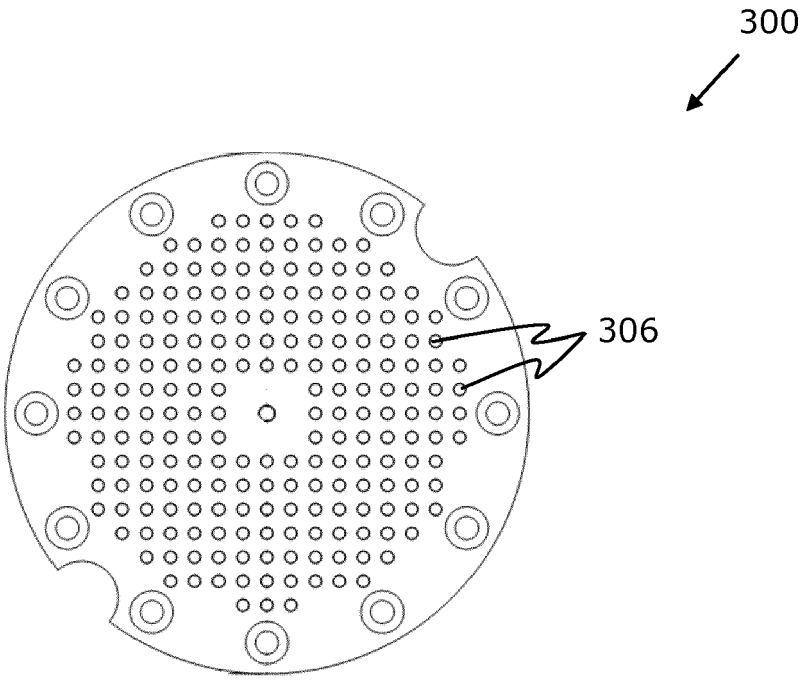

FIG. 3C

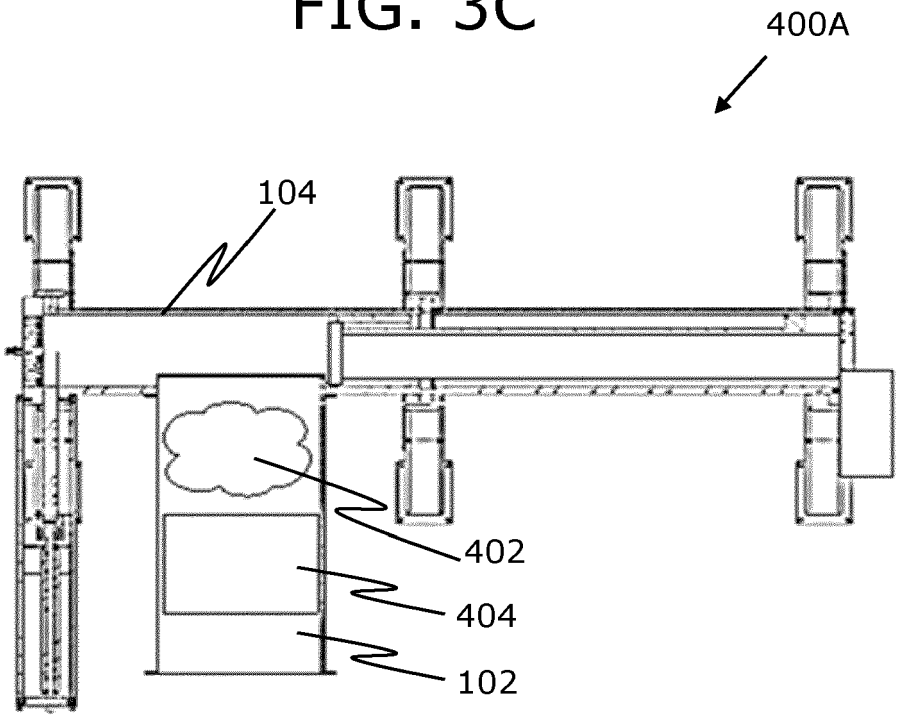

FIG. 4A

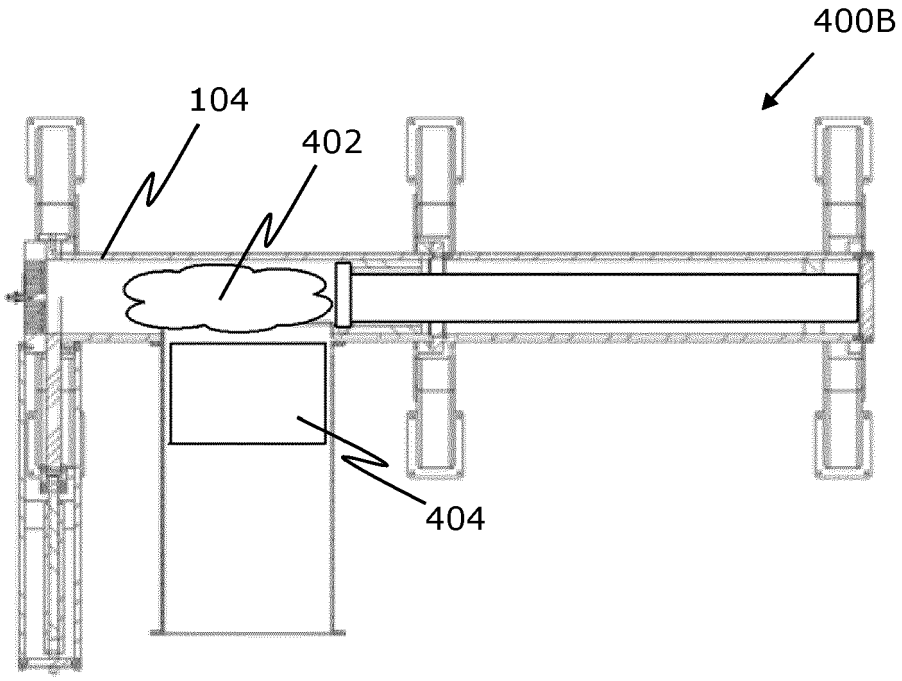

FIG. 4B

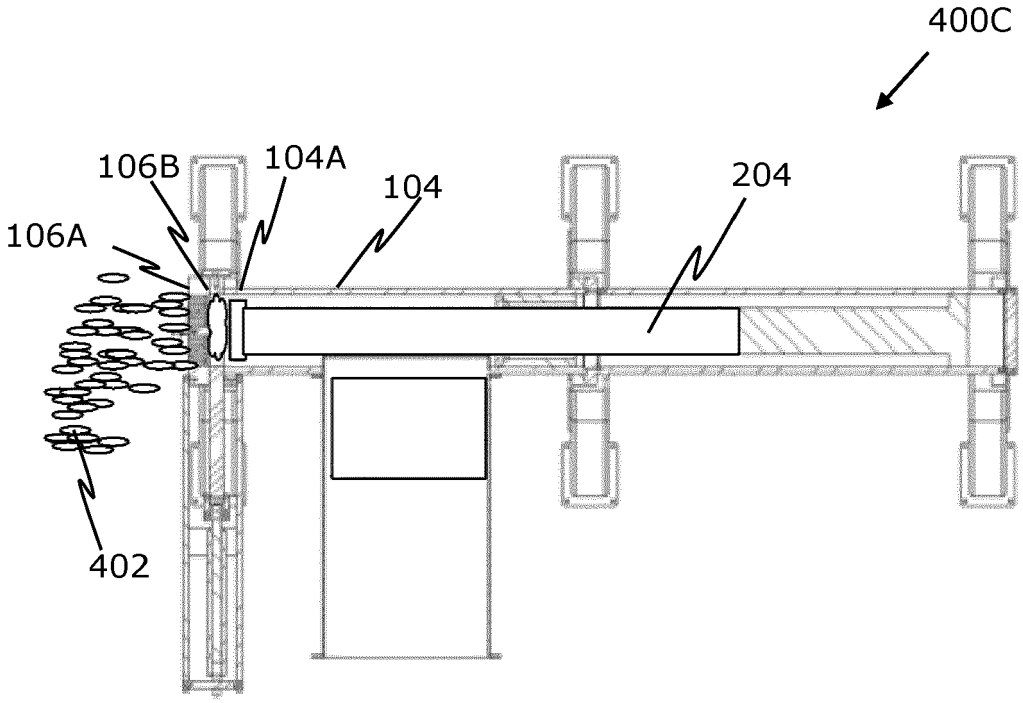

FIG. 4C

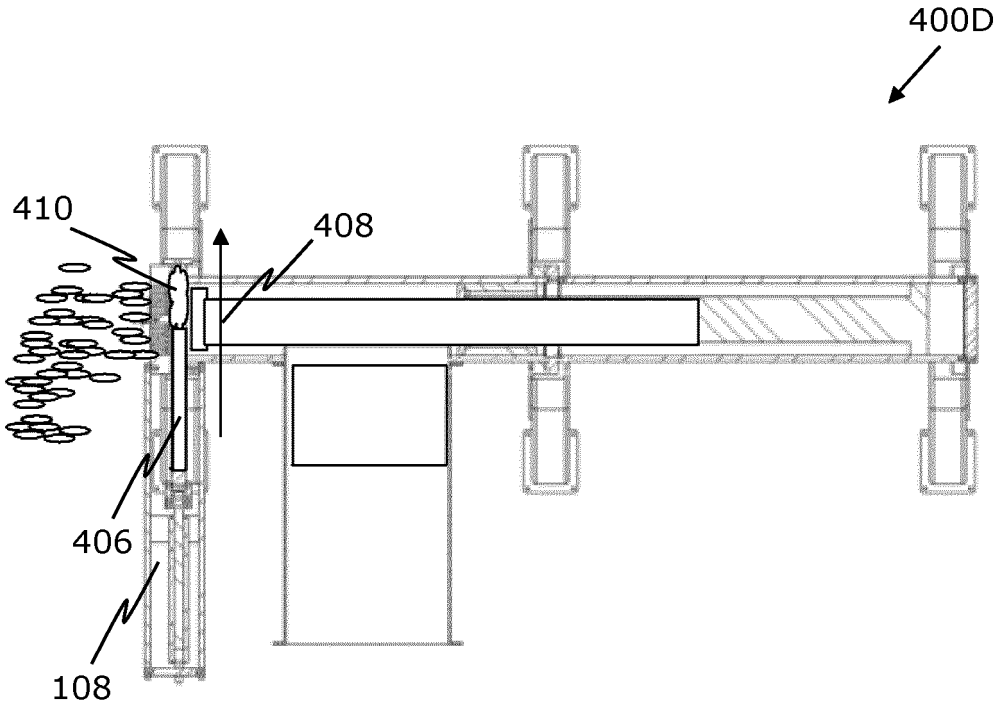

FIG. 4D

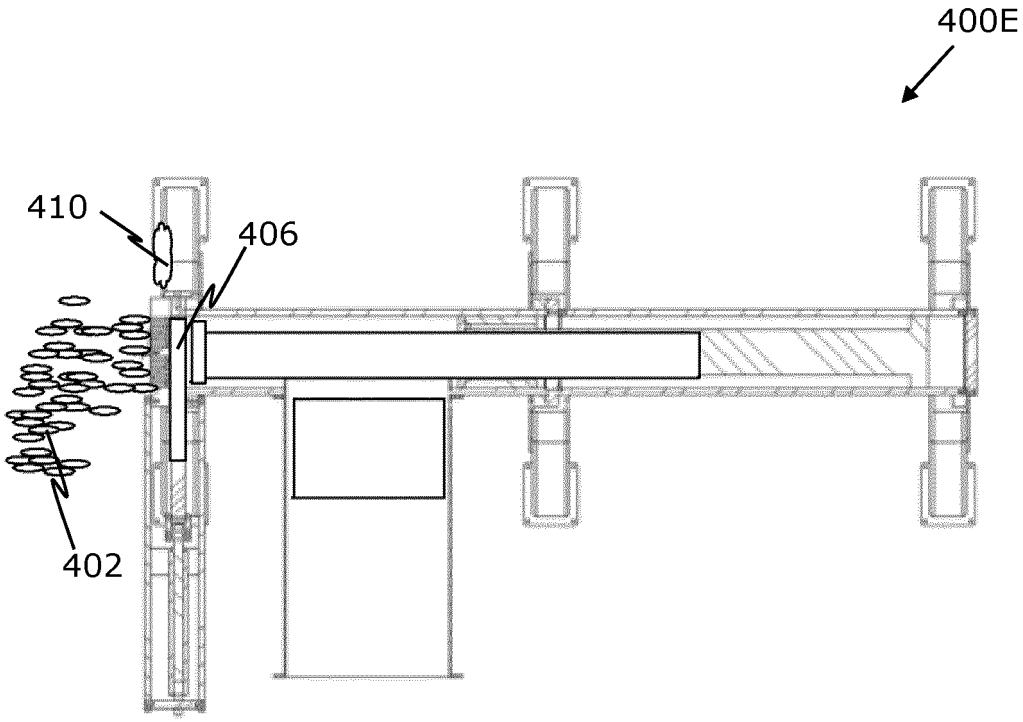

FIG. 4E

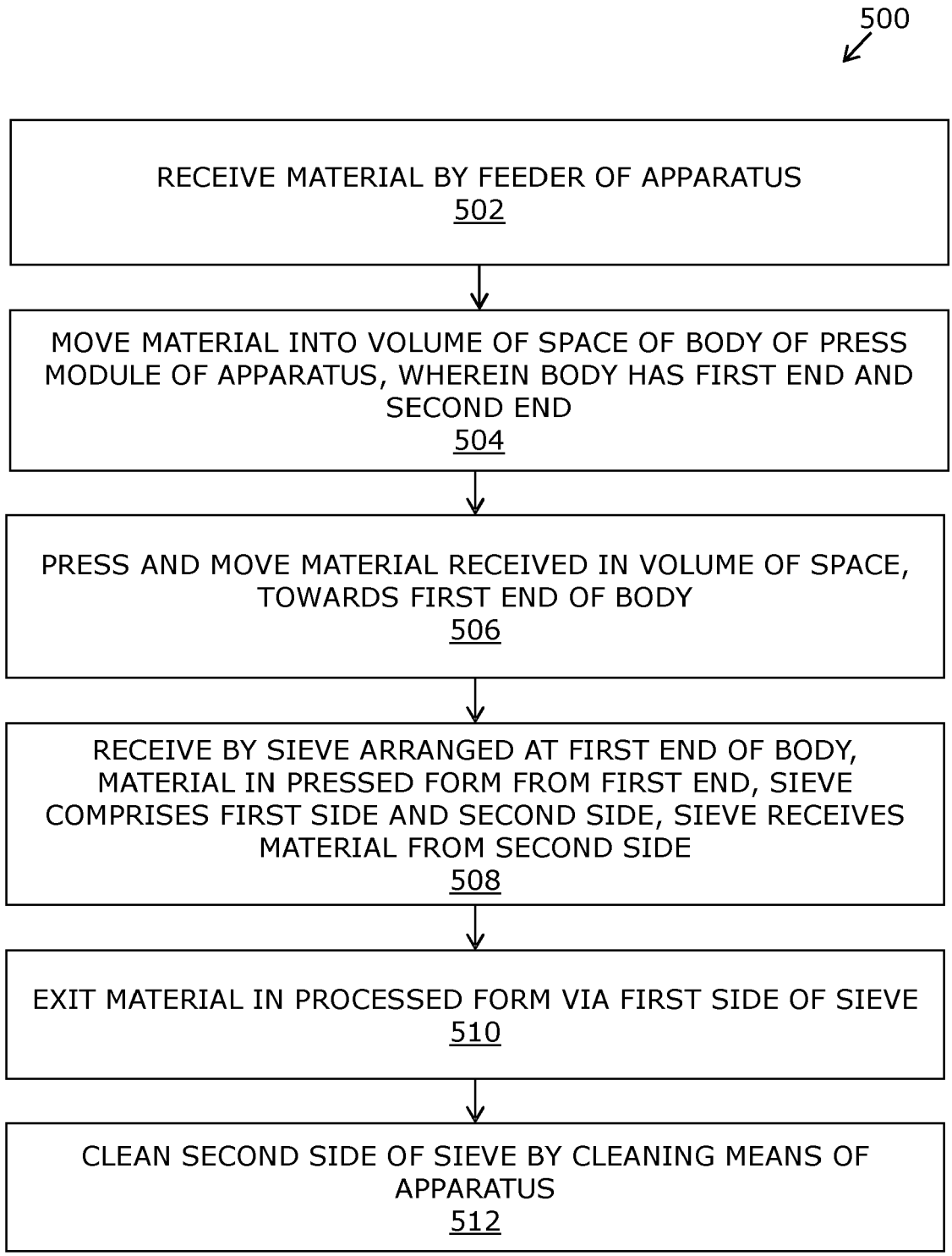
500
RECEIVE MATERIAL BY FEEDER OF APPARATUS
502
MOVE MATERIAL INTO VOLUME OF SPACE OF BODY OF PRESS MODULE OF APPARATUS, WHEREIN BODY HAS FIRST END AND SECOND END
504
PRESS AND MOVE MATERIAL RECEIVED IN VOLUME OF SPACE, TOWARDS FIRST END OF BODY
506
RECEIVE BY SIEVE ARRANGED AT FIRST END OF BODY, MATERIAL IN PRESSED FORM FROM FIRST END, SIEVE COMPRISES FIRST SIDE AND SECOND SIDE, SIEVE RECEIVES MATERIAL FROM SECOND SIDE
508
EXIT MATERIAL IN PROCESSED FORM VIA FIRST SIDE OF SIEVE
510
CLEAN SECOND SIDE OF SIEVE BY CLEANING MEANS OF APPARATUS
512

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 4507

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Y	EP 2 292 419 A2 (CATTANI SERGIO [IT]; CATTANI CARLO [IT] ET AL.) 9 March 2011 (2011-03-09) * claims; figures *	2-5,14	

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B30B
B28B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 June 2020	Baradat, Jean-Luc

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 15 4507

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30-06-2020

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		IT 1401575 B1	26-07-2013

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