



(51) International Patent Classification:

B02C 15/00 (2006.01)

F16J 15/18 (2006.01)

F16J 15/44 (2006.01)

(21) International Application Number:

PCT/EP2020/025255

(22) International Filing Date:

29 May 2020 (29.05.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

201911021236

29 May 2019 (29.05.2019)

IN

(71) Applicant: GENERAL ELECTRIC TECHNOLOGY

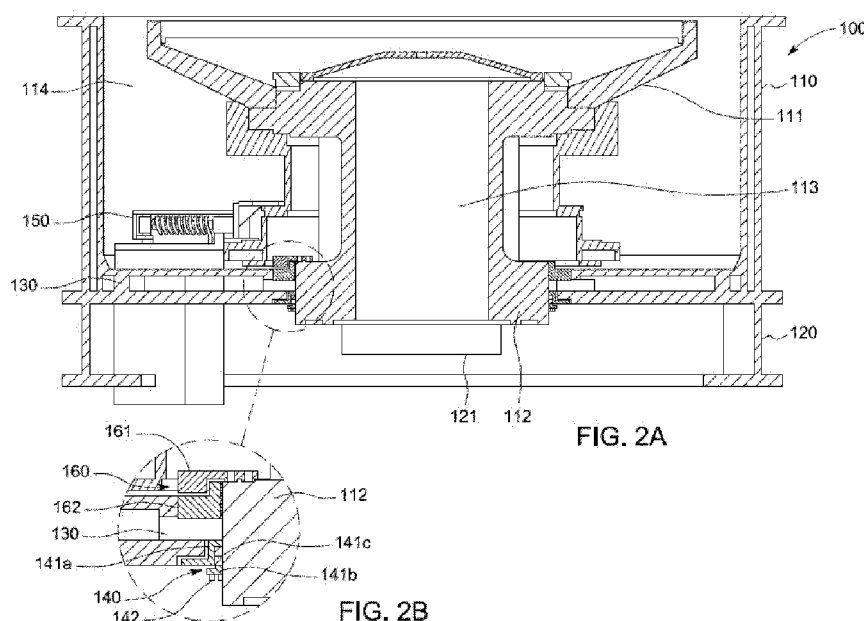
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,

(54) Title: SELF-COMPENSATING SEALING ARRANGEMENT FOR BOWL MILL



(57) Abstract: A bowl mill (100) includes upper (110) and lower (120) housing arrangements, and a labyrinth structure (130) separating thereto. The upper housing (110) includes a bowl hub (112) and a shaft (113) that vertically extend along the bowl hub (112), and an interior space (114) surrounding the bowl hub (112) and the shaft (113), to receive hot air and coal dust during coal pulverization. The lower housing (120) includes a gear box arrangement (121) that rotates the shaft (113). The bowl mill (100) includes a self-compensating sealing arrangement (140) circumferentially arranged between the labyrinth structure (130) and the bowl hub (112). The sealing arrangement (140) biases towards the bowl hub (112) to compensate a gap arises due to wear and tear of the sealing arrangement (140) during the coal pulverization to prevent the hot air and coal dust of the interiors space (114) to move in the lower housing (120).

OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

- (84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

SELF-COMPENSATING SEALING ARRANGEMENT FOR BOWL MILL

BACKGROUND

Field of Endeavor

- 5 The present disclosure relates generally to bowl mill, more particularly, to a sealing arrangement in a bowl mill.

Brief Description of the Related Art

- 10 It is known that fossil fuels including coal, may be pulverized in a pulverizing operation performed by a bowl mill. The bowl mill, as shown in prior art Fig. 1, typically, includes upper and lower mill housings separated by a labyrinth structure. The upper mill housing includes a bowl, a bowl hub and a rotating shaft. In the lower mill housing, a gear box arrangement with oil is provided. The gear box arrangement rotates the rotating shaft to pulverize the coal. During the
15 pulverization of the coal in the bowl mill, various hot gases and coal particles are generated that may be transferred to from the upper mill housing to the lower mill housing.

- Conventionally, to avoid problem, one or other kind of seal (as encircled portion 'A' in the prior art Fig. 1) may have been used along the labyrinth structure.
20 Such seals may have been effective during the initial stage of the pulverization of the coal in the bowl mill. However, as and when, after being used for a certain period, such seal gets erode that causes the movement of fine coal particles from the upper mill housing to the lower mill housing, and also results in insufficient sealing pressure along the labyrinth structure.

- 25 Once such seal gets eroded, there is no other option but to replace the eroded seal with the new seal otherwise, other parts around the seal, such as the labyrinth structure that are proximate to the bowl hub starts eroding. Replacement of such seals are quite a cumbersome task as it involves complete disassembling and reassembling of the bowl mill. This is time consuming and increases overall
30 breakdown in turn affecting productivity.

 Other related conventional designs are discussed, for example, in Chinese

utility model CN204512428U that discloses a seal mill variable loading pulling rod sealing device. Further, another Chinese utility model CN203272796U discloses sealing structure of pull rod of variable-loading coal mill.

Accordingly, there exists a need for such a sealing arrangement in the bowl mill that may provide solution to such problems that reduces such frequent breakdown and increase productivity of the bowl mill.

SUMMARY

The present disclosure discloses a self-compensating sealing arrangement for bowl mill that will be presented in the following simplified summary to provide a basic understanding of one or more aspects of the disclosure that are intended to overcome the discussed drawbacks, but to include all advantages thereof, along with providing some additional advantages. This summary is not an extensive overview of the disclosure. It is intended to neither identify key or critical elements of the disclosure, nor to delineate the scope of the present disclosure. Rather, the sole purpose of this summary is to present some concepts of the disclosure, its aspects and advantages in a simplified form as a prelude to the more detailed description that is presented hereinafter.

A general object of the present disclosure is to provide the bowl mill that may provide solution to such problems that reduces such frequent breakdown and increase productivity of the bowl mill. Further, another object of the present disclosure is to provide such a sealing assembly that may be configured in the bowl mill that may provide solution to such problems that reduces such frequent breakdown and increase productivity of the bowl mill.

In one aspect of the present disclosure, a bowl mill for coal pulverization is provided. The bowl mill may include an upper housing arrangement, a lower housing arrangement, and a labyrinth structure separating the upper and the lower housing arrangements. The upper housing arrangement may include a bowl, a bowl hub coupled to the bowl, and a shaft that may vertically extend along the bowl hub. The upper housing arrangement may also include an interior space surrounding the bowl hub and the shaft. The interior space receives hot air and coal dust during coal

pulverization. Further, the lower housing arrangement may include a gear box arrangement with oil. The gear box arrangement may rotate the shaft. Furthermore, the bowl hub and the shaft may extend to the lower housing arrangement. The bowl mill also includes a self-compensating sealing arrangement circumferentially arranged between the labyrinth structure and the bowl hub. The self-compensating sealing arrangement biases towards the bowl hub to compensate a gap arises due to wear and tear of the self-compensating sealing arrangement during the coal pulverization. Such compensating arrangement of the sealing arrangement prevents the hot air and the coal dust of the interiors space to move in to the lower housing arrangement. The self-compensating sealing arrangement may include a sealing member and a biasing member. The sealing member is circumferentially arranged between the labyrinth structure and the bowl hub, and the biasing member is coupled to the sealing member to bias the sealing member towards the bowl hub to compensate the gap arises due to wear and tear of the sealing member.

In one embodiment of the present disclosure, the sealing member may include an upper packing element, a lower packing element, and a packing body. The upper packing element may be circumferentially configured to the labyrinth structure proximate to the bowl hub. The lower packing element may also be circumferentially configured to the labyrinth structure and arranged in close coordination with the upper packing element. The packing body may be circumferentially arranged along the bowl hub and disposed between the upper and lower packing elements.

Further, in one embodiment of the present disclosure, the biasing member may be coupled to at least one or both of the lower packing element and the upper packing element to squeeze the packing body between the upper and the lower packing elements to compensate the gap arises due to wear and tear of the packing body between the bowl hub and the self-compensating sealing arrangement during the coal pulverization.

In one another embodiment of the present disclosure, the bowl mill may include a first scrapper arrangement coupled to the labyrinth structure and disposed

in the upper housing arrangement to scrap coal particles out from the interior space of the upper housing arrangement.

In one another embodiment of the present disclosure, the bowl mill may include a second scrapper arrangement coupled between the labyrinth structure and the bowl hub. The second scrapper arrangement may include a first and second
5 scrapping members. The first scrapping member may be coupled circumferentially and fixedly to the labyrinth structure proximate to the bowl hub. The second scrapping member may be movably engageable to the first scrapping member. The second scrapping member may be coupled to the bowl hub and is movable with the
10 bowl hub. The first and second scrapping members engagement are capable of scrapping out coal particles of smaller size.

In another aspect of the present disclosure, a self-compensating sealing arrangement for a bowl mill for coal pulverization is provided. Such self-compensating sealing arrangement is circumferentially arranged between the
15 labyrinth structure and the bowl hub as disclosed above. The self-compensating sealing arrangement biases towards the bowl hub to compensate a gap arises due to wear and tear of the self-compensating sealing arrangement during the coal pulverization. Such compensating arrangement of the sealing arrangement prevents the hot air and the coal dust of the interiors space to move in to the lower housing
20 arrangement.

The self-compensating sealing arrangement may include a sealing member and a biasing member. The sealing member is circumferentially arranged between the labyrinth structure and the bowl hub, and the biasing member is coupled to the
25 sealing member to bias the sealing member towards the bowl hub to compensate the gap arises due to wear and tear of the sealing member.

In one embodiment of the present disclosure, the sealing member may include an upper packing element, a lower packing element, and a packing body. The upper packing element may be circumferentially configured to the labyrinth
30 structure proximate to the bowl hub. The lower packing element may also be circumferentially configured to the labyrinth structure and arranged in close coordination with the upper packing element. The packing body may be

circumferentially arranged along the bowl hub and disposed between the upper and lower packing elements.

Further, in one embodiment of the present disclosure, the biasing member may be coupled to at least one or both of the lower packing element and the upper packing element to squeeze the packing body between the upper and the lower packing elements to compensate the gap arises due to wear and tear of the packing body between the bowl hub and the self-compensating sealing arrangement during the coal pulverization.

These together with the other aspects of the present disclosure, along with the various features of novelty that characterize the present disclosure, are pointed out with particularity in the present disclosure. For a better understanding of the present disclosure, its operating advantages, and its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated exemplary embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The advantages and features of the present disclosure will better understood with reference to the following detailed description and claims taken in conjunction with the accompanying drawing, wherein like elements are identified with like symbols, and in which:

FIG. 1 illustrates a cross sectional view of a bowl mill, in accordance with a prior art design;

FIG. 2A illustrates a cross sectional view of a bowl mill, in accordance with an exemplary embodiment of the present disclosure;

FIG. 2B illustrates an enlarged view of an encircled portion of the bowl mill of FIG. 2A, in accordance with an exemplary embodiment of the present disclosure;

FIGS. 3A and 3B, respectively, illustrate, a cross sectional view and a bottom view of the self-compensating sealing arrangement, in accordance with various exemplary embodiments of the present disclosure;

FIG. 4A illustrates first and second scrapper arrangements configured in the bowl mill, in accordance with various exemplary embodiments of the present

disclosure; and

FIG. 4B illustrates an enlarged view of the second scrapper arrangement configured in the bowl mill, in accordance with various exemplary embodiments of the present disclosure.

5 Like reference numerals refer to like parts throughout the description of several views of the drawings.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

For a thorough understanding of the present disclosure, reference is to be
10 made to the following detailed description, including the appended claims, in connection with the above-described drawings. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be apparent, however, to one skilled in the art that the present disclosure can be practiced without these
15 specific details. In other instances, structures and devices are shown in block diagrams form only, in order to avoid obscuring the disclosure. Reference in this specification to “one embodiment,” “an embodiment,” “another embodiment,” “various embodiments,” means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one
20 embodiment of the present disclosure. The appearance of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Moreover, various features are described which may be exhibited by some embodiments and not by others. Similarly, various
25 requirements are described which may be requirements for some embodiments but may not be of other embodiment’s requirement.

Although the following description contains many specifics for the purposes of illustration, anyone skilled in the art will appreciate that many variations and/or alterations to these details are within the scope of the present disclosure. Similarly,
30 although many of the features of the present disclosure are described in terms of each other, or in conjunction with each other, one skilled in the art will appreciate

that many of these features can be provided independently of other features. Accordingly, this description of the present disclosure is set forth without any loss of generality to, and without imposing limitations upon, the present disclosure. Further, the relative terms used herein do not denote any order, elevation or importance, but rather are used to distinguish one element from another. Further,
5 the terms “a,” “an,” and “plurality” herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced items.

Referring to FIGS. 2A to 4B, to describe a bowl mill (100) (shown in FIG. 2A) for coal pulverization. As shown in FIG. 2A, a cross-sectional view of a portion
10 of the bowl mill (100) is illustrated. The present disclosure includes drawings and its description related to the bowl mill and its components according to various embodiments of the present disclosure, and only those components are described and shown in drawings herein that are relevant to the scope of the present invention, however, the bowl mill (100) may include various elements that may not have been
15 shown or described herein but may be relevant in operating of the bowl mill (100), and that the present specification shall not be considered to be excluding such components from the scope of the present disclosure.

In one aspect of the present disclosure, as shown in FIG. 2A, the bowl mill (100) may include an upper housing arrangement (110), a lower housing
20 arrangement (120), and a labyrinth structure (130) separating the upper (110) and the lower (120) housing arrangements. The upper housing arrangement (110) may include a bowl (111), bowl hub (112) and a shaft (113). The bowl hub (112) may be coupled to the bowl (111), and the shaft (113) may vertically extend along the bowl hub (112). The upper housing arrangement (110) also defines an interior space
25 (114) surrounding the bowl hub (112) and the shaft (113). The interior space (114) may receive hot air and coal dust during coal pulverization.

Further, the lower housing arrangement (120) may include a gear box arrangement (121) with oil. The gear box arrangement (121) may rotate the shaft (113). Furthermore, the bowl hub (112) and the shaft (113) may extend to the lower
30 housing arrangement (120).

The bowl mill (100) may also include a self-compensating sealing

arrangement (140), hereinafter referred to as 'sealing arrangement (140)'. The sealing arrangement (140) may be described herein with reference to FIG. 3A and 3B, and in conjunction with FIGS. 2A and 2B. FIGS. 3A and 3B, respectively, illustrate, a cross sectional view and a bottom view of the sealing arrangement (140), in accordance with various exemplary embodiments of the present disclosure.

As shown in FIGS. 2A and 2B, the sealing arrangement (140) may circumferentially be arranged between the labyrinth structure (130) and the bowl hub (112). The sealing arrangement (140) biases towards the bowl hub (112) to compensate a gap (not shown) arises due to wear and tear of the sealing arrangement (140) during the coal pulverization. Such compensating arrangement of the sealing arrangement (140) prevents the hot air and the coal dust of the interiors space (114) of the upper housing arrangement (110) to move in to the lower housing arrangement (120).

In one example embodiment, as shown in FIGS. 3A and 3B, the sealing arrangement (140) may include a sealing member (141) and a biasing member (142). The sealing member (141) may be circumferentially arranged between the labyrinth structure (130) and the bowl hub (112). Further, the biasing member (142) may also be configured in close coordination with the sealing member (141) to bias the sealing member (141) towards the bowl hub (112) to compensate the gap arises due to wear and tear of the sealing member (141).

In an example, the sealing member (141) may include an upper packing element (141a), a lower packing element (141b) and a packing body (141c). The upper packing element (141a) may be circumferentially configured to the labyrinth structure (130) proximate to the bowl hub (112). The lower packing element (141b) may also be circumferentially configured to the labyrinth structure (130) and arranged in close coordination with the upper packing element (141a). In one example embodiment, the upper (141a) and the lower (141b) packing elements may be rigid structure made of metal. However, without departing from the scope of the present disclosure, the upper (141a) and the lower (141b) packing elements may be made of any other rigid material.

Further, the packing body (141c) may be circumferentially arranged along the bowl hub (112) and disposed between the upper (141a) and lower (141b) packing elements. In one example embodiment, the packing body (141c) may be of flexible nature and includes fibrous and elastic materials, such as rope and so forth.

5 The examples of the packing body (141c) as disclosed herein may be considered as an example among the various embodiments that may be suitable of this invention and shall not be considered to be limiting in any manner whatsoever only to those as disclosed. The present invention can incorporate various other materials as the packing body (141c).

10 Further, in one embodiment of the present disclosure, the biasing member (142) may be coupled to one of or both of the upper packing element (141a) and the lower packing element (141b) to bias the lower packing element (141b) in an upward direction to squeeze the packing body (141c) between the upper (141a) and the lower (141b) packing elements to compensate the gap arises due to wear and
15 tear of the packing body (141c) between the bowl hub (112) and the sealing arrangement (140) during the coal pulverization. In one example, the biasing member (142) may be one or more coil spring(s).

In one example arrangement as shown in FIGS. 3A and 3B, various biasing members, such as the coil springs, may be disposed in grooved portion that may be
20 formed in the upper packing element (141a) and the lower packing element (141b) as may be required to generate such biasing force as may be required to squeeze the packing body (141c) between the upper (141a) and the lower (141b) packing elements to compensate the gap arises due to wear and tear of the packing body (141c) between the bowl hub (112) and the sealing arrangement (140).

25 In one example embodiment, the sealing arrangement (141) may be capable of preventing coal particles of size as less as below 3 mm to be passed in lower housing arrangement (120) from the interior housing (114) of the upper housing arrangement (110).

In one embodiment of the present disclosure, the bowl mill (112) may
30 include a first scrapper arrangement (150) and a second scrapper arrangement (160). The first scrapper arrangement (150) and the second scrapper arrangement (160)

may be described herein with reference to FIGS. 4A and 4B. FIG. 4A illustrates first (150) and second (160) scrapper arrangements configured in the bowl mill (100), in accordance with various exemplary embodiments of the present disclosure. Further, FIG. 4B illustrates an enlarged view of the second scrapper arrangement (160) configured in the bowl mill (100), in accordance with various
5 exemplary embodiments of the present disclosure.

As shown in FIG. 4A, the first scrapper arrangement (150) may be coupled to the labyrinth structure (130) and disposed in the upper housing arrangement (110). The first scrapper arrangement (150) may be capable of scrapping coal
10 particles out from the interior space (114) of the upper housing arrangement (110). In an example, the first scrapper arrangement (150) may be configured to scrap out coal particles of size greater than 5 mm from the interior housing (114) of the upper housing arrangement (110). The dimensions as disclosed herein are only for the example and understanding purpose and shall not be considered limiting to those
15 dimensions only as the invention can incorporate to scrap out coal particles of various other sizes.

Referring now to FIG. 4B, the bowl mill (100) may include the second scrapper arrangement (160) coupled between the labyrinth structure (130) and the bowl hub (112). The second scrapper arrangement (160) may be coupled between
20 the labyrinth structure (130) and the bowl hub (112) above the sealing member (141) that is also circumferentially arranged between the labyrinth structure (130) and the bowl hub (112). In one arrangement, the second scrapper arrangement (160) may be coupled between the labyrinth structure (130) and the bowl hub (112) along an upper portion of the labyrinth structure (130), while the sealing member (141)
25 may be coupled between the labyrinth structure (130) and the bowl hub (112) along an lower portion of the labyrinth structure (130) that is proximate to the bowl hub (112). The second scrapper arrangement (160) may include first (161) and second (162) scrapping members.

The first scrapping member (161) may be coupled circumferentially and
30 fixedly to the labyrinth structure (130) proximate to the bowl hub (112). In one example, the first scrapping member (161) may include a female groove

circumferentially configured there along. Further, the second scrapping member (162) engages to the first scrapping member (161). The second scrapping member (162) includes a male portion to accommodate within the female groove circumferentially configured along the first scrapping member (161). The second
5 scrapping member (162) may be a longitudinal structure whose one end is affixed to the bowl hub (112) while the other end including the male portion engages the female groove of the first scrapping member (161). The second scrapping member (162) that is coupled to the bowl hub (112) and is movable with the bowl hub (112). In an example, the second scrapping member (162) may be a small sweeper to
10 prevent build-up of the coal particles along the sealing arrangement (140). The first (161) and second (162) scrapping members may be engaged to scrap out coal particles of smaller size. In one example, the first (161) and second (162) scrapping members may be capable of scraping or sweeping out coal particles of size range between 3 mm to 5 mm. The dimensions as disclosed herein are only for the
15 example and understanding purpose and shall not be considered limiting to those dimensions only as the invention can incorporate to scrap out coal particles of various other sizes.

During the operation of the bowl mill (100) over the extend period of time, the packing body (141c) of the sealing arrangement (140) may get wear and tear
20 and due to that a gap between the bowl hub (112) and the sealing arrangement (140) may arises. Due to such gap the fine coal particles of the upper housing arrangement (110) may move therefrom to the lower housing arrangement (120) in the gear box arrangement and oil. To avoid this, the self-compensating sealing arrangement (140) of the present invention is advantageous, which with the help of the upper
25 packing element (141a) and the lower packing element (141b) of the sealing member (141) and a biasing member (142), closes such gap. In doing so, the biasing member (142) biases the lower packing element (141b) in an upward direction to squeeze the packing body (141c) between the upper (141a) and the lower (141b) packing elements to compensate the gap arises due to wear and tear of the packing
30 body (141c) between the bowl hub (112) and the sealing arrangement (140) during the coal pulverization.

Advantageously, the bowl mill of the present disclosure may provide solution the problems that reduces such frequent breakdown and increase productivity of the bowl mill. Further, the bowl mill of the present invention provides such a sealing assembly that may provide solution to such problems as
5 discussed that reduces such frequent breakdown and increase productivity of the bowl mill.

The foregoing descriptions of specific embodiments of the present disclosure have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present disclosure to the precise
10 forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present disclosure and its practical application, to thereby enable others skilled in the art to best utilize the present disclosure and various embodiments with various modifications as are suited to the particular use
15 contemplated. It is understood that various omission and substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but such are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present disclosure.

REFERENCE NUMERAL LIST:

	Bowl mill	(100);
	Upper housing arrangement	(110);
5	Bowl	(111);
	Bowl hub	(112);
	Shaft	(113);
	Interior space	(114);
	Lower housing arrangement	(120);
10	Gear box arrangement	(121);
	Labyrinth structure	(130);
	Self-compensating sealing arrangement/ sealing arrangement	(140);
	Sealing member	(141);
	Biasing member	(142);
15	Upper packing element	(141a);
	Lower packing element	(141b);
	Packing body	(141c);
	First scrapper arrangement	(150);
	Second scrapper arrangement	(160);
20	First scrapping members	(161); and
	Second scrapping members	(162).

WE CLAIM:

1. A bowl mill (100) for coal pulverization, comprising:

an upper housing arrangement (110) having a bowl (111), a bowl hub (112) coupled to the bowl (111), and a shaft (113) vertically extending along the bowl hub (112), and an interior space (114) surrounding the bowl hub (112) and the shaft (113), the interior space (114) receives hot air and coal dust during coal pulverization;

a lower housing arrangement (120) having gear box arrangement (121) with oil, the gear box arrangement (121) rotates the shaft (113), the bowl hub (112) and the shaft (113) extend to the lower housing arrangement (120);

a labyrinth structure (130) horizontally separating the upper (110) and the lower (120) housing arrangements; and

characterised in that:

a self-compensating sealing arrangement (140) circumferentially arranged between the labyrinth structure (130) and the bowl hub (112), the self-compensating sealing arrangement (140) biases towards the bowl hub (112) to compensate a gap arises due to wear and tear of the self-compensating sealing arrangement (140) during the coal pulverization, to prevent the hot air and the coal dust of the interiors space (114) to move in to the lower housing arrangement (120), the self-compensating sealing arrangement (140) having:

a sealing member (141) circumferentially arranged between the labyrinth structure (130) and the bowl hub (112), and

a biasing member (142) coupled to the sealing member (141) to bias the sealing member (141) towards the bowl hub (112) to compensate the gap arises due to wear and tear of the sealing member (141).

2. The bowl mill (100) as claimed in claim 1, wherein the sealing member (141) comprises:

an upper packing element (141a) circumferentially configured to the labyrinth structure (130) proximate to the bowl hub (112);

a lower packing element (141b) circumferentially configured to the labyrinth structure (130) and arranged in close coordination with the upper packing element (141a); and

a packing body (141c) circumferentially arranged along the bowl hub (112)
5 and disposed between the upper (141a) and lower (141b) packing elements.

3. The bowl mill (100) as claimed in claim 2, wherein the upper (141a) and the lower packing elements (141b) comprises rigid properties.

4. The bowl mill (100) as claimed in claim 2, wherein the packing body comprises flexible properties, and includes fibrous and elastic materials.

10 5. The bowl mill (100) as claimed in claim 2, wherein the biasing member (142) is coupled to at least one or both of the lower packing element (141b) and the upper packing element (141a) to squeeze the packing body (141c) between the upper (141a) and the lower (141b) packing elements to compensate the gap arises due to wear and tear of the packing body (141c) between the bowl hub (112)
15 and the self-compensating sealing arrangement (140) during the coal pulverization.

6. The bowl mill (100) as claimed in claim 1 further comprising a first scrapper arrangement coupled to the labyrinth structure and disposed in the upper housing arrangement to scrap coal particles out from the interior space of the upper housing arrangement, wherein the first scrapper arrangement configured to scrap
20 out coal particles of size greater than 5 mm.

7. The bowl mill (100) as claimed in claim 1 further comprising a second scrapper arrangement coupled between the labyrinth structure and the bowl hub.

8. The bowl mill (100) as claimed in claim 7, wherein the second
25 scrapper arrangement (160) comprises:

a first scrapping member (161) coupled circumferentially and fixedly to the labyrinth structure (130) proximate to the bowl hub (112); and

a second scrapping member (162) movably engageable to the first scrapping member (161), the second scrapping member (162) coupled to the bowl hub (112)
30 and is movable with the bowl hub (112), wherein the first (161) and second (162) scrapping members engages to scrap out coal particles of size range between 3 mm

to 5 mm.

9. The bowl mill (100) as claimed in claim 1, wherein the self-compensating sealing arrangement (140) is arranged to prevent coal particles of size as less as below 3 mm.

5 10. A self-compensating sealing arrangement (140) for a bowl mill (100) for coal pulverization, the bowl mill (100) having upper (110) and lower (120) housing arrangements and a labyrinth structure (130) separating the upper (110) and lower (120) housing arrangements, the upper housing arrangement (110) having a bowl (111), a bowl hub (112), a shaft (113) and an interior space (114) surrounding the bowl hub (112) and the shaft (113) and receives hot air and coal dust during coal pulverization, and, the lower housing arrangement (120) having gear box arrangement (121) with oil to rotate the shaft (113), the self-compensating sealing arrangement (140) is **characterised by**:

15 a sealing member (141) circumferentially arranged between the labyrinth structure (130) and the bowl hub (112), and

a biasing member (142) coupled to the sealing member (141) to bias the sealing member (141) towards the bowl hub (112) to compensate the gap arises due to wear and tear of the sealing member (142).

20 11. The self-compensating sealing arrangement (140) as claimed in claim 10, wherein the sealing member (141) comprises:

an upper packing element (141a) circumferentially configured to the labyrinth structure proximate (130) to the bowl hub (112);

25 a lower packing element (141b) circumferentially configured to the labyrinth structure (130) and arranged in close coordination with the upper packing element (141a); and

a packing body (141c) circumferentially arranged along the bowl hub (112) and disposed between the upper (141a) and lower (141b) packing elements.

30 12. The self-compensating sealing arrangement (140) as claimed in claim 11, wherein the biasing member (142) is coupled to at least one or both of the lower packing element (141b) and the upper packing element (141b) to squeeze the packing body (141c) between the upper (141a) and the lower (141b) packing

elements to compensate the gap arises due to wear and tear of the packing body (141c) between the bowl hub (112) and the self-compensating sealing arrangement (140) during the coal pulverization.

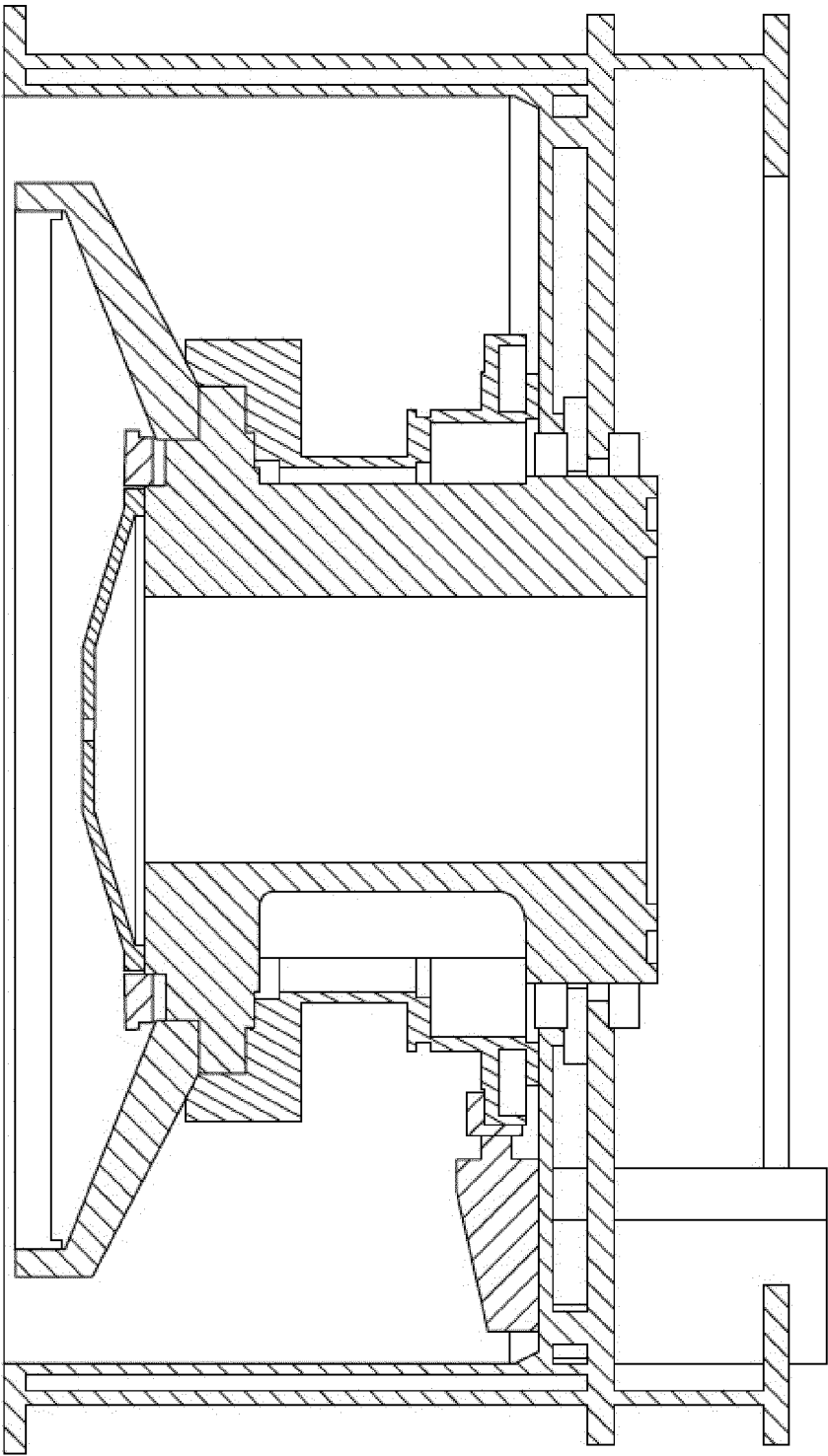
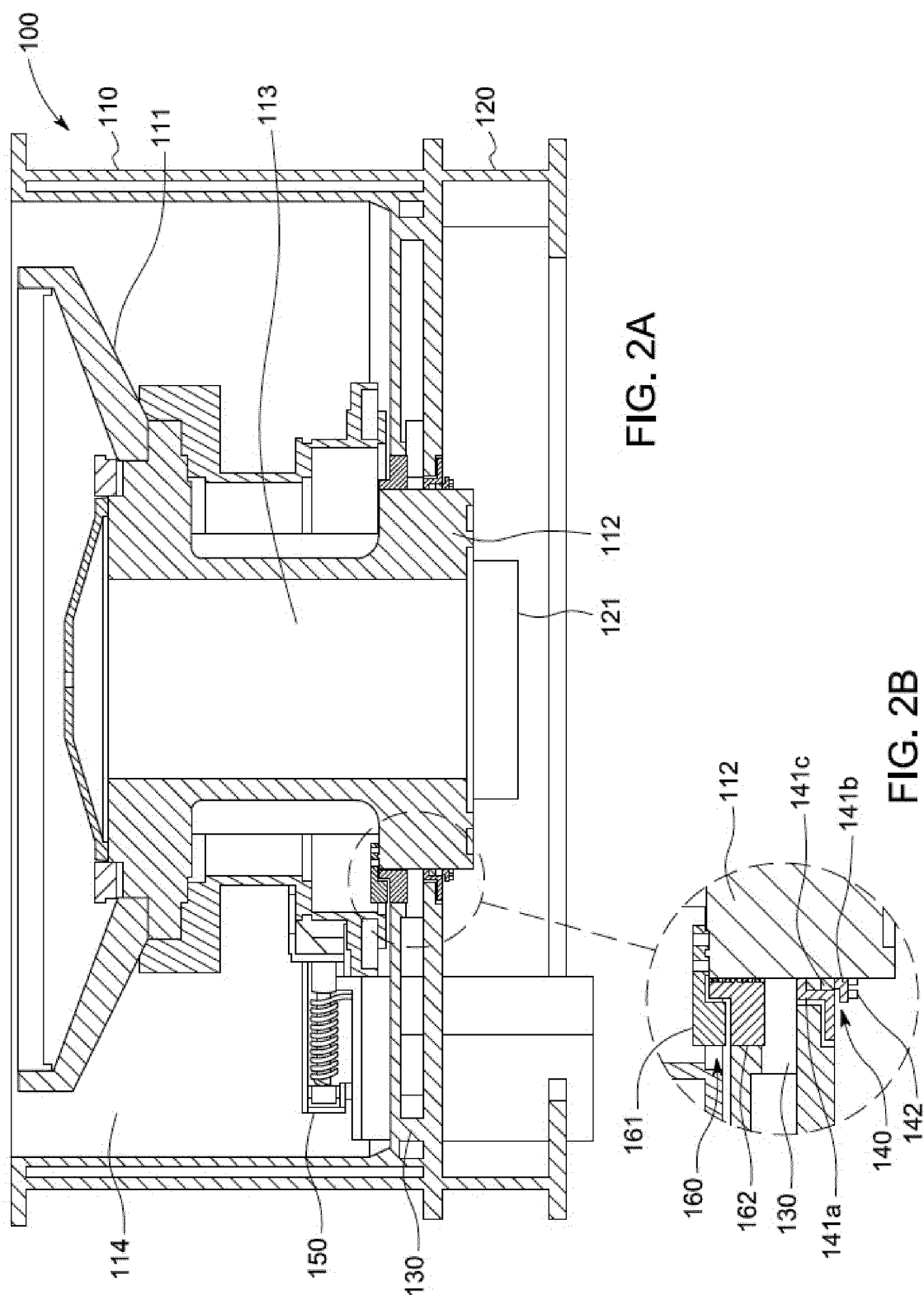


FIG. 1
(Prior Art)



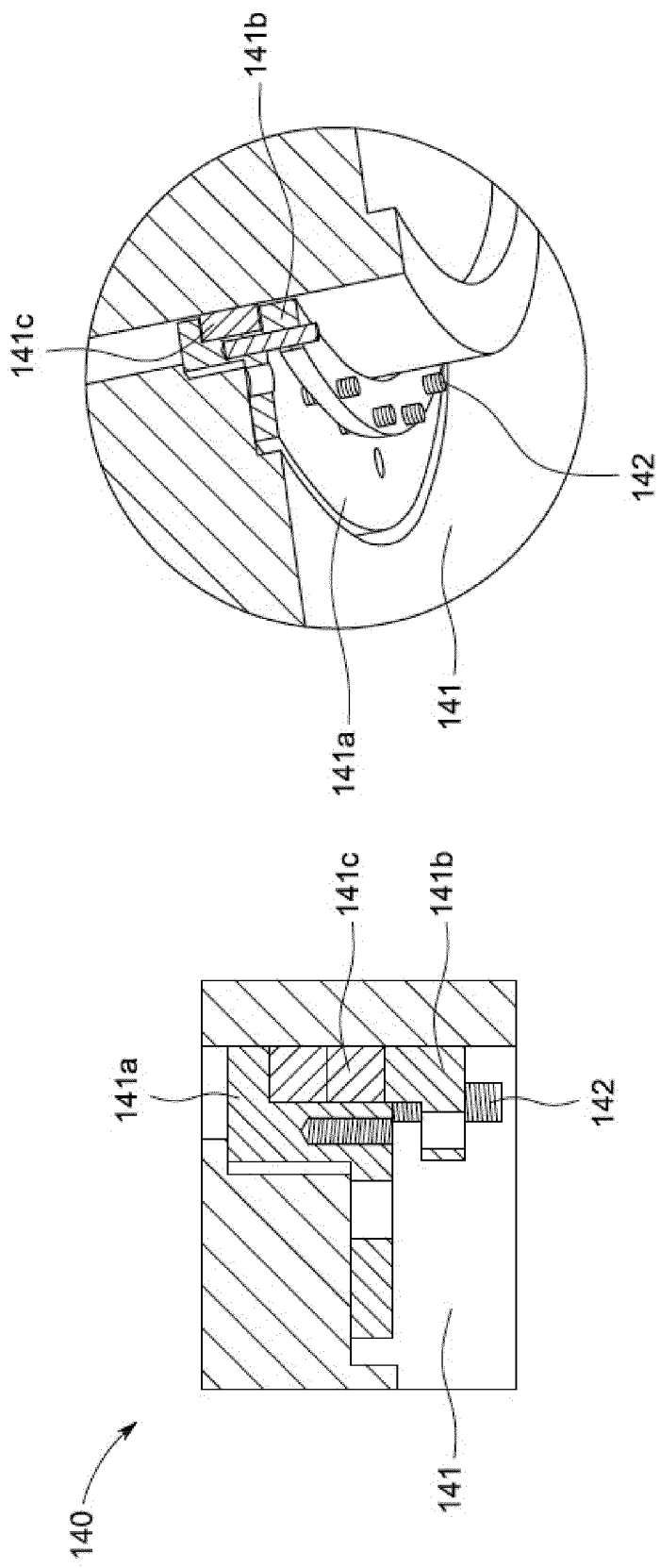


FIG. 3B

FIG. 3A

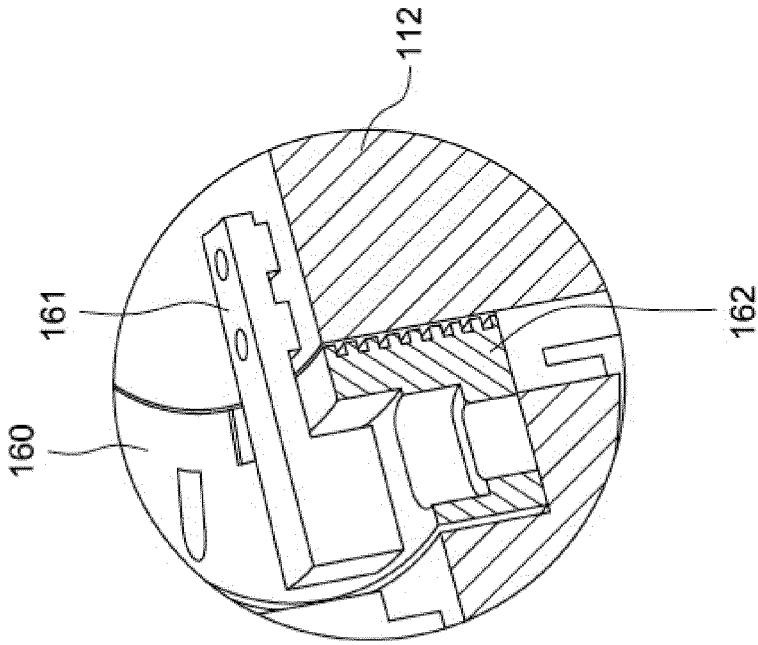


FIG. 4B

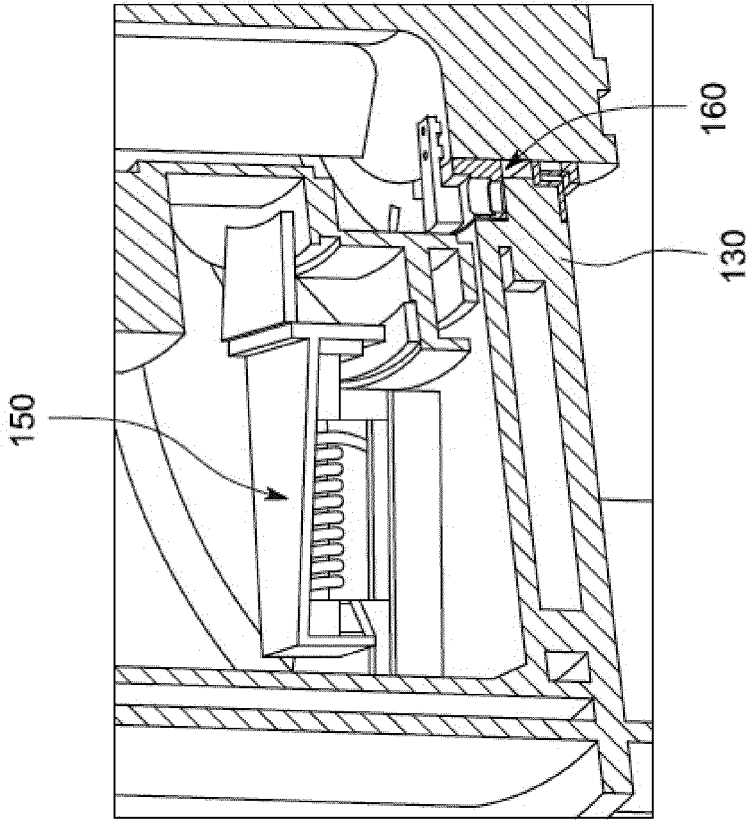


FIG. 4A

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/025255

A. CLASSIFICATION OF SUBJECT MATTER
INV. B02C15/00 F16J15/44 F16J15/18
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B02C F16J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 193 850 A1 (VSE AG [DE]) 9 June 2010 (2010-06-09)	1-5,9-12
Y	paragraphs [0002] - [0007], [0009], [0011], [0012], [0017] - [0025], [0028] - [0031]; figures 1,3,4a -----	6-8
Y	US 5 904 307 A (PRAIRIE ROBERT S [US] ET AL) 18 May 1999 (1999-05-18) column 2, lines 48-52; figures 1-3,6 column 3, lines 1-24 column 4, line 43 - column 5, line 14 -----	6,7
Y	CN 202 921 357 U (UNIV NORTH CHINA ELEC POWER) 8 May 2013 (2013-05-08) abstract; figures 1,2 -----	8



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

8 September 2020

Date of mailing of the international search report

17/09/2020

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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