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(54) **A SCREENING APPARATUS FOR PROCESSING MATERIAL**

(57) The present invention relates to a screening apparatus (1) configured for processing material that is capable of being separated into fine material and coarse material, the screening apparatus comprising a screen having an inlet end (3) for receiving material to be processed and an outlet end (4), in which the material to be processed is configured to move through the screen from the inlet end to the outlet end, and in which the screen is configured to rotate about a first axis of rotation extending centrally and longitudinally from the inlet end to the outlet end. The screen comprises a cylindrically shaped side wall configured with a plurality of spaced apart elongate rotating screen bars (5), each screen bar having a substantially elliptically shaped cross-section and a second axis of rotation about which it rotates, the screen and the screen bars are rotated simultaneously about their respective first and second axes of rotation, rotation of the screen and the screen bars causes separation of the material within the screen such that the separated fine material falls through spaces between the screen bars and the separated coarse material is retrieved at the outlet end of the screen.

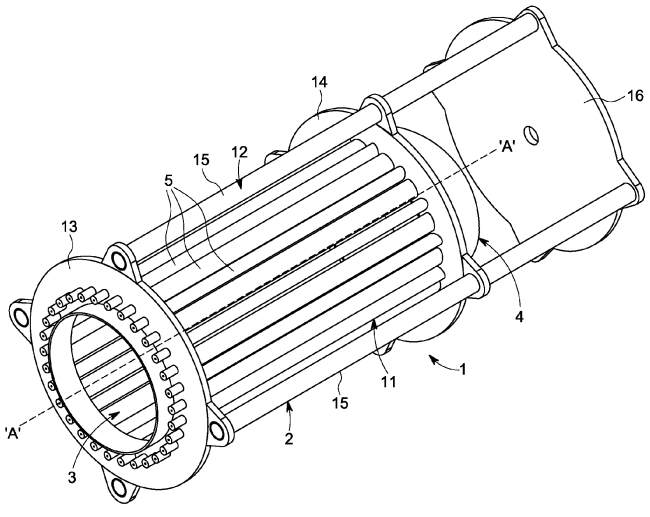


FIG. 1

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## Description

**[0001]** The present invention relates to a screening apparatus for processing material, and more particularly, for separating fine materials from more coarse materials.

**[0002]** Trommel screens, wobble screens and vibratory screens are different types of screening equipment that are used to separate fine materials, such as clay and smaller rocks, from more coarse materials, such as larger rocks, concrete and large ore.

**[0003]** However, these known screening devices are prone to clogging, particularly when wet or sticky fine materials clump together and stick to the screening surfaces, and this reduces the capability and efficiency of the screening equipment to operate and achieve an optimally clean separation of the fine and coarse materials.

**[0004]** It is an object of the present invention to provide an improved screening apparatus that addresses the above problems and/or that provides the public or industry with a useful alternative.

**[0005]** Accordingly, there is provided a screening apparatus configured for processing material that is capable of being separated into fine material and coarse material, the screening apparatus comprising:

a screen having an inlet end for receiving material to be processed and an outlet end, in which the material to be processed is configured to move through the screen from the inlet end to the outlet end,

in which the screen is configured to rotate about a first axis of rotation extending centrally and longitudinally from the inlet end to the outlet end,

**characterised in that** the screen comprises a cylindrically shaped side wall configured with a plurality of spaced apart elongate rotating screen bars, each screen bar having a substantially elliptically shaped cross-section and a second axis of rotation about which it rotates, and

whereby the screen and the screen bars are rotated simultaneously about their respective first and second axes of rotation, and rotation of the screen and the screen bars causes separation of the material within the screen such that the separated fine material falls through spaces between the screen bars and the separated coarse material is retrieved at the outlet end of the screen.

**[0006]** The present invention comprises a rotating screen provided as an open-ended cylinder or drum with a side wall consisting of a series of spaced apart elliptically shaped bars. As the material being processed moves through the apparatus both the screen and the spaced screen bars rotate about their respective axes of rotation.

**[0007]** Accordingly, each screen bar of the side wall is rotating about two axes, including the first central axis of rotation of the screen as the screen rotates, and the screen bars own second axis of rotation.

**[0008]** The arrangement of the screen and elliptically shaped elongate screen bars rotating at the same time generates an enhanced tumbling and rolling effect on the material being processed within the apparatus which optimises the impact frequency of the materials against the screen bars, which in turn improves the efficiency of separation of the processed material into coarse and fine materials.

**[0009]** The impact of the heavier coarse materials tumbling onto the rotating screen bars as the material moves through the rotating screen effectively cleans the screen bars and this substantially reduces or eliminates blocking and clogging of the gaps between the screen bars to provide a cleaner separation of the coarse and fine materials.

**[0010]** As the material being processed moves through the screen the fine material being screened falls through gaps between the screen bars and the coarse material carries on through the screen for retrieval at the outlet end.

**[0011]** The present invention provides a screening apparatus for use in the aggregate production, quarrying, mining, recycling, construction, waste disposal, landscaping, building demolition and other industries in which materials are processed to separate them into coarse and fine materials.

**[0012]** The invention will be particularly applicable to, but is not in any way limited to, separating sticky coarse materials such as bauxite, iron ore, nickel ore, limestone, from fine material, such as clay, sand, dirt and the like.

**[0013]** Preferably, the second axis of rotation of each screen bar extends in a longitudinal direction between ends of each screen bar.

**[0014]** Preferably, adjacent screen bars are configured to rotate at an offset angle of substantially 90 degrees.

**[0015]** Preferably, the screen is in the shape of a drum. The screen is thus substantially cylindrically shaped with open ends defining the inlet end and the outlet end.

**[0016]** Preferably, the apparatus further comprises mechanical drive means to rotate the screen and the screen bars.

**[0017]** Preferably, the mechanical drive means is configured to rotate the screen independently of the screen bars.

**[0018]** Preferably, the mechanical drive means comprises a first drive means to rotate the screen and a second drive means to rotate the screen bars.

**[0019]** Preferably, the apparatus comprises selection means to enable selection of one or more screen bars to be rotated by the second drive means.

**[0020]** Preferably, the mechanical drive means is further configured to adjust the speed of rotation of the screen and/or the screen bars.

**[0021]** Preferably, the screen bars each comprise a first end and a second end, whereby the first end of each

screen bar is connected to the inlet end of the screen and the second end of each screen bar is connected to the outlet end of the screen, whereby respective ends of the screen bars are arranged in a substantially circular or ring-shaped configuration at the respective inlet end and outlet end of the screen.

**[0022]** Preferably, the screening apparatus further comprises a mounting frame and the screen is rotatably connected to the frame.

**[0023]** Preferably, the frame comprises an inlet mounting plate and an outlet mounting plate, whereby the screen bars are connected to and extend between the mounting plates.

**[0024]** The mounting plates are substantially ring shaped with spaced apart holes to receive respective first and second ends of the screen bars in a spaced apart configuration around the circumference of the plates.

**[0025]** Preferably, the inlet end of the screen is attached to a feed hopper operable to convey material to be processed through the screen under force of gravity.

**[0026]** Preferably, the outlet end of the screen is attached to a conveyor or hopper operable to receive the separated coarse material that passes fully though the screen.

**[0027]** Preferably, a conveyor or hopper is provided underneath the screen to receive separated fine material that passes through spaces between the screen bars.

**[0028]** The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side perspective view of a screening apparatus according to the invention,

Figure 2 is a side view of the screening apparatus shown in Figure 1,

Figure 3 is a sectional end view of the screening apparatus shown in Figure 1, and

Figure 4 is a side perspective view of the screening apparatus of Figure 1 shown integrated with a feed hopper and drive means.

**[0029]** As shown in Figures 1 to 4, there is provided a screening apparatus, indicated generally by the reference numeral 1, configured for processing material that is capable of being separated into fine material and coarse material.

**[0030]** The screening apparatus 1 comprises a screen, indicated generally by the reference numeral 2 having an inlet end 3 for receiving material to be processed and an outlet end 4. The screen 2 is positioned at an incline to enable the material being processed to move downhill through the screen 2 from the inlet end 3 to the outlet end 3.

**[0031]** The screen 2 is further configured to rotate about a first central axis of rotation extending longitudinally from the inlet end 3 to the outlet end 4, indicated generally in Figure 1 by the line A-A. As shown, the screen 2 is in the shape of a drum and is thus substantially cylindrically shaped with open ends defining the inlet end 3 and outlet end 4.

**[0032]** The screen 2 comprises a side wall configured with a plurality of spaced apart elongate rotating screen bars 5, each screen bar 5 having a substantially elliptically shaped cross-section and a second axis of rotation about which it rotates. As shown, adjacent screen bars 5 are set and configured to rotate at an angle of substantially 90 degrees relative to one another.

**[0033]** The screen bars 5 each comprise a first end 6 and a second end 7, whereby the first end 6 is connected at the inlet end 3 and the second end 7 is connected at the outlet end 4 of the screen 2. As shown, the respective ends 6, 7 of the rotatable screen bars 5 are arranged in a substantially circular or ring-shaped configuration at the respective inlet end 3 and outlet end 4 of screen 2 and are provided in a spaced apart arrangement with gaps 11 in between them about the full circumference of the inlet and outlet ends 3, 4.

**[0034]** The second axis of rotation of each screen bar 5 extends in a longitudinal direction between the ends 6, 7 of each screen bar 5, as indicated generally in Figure 2 by the line B-B. Accordingly, each screen bar 5 is effectively rotating about two axes, including the axis of rotation of the screen as the screen rotates, and its own axis.

**[0035]** The screening apparatus 1 further comprises mechanical drive means, indicated generally by the reference numeral 8, to mechanically rotate the screen 2 and the screen bars 5. The drive means 8 comprises a first drive means 9 to rotate the screen 2 and a second drive means 10 to rotate the screen bars 5.

**[0036]** Furthermore, the apparatus 1 comprises selection means to enable selection of one or more screen bars 5 to be rotated so that an operator may select which screen bars 5 are to be rotated during rotation of the screen 2. The drive means 8 is thus optionally configured to rotate the screen 2 independently of the or each of the screen bars 5. The drive means 8, 9, 10 is further configured to adjust the speed of rotation of the screen 2 and/or the screen bars 5.

**[0037]** In operation, the screen 2 and the screen bars 5 are rotated simultaneously about their respective axes of rotation A-A, B-B and rotation of the screen 2 and the screen bars 5 causes separation of the material passing through the screen 2 such that the separated fine material falls through spaces or gaps 11 between the screen bars 5 under force of gravity, and the separated coarse material is retrieved at the outlet end 4 of the screen 2.

**[0038]** The screening apparatus 1 further comprises a mounting frame, indicated generally by the reference numeral 12, and the screen 2 is rotatably connected to the frame 12. The frame 12 comprises an inlet mounting plate

13 and an outlet mounting plate 14, whereby ends 6,7 of the screen bars 5 are connected to and extend between respective mounting plates 13, 14. The plates 13, 14 are ring shaped and spaced apart by mounting bars 15, which extend beyond the outlet end 4 to an end plate 16 to which the drive means 9 is mechanically coupled and configured to rotate the screen 2.

**[0039]** The mounting plates 13, 14 are substantially ring or circular shaped with spaced apart holes to receive respective first ends 6 and second ends 7 of the screen bars 5 in a spaced apart configuration around the edge of the plates 13, 14 in a circular configuration.

**[0040]** Turning to Figure 4, the inlet end 3 of the screen is attached via the mounting plate 13 to a feed hopper 17 that is operable to convey material to be processed via the inlet end 3 and into and through the screen 2 under force of gravity. The outlet end 4 of the screen 2 is attached to a conveyor or hopper operable to receive the separated coarse material that passes fully though the screen 2. A conveyor or hopper may be provided underneath the screen 2 to receive separated fine material that has been separated and passes through the spaces 11 between the screen bars 2.

**[0041]** The screening apparatus 1 of the present invention may be provided with tracks for mounting to a frame or chassis with a feed hopper. Alternatively, it may be configured as a stationary or static machine, a wheel mounted Machine, or a skid mounted machine as required or as desired.

**[0042]** It is to be understood that the invention is not limited to the specific details described herein which are given by way of example only and that various modifications and alterations are possible without departing from the scope of the invention as defined in the appended claims.

## Claims

1. A screening apparatus configured for processing material that is capable of being separated into fine material and coarse material, the screening apparatus comprising:

   a screen having an inlet end for receiving material to be processed and an outlet end, in which the material to be processed is configured to move through the screen from the inlet end to the outlet end,
   in which the screen is configured to rotate about a first axis of rotation extending centrally and longitudinally from the inlet end to the outlet end,
   **characterised in that** the screen comprises a cylindrical side wall configured with a plurality of spaced apart elongate rotating screen bars, each screen bar having a substantially elliptically shaped cross-section and a second axis of rotation about which it rotates, and
   whereby the screen and the screen bars are rotated simultaneously about their respective first and second axes of rotation, and rotation of the screen and the screen bars causes separation of the material within the screen such that the separated fine material falls through spaces between the screen bars and the separated coarse material is retrieved at the outlet end of the screen.

2. A screening apparatus as claimed in Claim 1, in which the second axis of rotation of each screen bar extends in a longitudinal direction between ends of each screen bar.

3. A screening apparatus as claimed in Claim 1 or Claim 2, in which adjacent screen bars are configured to rotate at an offset angle of substantially 90 degrees.

4. A screening apparatus as claimed in any one of the preceding claims, further comprising drive means to rotate the screen and the screen bars, in which the drive means is configured to rotate the screen independently of the screen bars.

5. A screening apparatus as claimed in any one of the preceding claims, further comprising selection means to enable selection of one or more screen bars to be rotated.

6. A screening apparatus as claimed in any one of the preceding claims, in which screen bars each comprise a first end and a second end, whereby the first end of each screen bar is connected to the inlet end of the screen and the second end of each screen bar is connected to the outlet end of the screen, whereby respective ends of the screen bars are arranged in a substantially circular or ring-shaped configuration at the respective inlet end and outlet end of the screen.

7. A screening apparatus as claimed in any one of the preceding claims, further comprising a mounting frame and the screen is rotatably connected to the frame.

8. A screening apparatus as claimed in Claim 7, in which the frame comprises an inlet mounting plate and an outlet mounting plate, whereby the screen bars are connected to and extend between the mounting plates.

9. A screening apparatus as claimed in Claim 8, in which the mounting plates are substantially ring shaped with spaced apart holes to receive respective first and second ends of the screen bars in a spaced apart configuration around a circumference of the plates.

**10.** A screening apparatus as claimed in any one of the preceding claims, in which the inlet end of the screen is attached to a feed hopper operable to convey material to be processed through the screen under force of gravity.

**11.** A screening apparatus as claimed in any one of the preceding claims, in which the outlet end of the screen is attached to a conveyor or hopper operable to receive the separated coarse material that passes fully though the screen.

**12.** A screening apparatus as claimed in any one of the preceding claims, in which a conveyor or hopper is provided underneath the screen to receive separated fine material that passes through spaces between the screen bars.

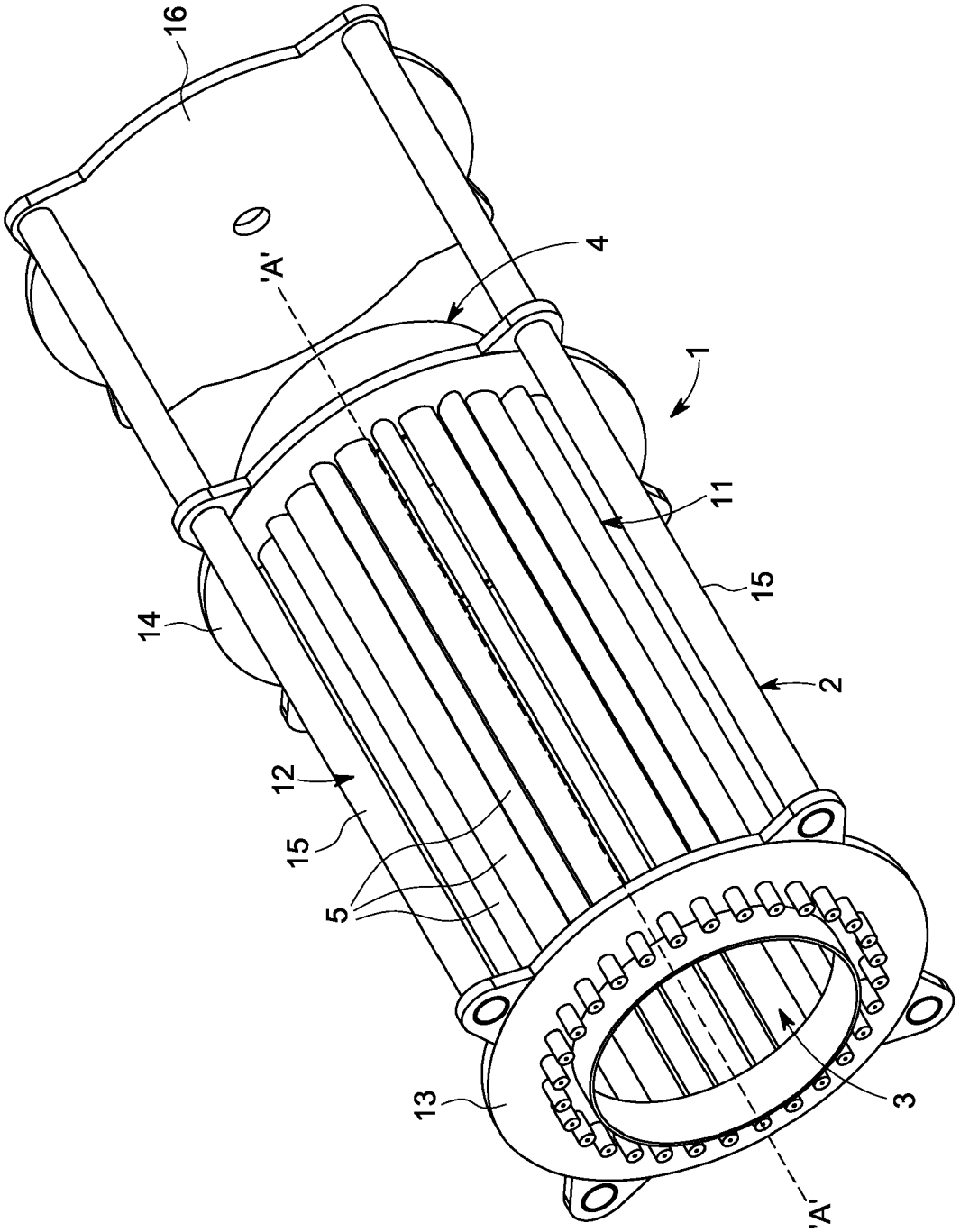


FIG. 1

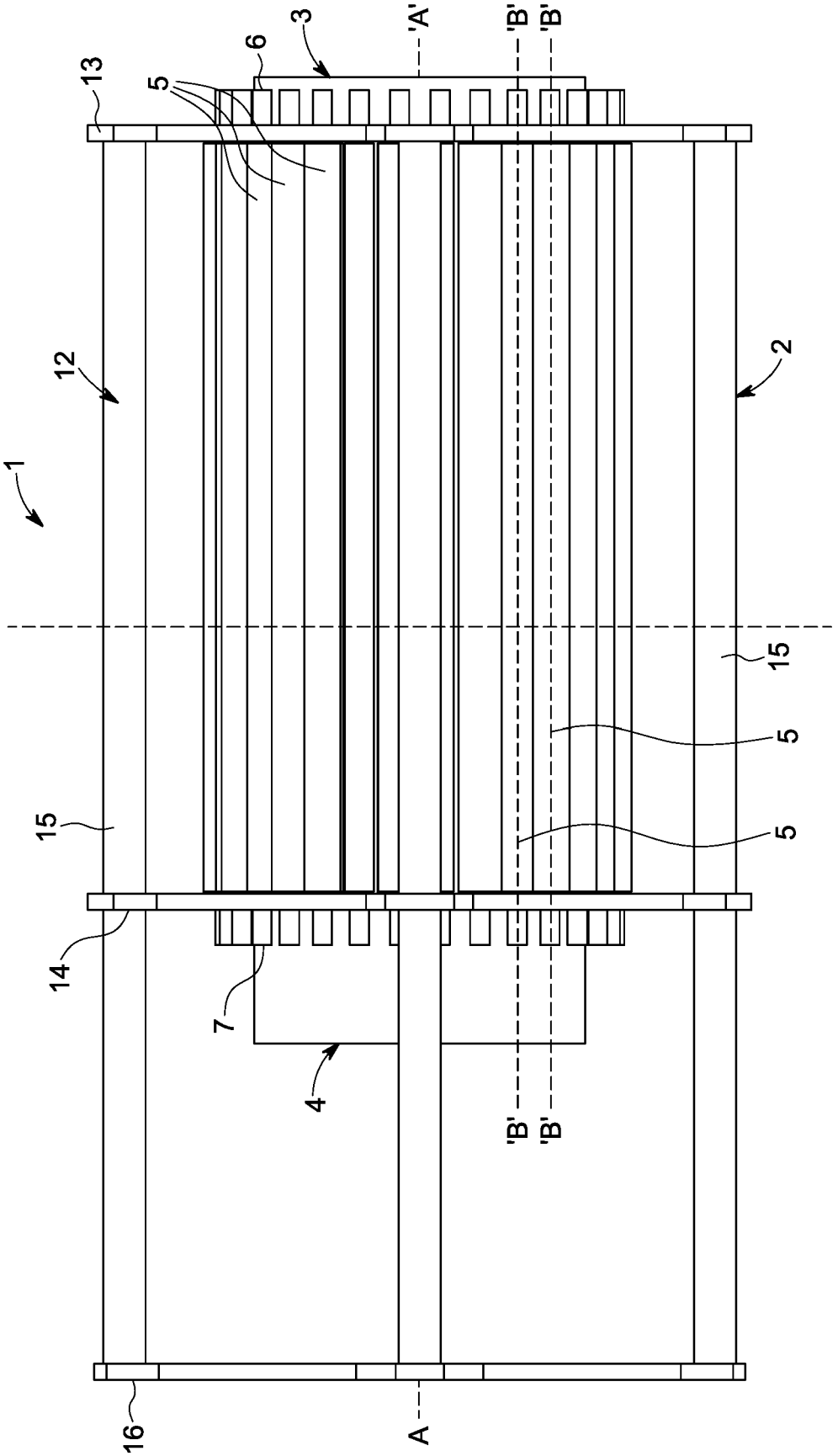


FIG. 2

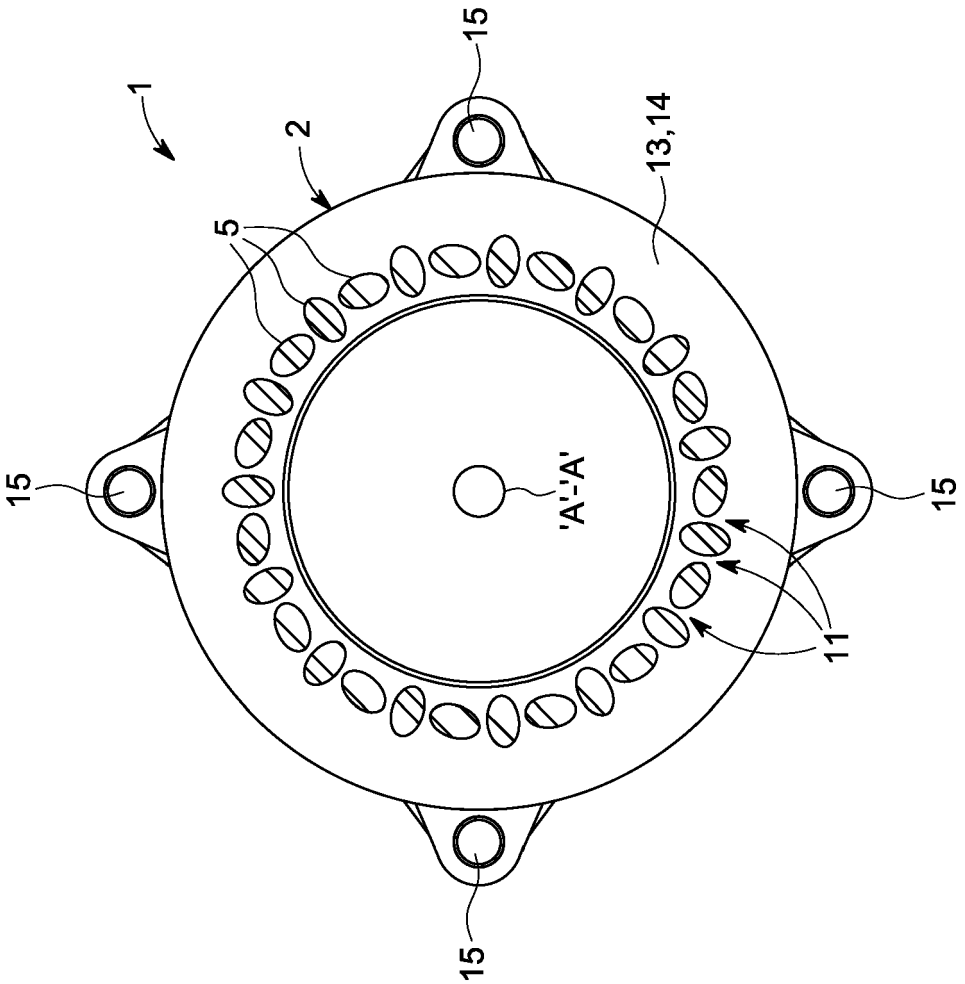


FIG. 3

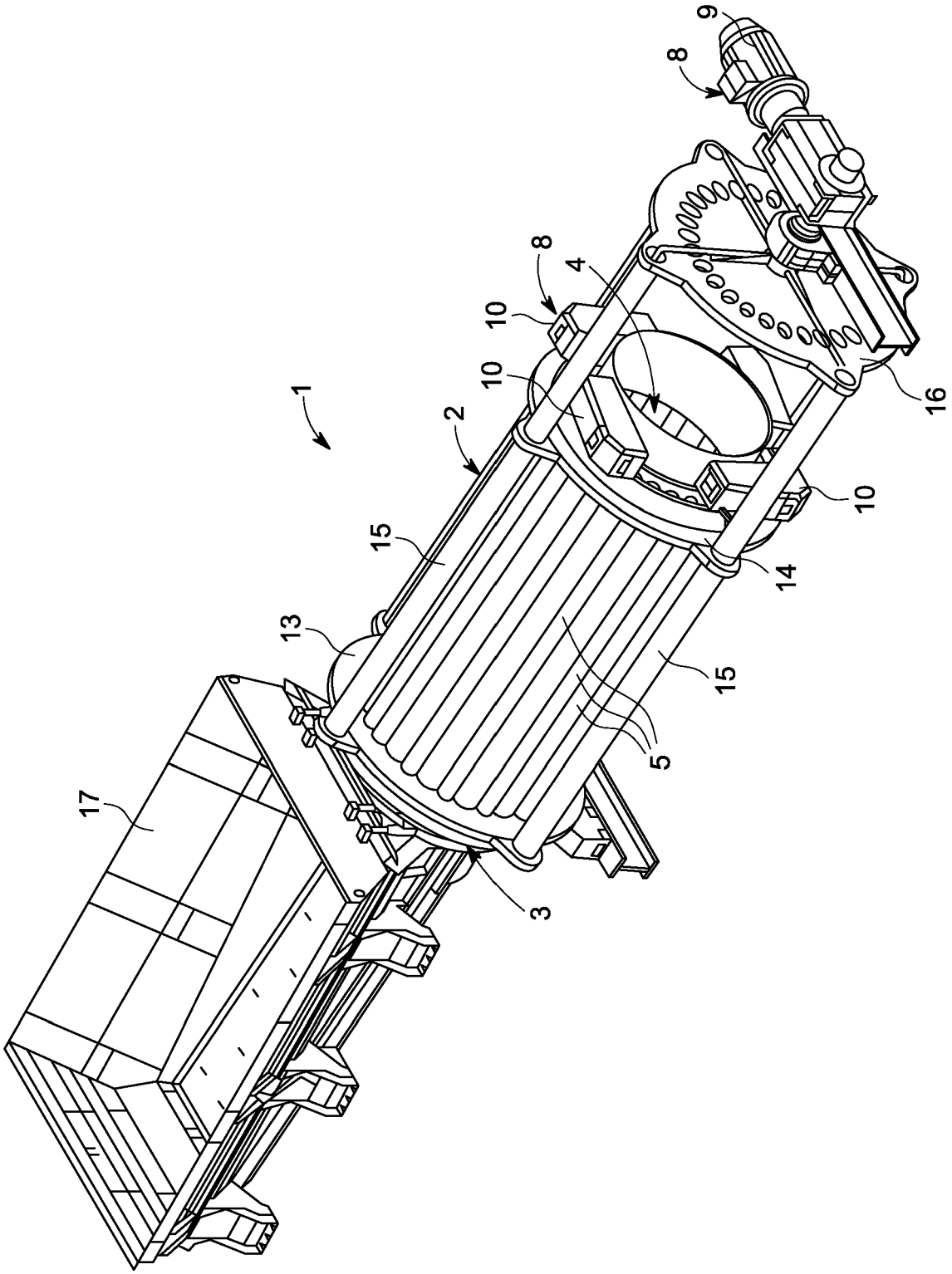


FIG. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 22 17 1290

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| Y | US 5 248 042 A (KUHMONEN MAURI [FI]) 28 September 1993 (1993-09-28) | 1,2,6-12 | INV. B07B1/24 |
| A | * column 5, line 61 - column 6, line 14; figures 1,6,9 * | 5 | B07B1/22 B07B13/18 B07B1/46 |
| Y | US 2010/012556 A1 (POHLE DANIEL L [US]) 21 January 2010 (2010-01-21) | 1,2,6-12 | B07B1/50 |
| | * paragraphs [0079] - [0082]; figures 4,16-18 * | | ADD. B07B1/00 B07B13/16 |
| A | GB 2 267 235 A (BORD NA MONA [IE]) 1 December 1993 (1993-12-01) | 1,3 | B07B1/42 |
| | * figure 1 * | | |

TECHNICAL FIELDS SEARCHED (IPC)

B07B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 13 October 2022 | Béguin-Adriaenssens |

CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 17 1290

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-10-2022

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 5248042 A | 28-09-1993 | AU 1623392 A | 24-12-1992 |
| | | US 5248042 A | 28-09-1993 |
| US 2010012556 A1 | 21-01-2010 | CA 2672429 A1 | 21-01-2010 |
| | | US 2010012556 A1 | 21-01-2010 |
| GB 2267235 A | 01-12-1993 | NONE | |

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