(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 124 871**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84104956.2**

(22) Date of filing: **03.05.84**

(51) Int. Cl.³: **B 02 C 11/04**
B 02 C 4/28

(30) Priority: **06.05.83 IT 8411383**

(43) Date of publication of application:
14.11.84 Bulletin 84/46

(84) Designated Contracting States:
AT CH DE FR GB IT LI SE

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(54) Cereal flow regulator device for roller mills.

(57) A cereal flow regulator device for roller mills, comprises a feed roller (3) disposed downstream of the feed hopper (4), and a mobile baffle (6) which can be spaced apart from said feed roller (3) in order to regulate the flow of cereal towards the grinding rolls (1,1'). The device comprises a deviator element (11) of length substantially equal to the length of said baffle (6), and which is disposed downstream of this latter and is mounted on a hinged support (12, 13) which varies its position in relation to the throughput of the cereal in order to always direct it between the grinding rolls (1,1').

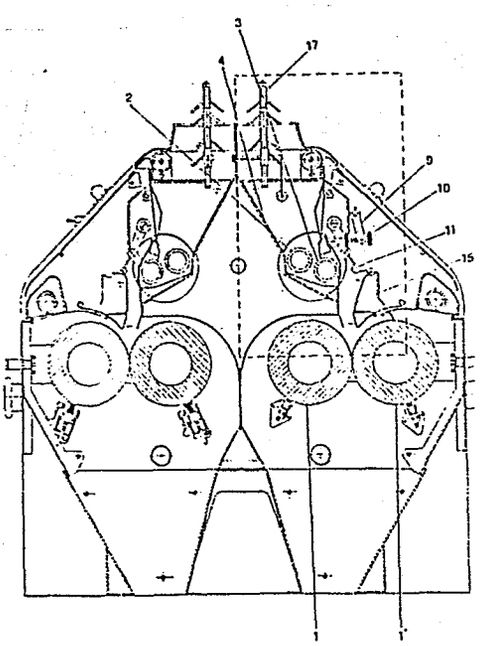

FIG.1

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This invention relates to a cereal flow regulator device for roller mills.

Cereal roller mills are known in which the product to be ground is introduced from the outside into a feed hopper from which it is transferred between two grinding rolls. In order to utilise said rolls over their entire length and at the same time attain high mill productivity, it is known to interpose between said feed hopper and said rolls a pair of rollers having the double purpose of distributing the cereal to be ground over the entire length of the underlying grinding rolls, and of feeding it in a quantity corresponding to the quantity of product entering the mill. Each grinding section of known roller mills currently comprises two rollers, which are together called feed rollers but in reality perform different tasks. In this respect, one of these rollers essentially performs the task of distributing the cereal over the entire width of the underlying grinding rolls, whereas the other essentially performs the task of feeding the cereal to be ground. For this purpose, this feed roller is provided with a baffle which when there are no external stresses substantially adheres to its lateral surface, but becomes spaced apart by a greater or lesser extent therefrom according to the

quantity of material entering the feed hopper, in order to cause a corresponding quantity of it to become discharged on to the grinding rolls.

Known roller mills use both the arrangement in which the distributor roller is upstream of the feed roller and the arrangement in which the distributor roller is downstream of the feed roller, but this latter arrangement is currently preferred because it is more advantageous, in that:

- it results in better distribution of the product to be ground over the entire operating face of the machine, and consequently reduces vibration and noise due to localised cereal accumulation between the grinding rolls,
- it enables the feed roller to be kept at a higher speed, thus allowing a much thinner sheet of material to be obtained for equal throughputs, this improving the subsequent grinding,
- it enables the distributor roller to be formed with blades, which on the one hand improve distribution and on the other hand can be adapted in terms of shape and dimensions to the particle size of the product to be ground.

However, arranging the feed roller downstream of

the distributor means that as the extent of baffle opening varies, ie as the throughput of the cereal to be ground varies, the shape of the parabola through which the sheet of material falls on to the grinding rolls varies. This leads to a certain disorder in the distribution of the material in the grinding zone, localised accumulation and consequent vibration and noise, with reduction in grinding capacity. Moreover, as the throughput increases, the sheet of material which leaves the feed roller tends to increase in thickness by centrifugal effect, and this also contributes to disorder in the sheet.

To obviate these drawbacks, it has also proposed to associate with the mobile baffle a fixed deviator which corrects the trajectory of the material sheet. However, this arrangement has proved of poor effectiveness in that it is valid essentially only for the optimum throughput, or for one given machine throughput, and is of little or no value when this is varied. In fact in certain cases the impact of the material on the deviator element breaks the sheet down, so worsening the machine operating conditions. Moreover, this known deviator element in no way remedies the increase in thickness of the sheet of material leaving the feed roller.

The object of the invention is to obviate these drawbacks by providing a roller mill which has its feed roller disposed downstream of the distributor roller, but which at the same time operates under conditions of maximum efficiency and maximum quietness over the entire performance range for which the machine has been dimensioned.

This object is attained according to the invention by a cereal flow regulator device for roller mills comprising a feed roller disposed downstream of the feed hopper, and a mobile baffle which can be spaced apart from said feed roller in order to regulate the flow of cereal towards the grinding rolls as a function of the cereal throughput at the machine inlet, characterised by comprising a deviator of length substantially equal to the length of said baffle, and which is disposed downstream of this latter and is mounted on a hinged support which varies its position in relation to the cereal throughput in order to always direct it between the grinding rolls.

Advantageously, the deviator element can be of such a configuration that its tangential plane at the zone of impact of the sheet of cereal substantially coincides with the plane which at that zone is tangential to the parabola through which the sheet of cereal falls.

A preferred embodiment of the present invention is described in detail hereinafter by way of non-limiting example with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic cross-section through a roller mill according to the invention; and

Figure 2 is a cross-sectional view thereof to an enlarged scale showing the detail enclosed by the dashed-line rectangle of Figure 1.

As can be seen from the figures, the device according to the invention is essentially used in cereal roller mills comprising a pair of grinding rolls which receive the cereal to be ground from a pair of overlying feed rollers. In practice, known roller mills comprise two constructionally identical grinding sections which are disposed back-to-back and can perform either the same or different operations on the cereal, and therefore for reasons of simplicity only one section is described hereinafter, the same description also being valid for the other.

The roller mill to which the device according to the invention is fitted comprises, for each section, a pair of grinding rolls 1,1', which are in contact along a

generating line which constitutes the grinding generating line, and are rotated in opposite directions at different speeds. The two rollers 2 and 3 constituting respectively the distributor roller and feed roller are disposed above the grinding rolls 1,1' in a position substantially corresponding with the lower discharge aperture of a hopper 4 which receives the cereal to be ground. The roller 2, which as stated constitutes the distributor roller, comprises a plurality of radial blades (not shown) inclined in such a direction as to distribute the cereal to be ground from its centre towards its end. It is rotated in the direction of the arrow 5.

The roller 3, which constitutes the actual feed roller, is disposed side-by-side with the roller 2 in a slightly lower position than this latter, and is rotated in the same direction as the roller 2 but at greater speed. At a minimum distance from its lateral surface, which is preferably fluted, there is provided a baffle 6 essentially constituted by a curved section bar of length equal to the length of the roller 3. Two lugs 7 are welded to the baffle 6 in order to connect two forked rods 8, which themselves are connected to two arms 9. The arms 9 are operated by conventional systems in relation to the upward or downward

variation in the quantity of cereal entering the hopper 4. The connection between the forked rods 8 and the relative arms 9 is made by way of screw elements 10 in order to set the minimum opening of the baffle 6, as described hereinafter.

The lateral supports by which the baffle 6 is moved during opening are not shown for simplicity of representation, said baffle rotating about an axis coinciding with the axis of curvature thereof so that the curved surface of said baffle always remains adhering to the wall of the hopper 4.

A deviator element 11 rests longitudinally against the baffle 6. It is constituted by a curved section bar of the same length as the baffle 6, and is provided with lugs 12 to which there are hinged arms 13, which are also hinged to the machine shoulders 14. In order to set the position of the deviator element 11 in the required manner, the connection between the lugs 12 and arms 13 is made by means of slotted holes, and the connection between the arms 13 and shoulders 14 is made by means of eccentric pins. The deviator element adheres by gravity to the baffle 6 at its upper longitudinal edge, as can be clearly seen from the drawings. It is also curved lowerly in such a manner as to

"embrace" the roller 3 and extend into an underlying channel 15 for feeding the cereal to the grinding rolls 1,1'.

Preferably one wall 16 of said channel 15 can assume several positions (two possible positions are shown on the drawings), as it has been found that on varying the cereal throughput it is advisable to also vary the degree of opening of said channel 15 so that the quantity of air drawn in is such as not to break the cereal sheet down, and not to cause irregularity in the machine operation.

At the inlet opening of the hopper 4 there is provided a conventional member 17 sensitive to the weight of the cereal to be ground, and arranged to adjust the degree of opening of the baffle 6 in relation to this latter, using conventional methods.

The operation of the device according to the invention is as follows:

When there is no cereal feed, the member 17 causes the baffle 6 to remain in its closed position, ie in a position in which it is separated from the roller 3 by just that distance sufficient to prevent mutual sliding if said roller 3 is moving. If the position of the baffle 6 in this closed state is incorrect, it can be adjusted by operating the screw devices 10.

In this position, the deviator element 11 rests upperly on the baffle 6 by gravity, and is just separated lowerly from the roller 3 and wall 16 of the channel 15, to which it substantially adheres. In this stage, the two constantly rotating grinding rolls 1,1' are spaced apart, and the machine is in its waiting state. If the cereal to be ground is now fed into the hopper 4, the member 17 is urged downwards by a distance proportional to the quantity of said cereal, and firstly causes the two rolls 1,1' to approach each other until they have reached their correct working position. The two rollers 2 and 3 are then started, and the shaft 19, to which the arms 9 are keyed, is then rotated by an amount relative to the quantity of cereal striking the member 17, with the result that the baffle 6 opens in the direction of the arrow 20. During this stage, the upper edge of the baffle 6 urges the deviator element 11 in the direction of the arrow 21, and withdraws it from the roller 3.

The greater the degree of opening of the baffle 6, the greater the quantity of cereal which the feed roller 3 transfers to the grinding rolls 1,1'. However, on varying the cereal throughput, the parabola through which the sheet of cereal falls varies even though the roller 3 is at

constant rotational speed, the result being that if the deviator element 11 was not present, the cereal would fall into zones on the rolls 1 and/or 1' distant from the correct grinding zone. Instead, the presence of said element 11 means that the sheet of material is deviated in such a manner as to fall exactly into the correct grinding zone without breaking down, this being so for substantially any throughput, ie for any degree of opening of the baffle 6. In particular, the configuration of the deviator element 11 is such that its tangential plane where it makes contact with the sheet of cereal which has left the roller 3 substantially coincides, at every position, with the plane tangential to the parabola through which said sheet falls, this latter therefore being progressively deviated towards the grinding zone for the two rolls 1,1' without undergoing any breakdown.

The deviator element 11 also performs another important function, in that by virtue of its embracing configuration and its lower elongation, it comes into contact with the flow of material before this has left the roller 3, and thus right from the beginning it opposes its tendency to diverge by centrifugal action. Because of this, said deviator element not only prevents breakdown of the

material sheet, but instead by exercising a "rolling" effect, ie a transverse constricting effect on the sheet of cereal, it adjusts it to the required thinness before conveying it along the channel 15 into the grinding zone.

The correct configuration of the deviator element 11 can be determined theoretically, but is preferably determined empirically, after the necessary experimental tests.

C L A I M S

1. A cereal flow regulator device for roller mills, comprising a feed roller (3) disposed downstream of the feed hopper (4), and a mobile baffle (6) which can be spaced apart from said feed roller (3) in order to regulate the flow of cereal towards the grinding rolls (1,1'), characterised by comprising a deviator element (11) of length substantially equal to the length of said baffle (6), and which is disposed downstream of this latter and is mounted on a hinged support (12, 13) which varies its position in relation to the throughput of the cereal in order to always direct it between the grinding rolls (1,1').

2. A device as claimed in claim 1, characterised in that the deviator element (11) is of such a configuration that its tangential plane at the zone of impact of the sheet of cereal substantially coincides with the plane which at that zone is tangential to the parabola through which the cereal falls.

3. A device as claimed in claim 1, characterised in that the deviator element (11) is mounted on arms (13) hinged to the machine shoulders (14) in a position above the axis of the feed roller (3), and rests by gravity against

the baffle (6) at a point such that opening said baffle (6) causes the deviator element (11) to withdraw from said feed roller (3).

4. A device as claimed in claims 1 and 3, characterised in that the arms (13) of the deviator element (11) are hinged to the respective shoulder (14) of the roller mill by means of an adjustment cam.

5. A device as claimed in claims 1 and 3, characterised in that the deviator element (11) is provided with lugs to which the arms (13) are hinged by way of adjustment slots.

6. A device as claimed in claim 1, characterised in that the deviator element (11) has a profile which is curved in the sense of partially embracing the roller (3) and extending lowerly in the form of a portion which faces the channel (15) for feeding the cereal to the grinding rolls (1,1').

7. A device as claimed in claims 1, 2 and 6, characterised in that the deviator element (11) has a configuration such that the zone of impact with the sheet of cereal makes contact with this latter before it has left the feed roller (3).

8. A device as claimed in claims 1 and 6,

characterised in that at least one longitudinal (16) wall of the channel (15) can be adjusted in terms of its distance from the opposite wall.

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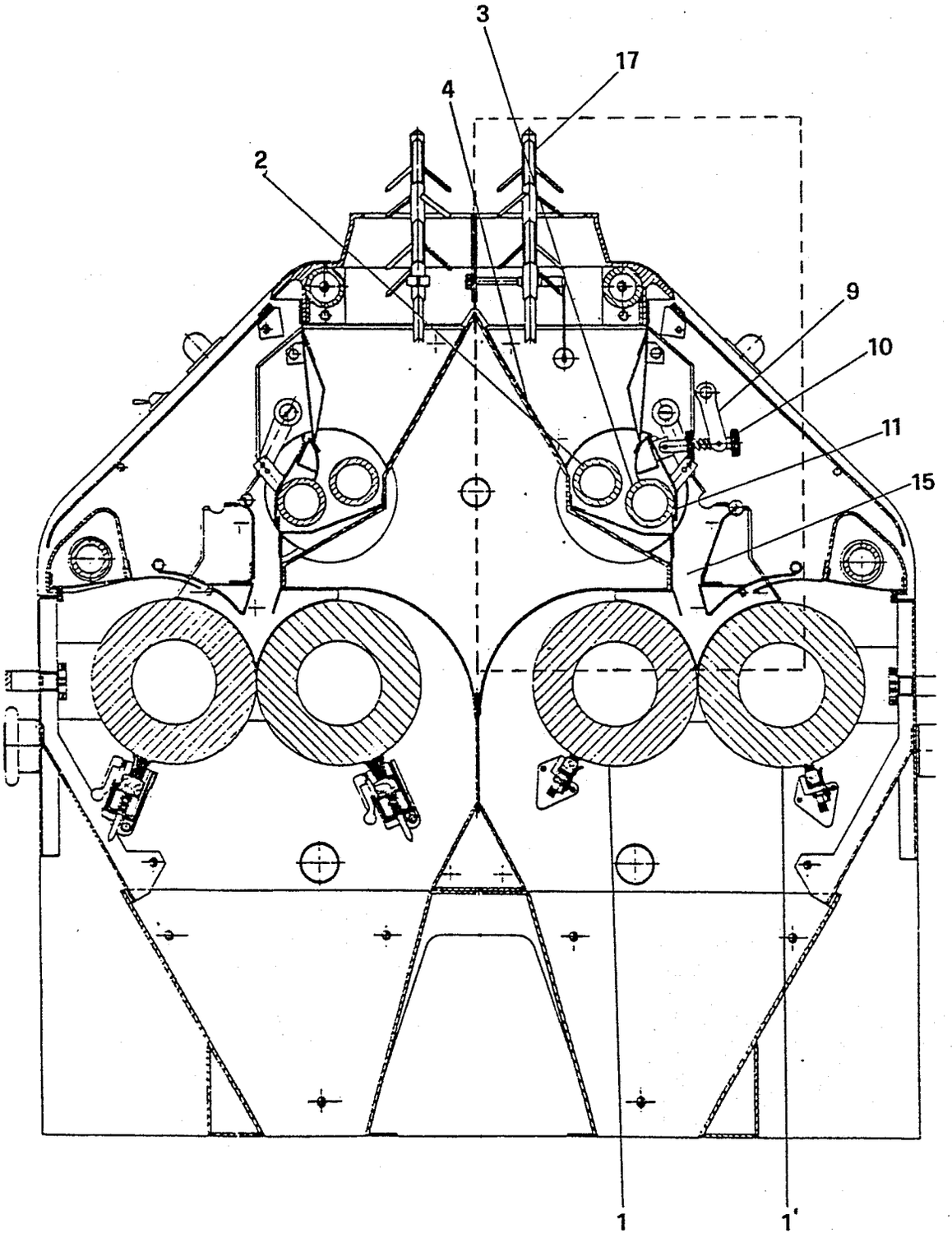

FIG.1

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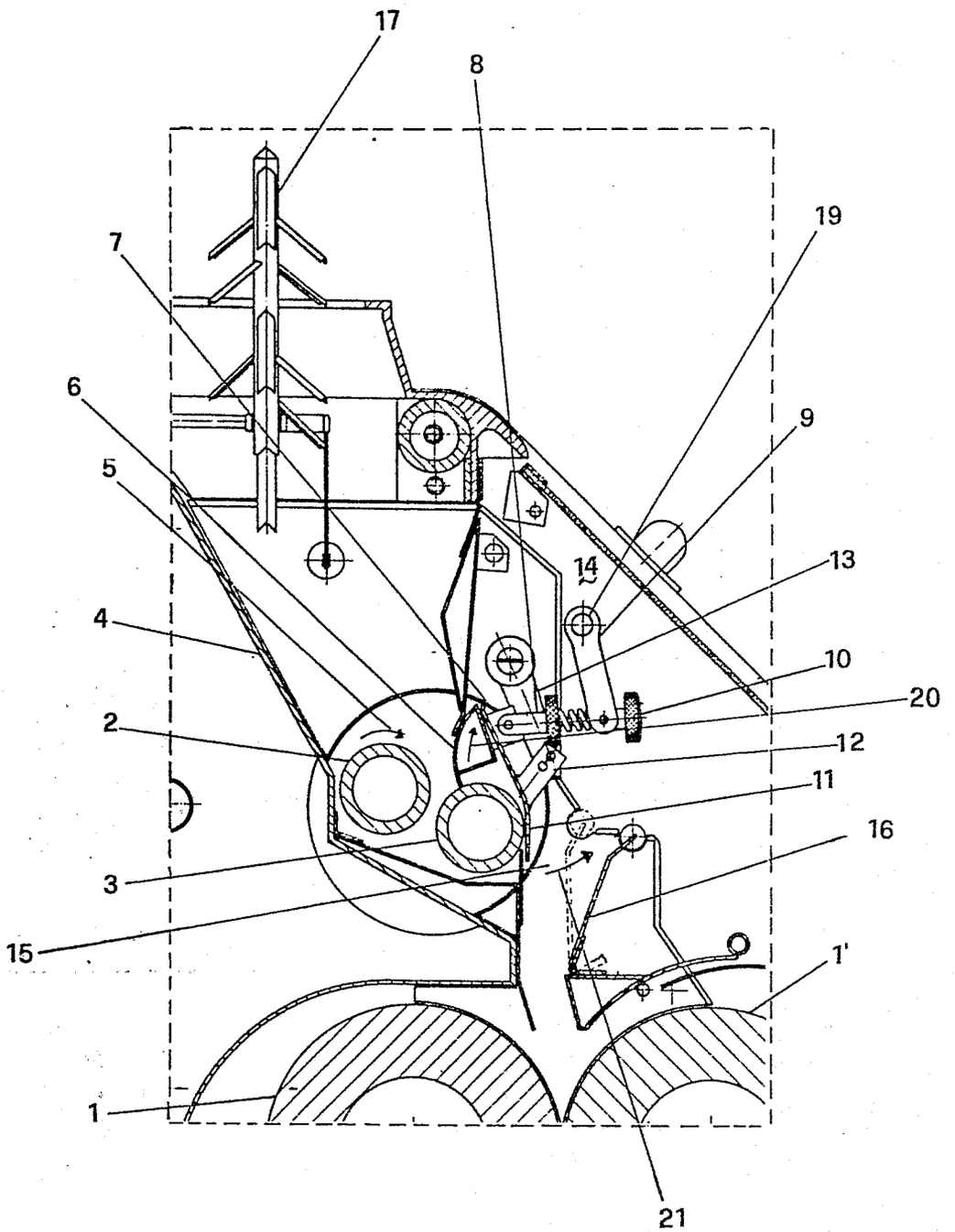

FIG.2