

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 83306272.2

51 Int. Cl.³: **B 02 C 15/06**

22 Date of filing: 17.10.83

30 Priority: 23.11.82 GB 8233313

71 Applicant: **F.L. Smidth & Co. A/S, 77 Vigerslev Allé, DK-2500 Valby Copenhagen (DK)**

43 Date of publication of application: 13.06.84
Bulletin 84/24

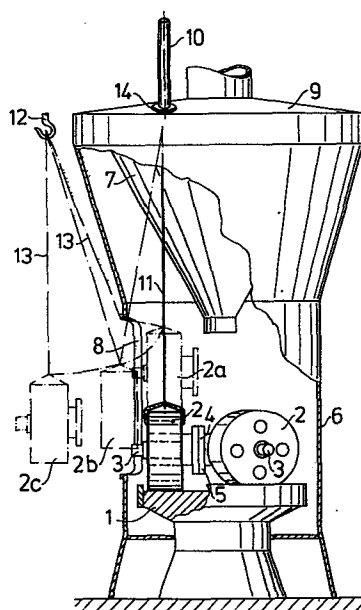
72 Inventor: **Reinhardt, Erik, c/o 77 Vigerslev Allé, DK-2500 Valby Copenhagen (DK)**
Inventor: **Petersen, Luis, c/o 77 Vigerslev Allé, DK-2500 Valby Copenhagen (DK)**

84 Designated Contracting States: **BE DE FR GB IT**

74 Representative: **Jackson, Peter Arthur et al, GILL JENNINGS & EVERY 53-64 Chancery Lane, London WC2A 1HN (GB)**

54 **Method of and apparatus for replacing a grinding roller in a vertical roller mill.**

57 A grinding roller (2) of a vertical roller mill is removed through an opening (8) in the mill housing (6), for replacement of the roller, by lifting the roller from the mill table (1) by means of an internal cable (11) connected to an hydraulic cylinder (10), fixing an external cable (13) to the roller, and slackening the cable (11) so that the roller swings out through the opening (8) suspended on the cable (13). The steps are reversed upon inserting a new roller into the mill housing.



- 1 -

F. L. SMIDTH & CO. A/S.

Ref: 50/2070/02

METHOD OF AND APPARATUS FOR REPLACING A
GRINDING ROLLER IN A VERTICAL ROLLER MILL.

The invention relates to a method of and apparatus for replacing a grinding roller in a vertical roller mill comprising grinding rollers rolling on a horizontal grinding table, and a mill housing having a side opening
5 level with the rollers for removal or insertion of a grinding roller in the mill. Such a mill is hereinafter referred to as of the kind described.

When replacing the comparatively light grinding rollers in small grinding mills it has previously caused
10 no major problems to dismount such rollers inside the mill and lift them out through a side opening in the mill housing, and normally it has not been necessary to provide the mill with special means for this purpose. However, the replacement of the large rollers in large
15 roller mills calls for special measures, and has often entailed difficulties, primarily because of the large weight of such a roller, which may be 40 tonnes or more.

Thus it is known in the grinding compartment of larger mills to build in a heavy horizontal beam, which
20 is secured to the mill housing above the centre of its side opening, and to use this beam as a support for a hoist for hoisting the roller free of the grinding table. Outside the mill housing is mounted another beam as an extension of the beam inside the mill housing, and
25 the grinding roller may then be drawn out of the mill

housing onto this beam and free of the housing.

Securing a beam above the side opening of the mill housing, however, demands that the opening and particularly its top edge is heavily reinforced, which
5 increases the price of the mill housing. Furthermore, it may be detrimental to have a large beam occupying a space inside the mill housing.

It is also known to use an outside crane and to dismount large parts of the mill housing and possibly a
10 built-in separator in order to remove a roller, but this solution is complicated, very space consuming and expensive.

Thus, it is the object of the invention to provide an easier method of replacing a grinding roller,
15 especially in a large roller mill, and for carrying out such replacement, an apparatus which is simpler and cheaper than the ones previously known.

According to the invention a method of replacing a roller in a mill of the kind described is character-
20 ised in that the roller to be replaced is placed in front of the side opening of the mill housing, released from its mounting and then hoisted vertically by means of at least one first cable suspended from at least one hoist at the top of the mill, whereupon a second cable
25 suspended outside the mill and above the side opening is connected to the roller and drawn taut while the first cable is subsequently slackened and the roller thus swung out through the side opening until it only hangs on the second cable outside the mill housing, and
30 in that a new roller is mounted in the mill by the same method used for removing a roller, but carried out in reverse order.

This method enables the hoist for lifting the roller to be placed in the top of the mill housing at a
35 position which can easily be reinforced if necessary, or

where the mill housing is already strong enough for carrying a grinding roller. It is thus unnecessary to provide stiffening and reinforcing measures around the side opening in the mill housing or to dismount large parts of the mill housing and, possibly a built-in separator, for removing a roller. Furthermore, the swinging out of the grinding roller and the swinging in of a new roller can be made in a completely controlled way which is advantageous, also for reasons of security.

The invention also includes an apparatus for carrying out the above method, characterised in that at least one hydraulic cylinder is secured to the top of the mill housing in a position substantially in the vertical centre plane of a grinding roller located in front of the side opening of the mill housing, and in that a piston rod, or an extension of the piston rod, of the cylinder extends down into the interior of the mill housing and has means for the attachment of the first cable.

It is an advantage of a hoist of the above kind that it is not too vulnerable to the ground material which is whirled up inside the mill. If desired, the hydraulic cylinder can easily be shielded so that damage caused by dust from the ground material inside the mill housing proper is almost completely avoided. Consequently, the hydraulic cylinder can remain mounted on the mill during the operation of the latter, ready for use.

To obtain an improved control of a grinding roller to be lifted and further to be able to place the hoisting apparatus so as not to interfere with, e.g. a separator inside the mill housing, it is advantageous if the hoisting apparatus comprises two hydraulic cylinders which may then be disposed adjacent to the circumference of the mill housing.

To avoid an offset pull in the piston rods of the

5 cylinders it is advantageous if the or each cylinder is mounted on a ceiling of the mill housing in a rocker bearing so that the axis of the cylinder and the piston rod can continuously adapt to the direction of pull in the first cable.

The invention will now be described in more detail by way of an example of a vertical roller mill as illustrated in the accompanying drawings, in which:-

10 Figure 1 is a diagrammatical side elevation, partly in section, of the mill; and,

Figure 2 is an elevation of the mill, as seen from the left in Figure 1.

As shown in the drawings, the mill has a grinding table 1 which is rotatable about a vertical axis.
15 Rolling on the grinding table 1 are three grinding rollers 2 which are rotatable about stationary horizontal shafts 3. The three rollers are secured to a common central frame 4 by means of flanges 5. The rollers are urged downwards against the grinding table by means of
20 pull or pressure means, not shown.

The mill is, in a manner known per se, encased by a mill housing 6, and at the top of the mill housing is a stationary, built-in separator 7.

25 The mill housing is provided with a side opening 8 level with the grinding rollers and having a size necessary for removing and inserting a grinding roller.

On a roof 9 of the mill housing are mounted two hydraulic cylinders 10, the piston rods of which project into the housing. The cylinders are mounted in
30 positions substantially in the centre plane of a roller placed in front of the side opening of the housing.

The hoisting apparatus, in the form of the hydraulic cylinders, is operated in the following way:-

35 The grinding roller to be removed from the mill housing is placed as shown in Figures 1 and 2 in front

of the opening 8 of the housing. This is achieved by disconnecting the means for holding the roller axes stationary and also the means for urging the rollers downwards; and rotating the grinding table with the rollers resting and carried on the table. The grinding roller is then released from the central frame 4 and steel wires 11 fastened at one of their ends to the piston rods of the hydraulic cylinders 10 are secured at their other ends to the grinding roller 2, or as shown, form part of a continuous wire passing through a loop which is secured to the roller.

In a known, but not shown, manner the pistons of the hydraulic cylinders are subsequently put under pressure in an upward direction whereby the grinding roller is lifted to a position 2a as indicated by dotted lines in Figure 1.

From a crane hook 12 outside the mill another steel wire 13 is introduced through the opening and secured to the roller in its position 2a. The steel wire 13 is drawn taut and held at that length.

By decreasing the pressure in the hydraulic cylinders 10, the steel wires 11 are then effectively payed out and, by the pull from the steel wire 13 the roller is swung out through the side opening 8 from the position 2a to a position 2b in which the roller is supported by both the inside steel wire 11 and the outside steel wire 13. By continued slackening of the steel wires 11 the outside steel wire 13 takes over more and more of the roller weight until the roller is suspended perpendicularly under the crane hook 12 in position 2c. In this position the steel wire 11 can be removed from the roller after which the roller can be lowered down onto a truck or carried away suspended from the crane hook 12.

When mounting a new roller in the mill the same

procedure is followed, but in reverse order, i.e. the roller is hoisted in the hook 12 to the position 2c, after which the steel wires 11 from the hydraulic cylinders 10 are connected to the grinding roller and drawn taut, the length of the outside steel wire 13 being retained. The grinding roller is then swung via the position 2b to the position 2a inside the mill housing. In this position the outside steel wire 13 is released from the grinding roller after which the latter by means of the hydraulic cylinders and suspended from the steel wires 11 is lowered onto the mill table to be mounted on the central frame 4.

To avoid an offset pull in the piston rods of the hydraulic cylinders 10 the latter are secured on the roof of the mill housing in rocker bearings 14 so that the piston rods of the cylinders can, at all times, adjust themselves according to the directions of the pull of the steel wires 11.

During normal mill operation the steel wires 11 are dismantled and the piston rods in the hydraulic cylinders withdrawn and possibly covered. Similarly, the opening 8 is closed by a cover.

- 7 -

CLAIMS

1. A method of replacing a roller (2) in a vertical roller mill comprising grinding rollers (2) rolling on a horizontal grinding table (1), and a mill housing (6) having a side opening (8) level with the rollers
5 for removal or insertion of a roller in the mill, characterised in that the roller (2) to be replaced is placed in front of the side opening of the mill housing, released from its mounting and then hoisted vertically (2a) by means of at least one first cable
10 (11) suspended from at least one hoist (10) at the top of the mill, whereupon a second cable (13) suspended outside the mill and above the side opening is connected to the roller and drawn taut while the first cable is subsequently slackened and the roller
15 thus swung out through the side opening until it only hangs (2c) on the second cable outside the mill housing, and in that a new roller is mounted in the mill by the same method used for removing a roller, but carried out in reverse order.
- 20 2. An apparatus for carrying out the method according to claim 1, characterised in that at least one hydraulic cylinder (10) is secured to the top of the mill housing (6) in a position substantially in the vertical centre plane of a grinding roller (2)
25 located in front of the side opening of the mill

housing, and in that a piston rod, or an extension of the piston rod, of the cylinder extends down into the interior of the mill housing (6) and has means for the attachment of the first cable (11).

- 5 3. An apparatus according to claim 2, characterised in that the hydraulic cylinder is mounted on a roof (9) of the mill housing in a rocker bearing.

1/2

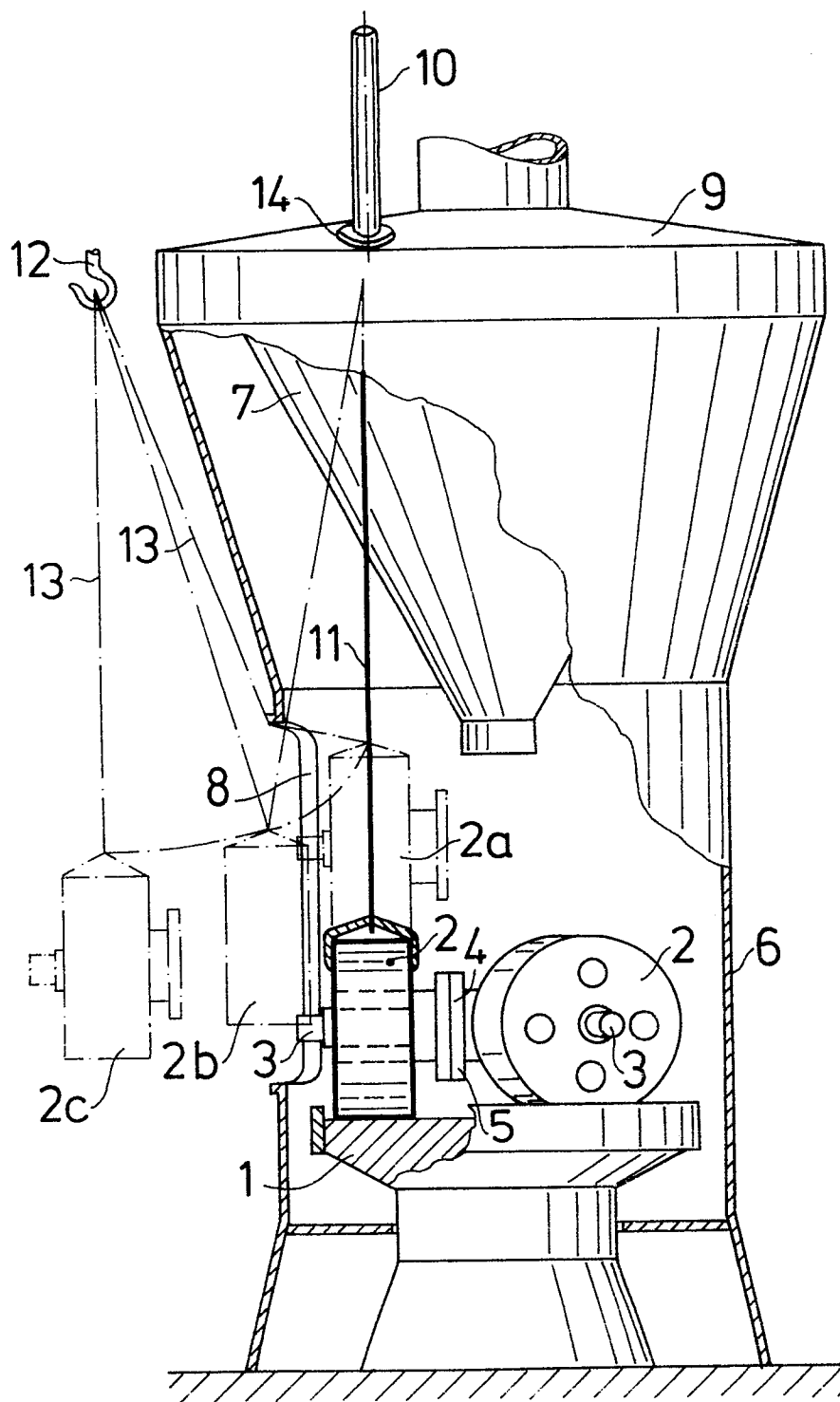


Fig.1

2/2

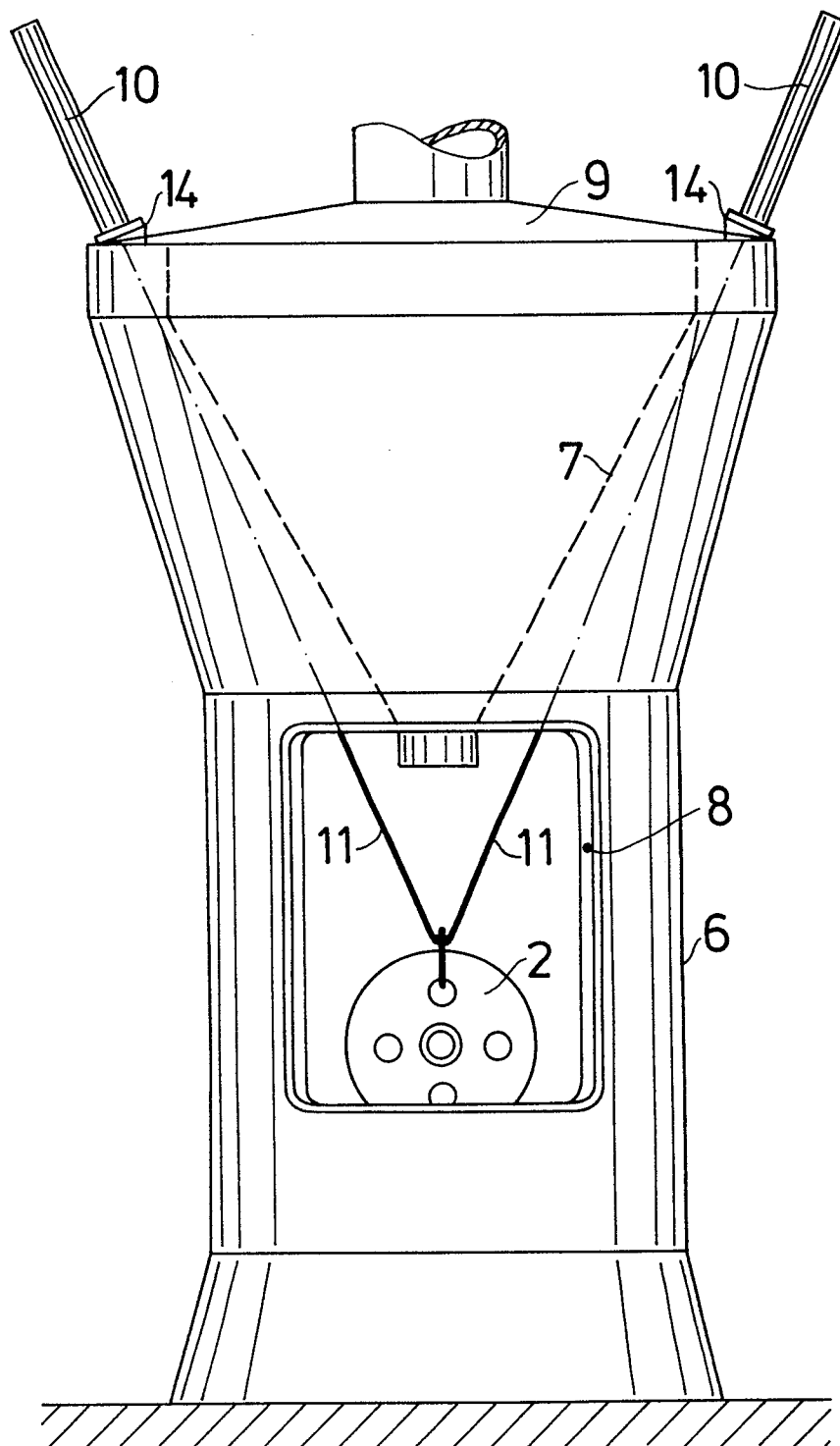


Fig.2