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

(11) Publication number: **0 125 117**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84303017.2**

(22) Date of filing: **04.05.84**

(51) Int. Cl.³: **B 02 C 25/00**
B 02 C 17/00

(30) Priority: **04.05.83 GB 8312129**

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

(84) Designated Contracting States:
BE DE FR IT LU NL SE

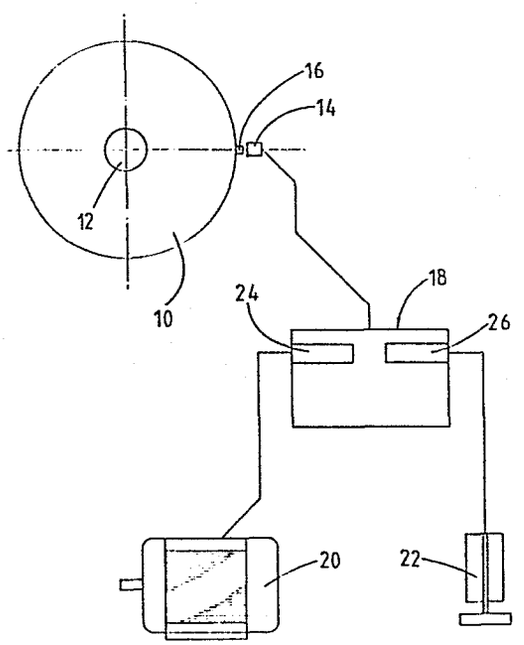
(71) Applicant: **William Boulton Limited**
Providence Engineering Works Navigation Road Burslem
Stoke-on-Trent Staffordshire(GB)

(72) Inventor: **Birks, Eric F/o William Boulton Limited**
Providence Engineering Works
Burslem Stoke-on-Trent Staffordshire(GB)

(74) Representative: **Campbell, Iain Angus et al,**
Swindell & Pearson 44 Friar Gate
Derby DE1 1DA(GB)

(54) Ball mill control device.

(57) A control device for a ball mill includes sensing means to determine and signal the number of revolutions of the mill, the signals from the sensing means being passed to a preset counter and control assembly which when a predetermined number of driven revolutions has been counted deactuates the drive and counts the decelerating free-wheeling revolutions so that just before the mill stops rotating a brake can be applied to stop it and hold it with its discharge port in a predetermined position.



EP 0 125 117 A2

BALL MILL CONTROL DEVICE

The present invention concerns improvements in or relating to control devices for ball mills or similar apparatus, that is apparatus including a rotatable cylinder containing product to be processed by a tumbling action. In this specification, for convenience, such apparatus will be referred to as ball mills.

In ball mills an entry port is provided in the drum side and the mill is intended to be loaded and unloaded when the port occupies a particular position, for example, at top dead centre. In most operating arrangements an operator switches off the motor driving the cylinder of the mill when a predetermined time has elapsed or a predetermined number of rotations has been achieved. The cylinder then freewheels to rest and there is no guarantee that the port occupies the desired unloading position. The operator must then operate the start control for the motor in an attempt to bring the port to top dead centre. This is difficult and damaging to the motor and its control gear.

A further disadvantage with the existing arrangement is that the drum, during loading and unloading may free-wheel and as a result may move away from the top dead centre position. This could be dangerous and is certainly inconvenient.

It is an object of the present invention to obviate or mitigate these disadvantages.

According to the present invention there is provided a ball mill control device comprising brake means for arresting rotation of the cylinder of the mill, sensing means arranged alongside said cylinder, means on the cylinder to actuate said sensing means and counting means actuable by said sensing means, said counting means being adapted to deactuate drive means for said cylinder and apply said brake at a predetermined time.

Preferably said sensing means is magnetic, alternatively it may be light sensitive.

Preferably said counting means counts the number of revolutions of the cylinder. It may have two counters, one to count the number of revolutions of the cylinder when it is driven, one to count free-wheeling revolutions.

Preferably the means on the cylinder for actuating the sensing means are adjustable relative to the cylinder whereby the position of a port in the cylinder may occupy a predetermined position when the brake is applied.

Preferably the counting means is adjustable whereby varying driven and free-wheeling revolutions can be pre-set therein.

Preferably the brake is a friction disc brake. Alternatively it may be a drum brake, or a positive mechanical locking means, for example a latch.

Further according to the present invention there is provided a method of controlling a ball mill whereby after operation the cylinder of the mill comes to rest in a pre-

determined position including counting the number of revolutions of the cylinder, de-actuating the drive to the cylinder when a predetermined number of revolutions has been counted, counting a further predetermined number of revolutions of the cylinder as it decelerates, and applying a brake to stop the cylinder in said predetermined position.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawing which shows diagrammatically a ball mill control device.

A ball mill comprises a cylinder 10 for product to be treated rotatably mounted at each end on trunnions 12. A loading and unloading port is provided in the cylinder wall and the mill is designed for loading and unloading operations with the port at the top dead centre position.

A sensing device 14 is adjustably mounted on framework (not shown) supporting the cylinder 10 and detects a sensor actuator, in the form of a ferrous block 16, mounted on a flanged end of the cylinder. The mounting means for the block 16 are so designed that the block may be mounted at a desired angular position on the flange. Each time the block 16 passes the sensing means 14 on rotation of the cylinder a signal is generated by the means 14 and transmitted to a counting means 18 which incorporates controls for the electric motor 20 which drives the cylinder by way of a suitable transmission (not shown) and for a brake assembly 22 actuable on the cylinder or the transmission.

The counting means is provided with two presetting arrangements, a first 24 on which a predetermined number of revolutions of the cylinder when it is being driven by the motor can be set, and a second 26 on which a predetermined number of revolutions of the cylinder when it is decelerating to rest can be set.

The first number of revolutions is determined by the product to be treated in the cylinder and the degree of treatment to which it is to be subjected and the second is determined on setting up and commissioning the mill.

In operation, after loading the mill and closing the loading port, a predetermined number of revolutions is set on the first preset arrangement 24. This number is the total number of revolutions required for complete processing of the product less the number of revolutions which has been predetermined by experimentation which are required for the cylinder to decelerate almost to a stop when drive to the cylinder is discontinued. This second number is preset on the second means 26.

The motor 20 is then started and each revolution of the cylinder is detected by the sensing means 14 and signalled to the counting means 18 whereby the revolutions are counted off the first preset means 24. When this reaches zero the supply to the motor is discontinued, the cylinder begins to free-wheel to rest and the second preset means are subjected to the signal from the sensing means and commence to count

down. When zero is reached the second means cause the brake to be actuated to stop the cylinder and by pre-adjustment of the block 16 and/or the sensing means 14 the cylinder stops and is held with the port in the correct top dead centre position. The brake is only released just prior to the start of the next operating cycle of the mill.

Various modifications can be made without departing from the scope of the invention. The revolution sensing means need not be magnetic but could be mechanical or light sensitive. The brake 22 may be a drum or disc brake actuable on the cylinder or the motor or the transmission therebetween or may be a positive mechanical locking device such as a latch.

Claims:

1. A ball mill control device including brake means for arresting position of the cylinder of the mill and characterised in that sensing means (14) are arranged alongside said cylinder (10), means (16) are provided on the cylinder to actuate said sensing means and counting means (18) are actuable by said sensing means and are adapted to deactuate drive means (20) for said cylinder (10) and apply said brake (22) at a predetermined time.

2. A control device as claimed in claim 1, characterised in that said sensing means is magnetic.

3. A control device as claimed in claim 1, characterised in that said sensing means is light sensitive.

4. A control device as claimed in any one of claims 1 to 3, characterised in that said counting means counts the number of revolutions of the cylinder.

5. A control device as claimed in any one of claims 1 to 4, characterised in that the counting means (18) has two counters, one to count the number of revolutions of the cylinder when it is driven, one to count free-wheeling revolutions.

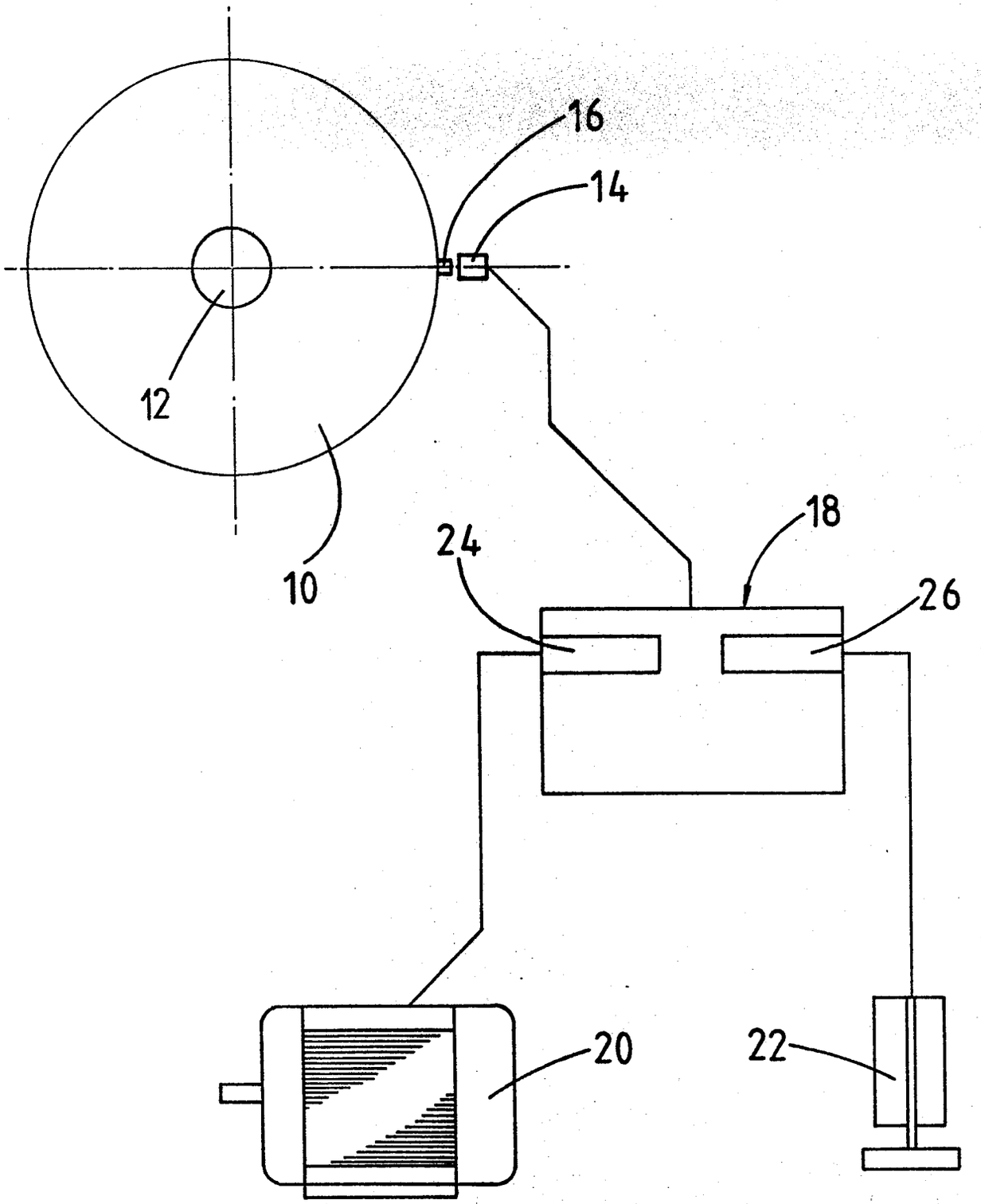
6. A control device as claimed in any one of the preceding claims, characterised in that the means (16)

on the cylinder for actuating the sensing means (14) are adjustable relative to the cylinder (10) whereby the position of a port in the cylinder may occupy a predetermined position when the brake (22) is applied.

7. A control device as claimed in claim 5 or claim 6, characterised in that the counting means (18) is adjustable whereby varying driven and free-wheeling revolutions can be pre-set therein.

8. A control device as claimed in any one of the preceding claims, characterised in that the brake is a friction disc brake.

9. A method of controlling a ball mill whereby after operation the cylinder of the mill comes to rest in a predetermined position, characterised in that the method includes counting the number of revolutions of the cylinder, deactuating the drive to the cylinder when a predetermined number of revolutions has been counted, counting a further predetermined number of revolutions of the cylinder as it decelerates, and applying a brake to stop the cylinder in said predetermined position.


16
14
12
10
18
24
26
20
22