

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

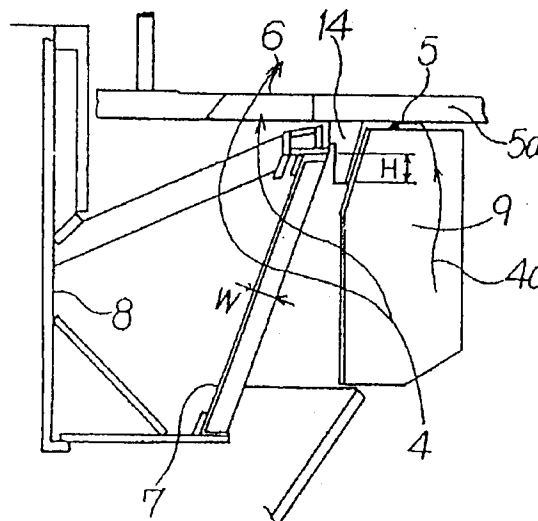
0 636 416 A2

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **94106620.1**(51) Int. Cl.⁶: **B02C 23/32**, B02C 23/08,
B02C 15/00(22) Date of filing: **27.04.94**(30) Priority: **29.07.93 JP 188072/93**(43) Date of publication of application:
01.02.95 Bulletin 95/05(84) Designated Contracting States:
BE ES NL(71) Applicant: **MITSUBISHI JUKOGYO KABUSHIKI KAISHA**
5-1, Marunouchi 2-chome
Chiyoda-ku
Tokyo (JP)(72) Inventor: **Sakamoto, Hidenori, c/o Nagasaki Shipyard & Mach.**
Works Mitsubishi Jukogyo K K,
1-1, Akunoura-machi
Nagasaki-shi,
Nagasaki-ken (JP)(74) Representative: **Henkel, Feiler, Hänzel & Partner**
Möhlstrasse 37
D-81675 München (DE)(54) **Roller mill containing therein a rotary classifier.**

(57) A roller mill containing therein a rotary classifier, which has a classification performance improved, is disclosed. A weir 14 having an annular cross-section for diverting an air flow 4a separated from a carrier air flow 4 rising within a mill and flowing towards the center axis of the mill along a mill top ceiling surface 5 as containing coarse particles into a descending flow, is mounted to the mill top ceiling surface 5 coaxially with a rotary shaft of the rotary classifier radially on the outside of blades 7 of the rotary classifier, the bottom end of the weir 14 is located at the position where the above-mentioned descending flow is made to join with a main flow 4 of the carrier air flow rising within the mill, whereby coarse particles short-cutting the rotary classifier are eliminated so as to improve a classification performance.

Fig. 1

**EP 0 636 416 A2**

BACKGROUND OF THE INVENTION:

1. Field of the Invention:

The present invention relates to a roller mill containing therein a rotary classifier such as, for example, a coal beater employed for a coal-burning boiler in a utility or non-utility electric power plant, a cement grinding mill or the like.

2. Description of the Prior Art:

In a heretofore known roller mill containing therein a rotary classifier, as shown in Fig. 2, raw material to be ground such as coal or the like is ground by a grinding roller 2 rotating on a grinding table 1, and the ground raw material 3 is carried upwards within the mill by carrier air flows rising within the mill. Within the mill, there are provided a rotary classifier having blades 7 rotating about a vertical rotary shaft at the center of the mill as driven by a rotor 8 directed in the vertical direction, and deflector vanes 9 mounted to a mill top plate 5a forming a ceiling surface 5 of the mill top, the flows of the ground raw material 3 and the carrier air flow 4 are caused to pass through the blades 7 of the rotary classifier by means of the deflector vanes 9, and fine powder classified by the rotary classifier is discharged through a fine powder outlet 6 provided on the mill top plate 5a.

In the heretofore known roller mill containing therein a rotary classifier, although provision is made such that the ground raw material and the carrier air flow 4 are made to pass through the blades 7 of the rotary classifier by means of the deflector vanes as described above, as shown in Fig. 3, coarse particles in the raw material 3 carried by the carrier air flow 4 would reach the ceiling surface 5 of the mill top due to their inertia as indicated by an arrow 4a, and then would flow towards the center of the mill along the top ceiling surface 5 jointly with a part of the carrier air flow.

In the roller mill containing therein a rotary classifier in the prior art, as shown in Fig. 3, the rotary classifier is equipped with a gap clearance 11 of 2 - 4 mm retained between the ceiling surface 5 and the classifier. Due to the fact that a rotary classifier is one kind of fan, a static pressure P_1 at the inlet of the blades 7 is somewhat higher than a static pressure P_2 within the blades 7. Accordingly, the air flow 4a containing coarse particles and flowing along the ceiling surface 5 is caused to take a short-cut as indicated by an arrow 4b due to the above-mentioned pressure difference ($P_1 > P_2$).

SUMMARY OF THE INVENTION:

It is therefore one object of the present invention to provide an improved roller mill containing therein a rotary classifier, which is free from the above-mentioned shortcomings in the prior art.

According to one feature of the present invention, there is provided a roller mill containing therein a rotary classifier, wherein a weir having an annular cross-section for diverting an air flow separated from a carrier air flow rising within the mill and flowing towards the center axis of the mill along a mill to ceiling surface as containing coarse particles into a descending flow, is mounted to the mill top ceiling surface coaxially with a rotary shaft of the rotary classifier radially on the outside of blades of the rotary classifier, and wherein the bottom end of the aforementioned weir is located at the position where the above-mentioned descending flow is made to join with a main flow of the carrier air flow rising within the mill.

According to the present invention, owing to the above-featured construction of the improved roller mill, the air flow flowing along the mill top ceiling surface towards the center axis of the mill as containing coarse particles would collide against the weir and would be diverted into a descending flow. Since the bottom end of the weir is located at the position where the descending flow is made to join with a main flow of the carrier air flow, the descending flow containing coarse particles would join with the main flow of the carrier air and then would pass through the rotary classifier. During this period, the coarse particles are classified by the rotary classifier. As described above, the improved roller mill can eliminate the coarse particles short-cutting the rotary classifier, and therefore, lowering of a classification precision can be prevented.

The above-mentioned and other objects, features and advantages of the present invention will become more apparent by reference to the following description of preferred embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings:

Fig. 1 is a vertical cross-section view of an essential part of a roller mill according to one preferred embodiment of the present invention;

Fig. 2 is a vertical cross-section view of a roller mill containing therein a rotary classifier in the prior art; and

Fig. 3 is an enlarged view of a portion encircled by a dash-line A in Fig. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

Now one preferred embodiment of the present invention will be described with reference Fig. 1. In this preferred embodiment, the heretofore known roller mill containing therein a rotary classifier shown in Figs. 2 and 3 has been improved in the manner as will be explained in the following, and in Fig. 1 component parts equivalent to those appearing in Figs. 2 and 3 are given like reference numerals and further explanation thereof will be omitted.

In the illustrated embodiment, a weir 14 of truncated conical shape having a cross-section at its lower portion reduced is disposed coaxially with a rotary shaft of a rotary classifier radially on the outside of blades 7 of the rotary classifier and on the inside of deflector vanes 9, and the upper end of this weir 14 is mounted to a mill top ceiling surface 5. The bottom end of this weir 14 is positioned within a main flow of carrier air 4 rising within the mill. In order to promote joining of a descending flow containing coarse particles produced by the weir 14 and the main flow of the carrier air 4 as will be described later, the bottom end of the weir 14 is set lower than the top end of the blades 7 of the rotary classifier by a height H as defined by the following formula:

$$H > (0.7 - 1.5) \times W,$$

where

W: a width of the blade 7.

In the illustrated embodiment, due to existence of the weir 14, an air flow 4a containing coarse particles and flowing towards the center axis of the mill along the mill top ceiling surface 5 is diverted into a descending flow and joins with the main flow 4 of the carrier air flow rising within the mill, and when passing through the blades 7, the coarse particles would be separated from the carrier air flow and would fall to be ground again by a grinding roller on a grinding table.

As described above, in this preferred embodiment, an air flow containing coarse particles and short-cutting the rotary classifier can be eliminated by the weir 14, and so, lowering of a classification precision of the rotary classifier can be prevented.

When coal was ground and classified by making use of the apparatus according to the present invention, a favorable result of 200 μ pass 98.4% and 100 μ residual 0% could be obtained.

It is to be noted that while a weir of truncated conical shape was employed in the above-described embodiment, the weir could be formed in a cylindrical shape, and so long as it is formed in an annular shape, its horizontal cross-section shape

need not be toroidal but could be, for instance, polygonal. In addition, the weir could be mounted to the mill top ceiling surface via an appropriate member instead of being mounted directly.

As will be obvious from the detailed description of the preferred embodiment above, according to the present invention, owing to the structural feature as defined in the appended claims, it is possible to divert an air flow containing coarse particles and flowing towards a center axis of a mill along a mill top ceiling surface into a descending flow by means of a weir mounted to the mill top ceiling surface and to make the descending flow join with a main flow of a carrier air flow and introduce them into a rotary classifier, and thereby a classification effect in a roller mill can be greatly improved.

While a principle of the present invention has been described above in connection to one preferred embodiment of the invention, it is a matter of course that many apparently widely different embodiments of the present invention could be made without departing from the spirit of the present invention.

Claims

1. A roller mill containing therein a rotary classifier; characterized in that a weir (14) having an annular cross-section for diverting an air flow separated from a carrier air flow rising within the mill and flowing towards the center axis of the mill along a mill top ceiling surface (5) as containing coarse particles into a descending flow, is mounted to the mill top ceiling surface (5) coaxially with a rotary shaft of the rotary classifier radially on the outside of blades (7) of the rotary classifier; and that the bottom end of said weir (14) is located at the position where said descending flow is made to join with a main flow of the carrier air flow rising within the mill.

2. A roller mill containing therein a rotary classifier as claimed in Claim 1, further characterized in that the bottom end of the weir (14) is located at the position lower than the top of the blade (7) of the rotary classifier by a height H as defined in the following formula:

$$H > (0.7 - 1.5) \times W,$$

where

W: a width of the blade (7).

3. A roller mill containing therein a rotary classifier as claimed in Claim 1 or 2, further characterized in that the weir (14) is formed in a conical shape.

4. A roller mill containing therein a rotary classifier as claimed in Claim 1 or 2, further characterized in that the weir (14) is formed in a cylindrical shape.

5

5. A roller mill containing therein a rotary classifier as claimed in Claim 1 or 2, further characterized in that the weir (14) is formed in a shape having a polygonal horizontal cross-section.

10

15

20

25

30

35

40

45

50

55

Fig. 1

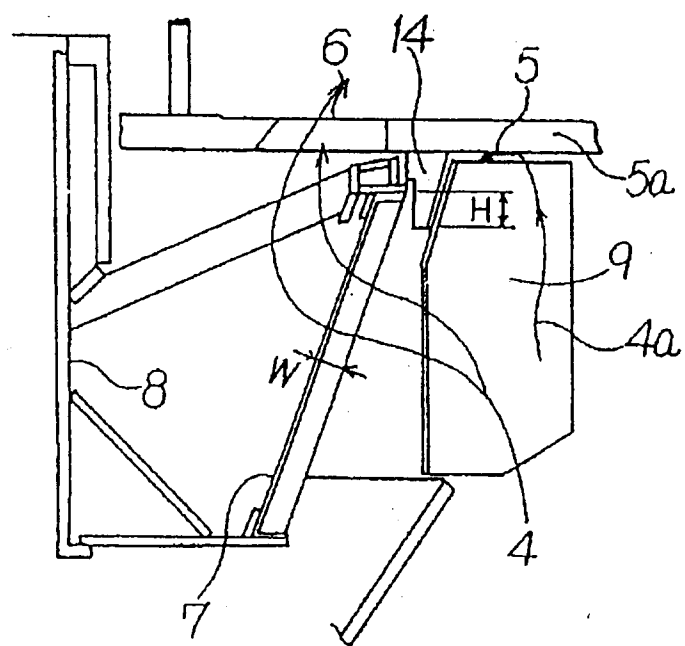


Fig. 2

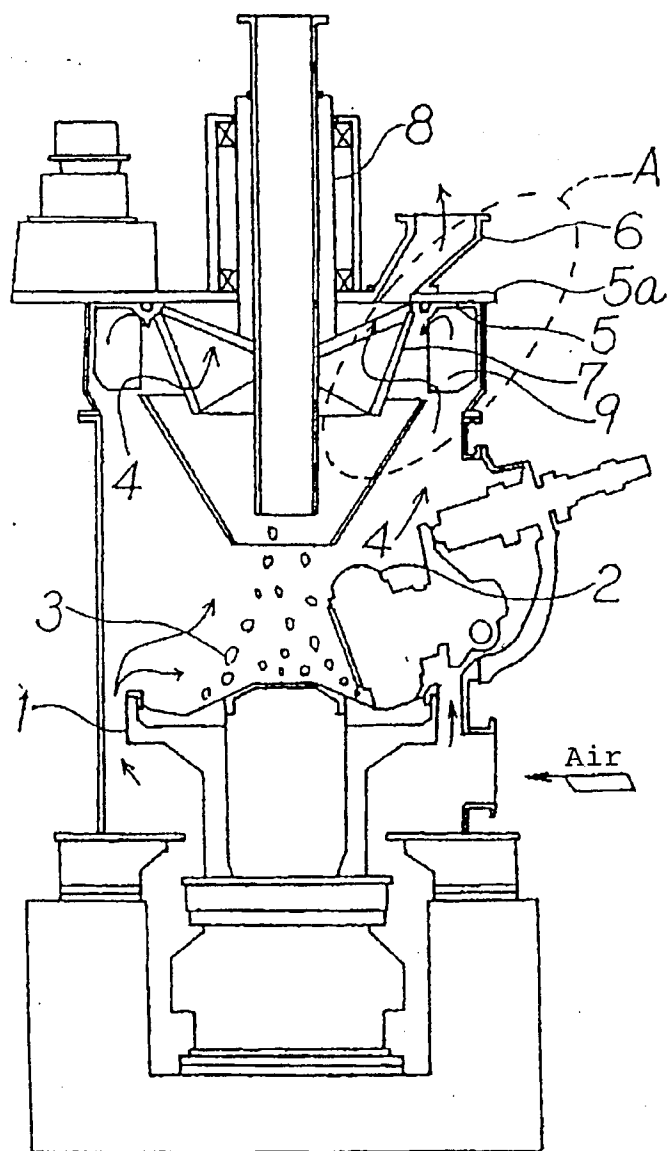


Fig. 3

