ABSTRACT

A roll grinding device for a roll supported by chocks, comprising a plurality of vertically movable pins for supporting the chocks, each pin having a slope at its lower end, and a plurality of horizontally movable wedge members, each having a slope at its upper end adapted to be mated with the slope of a pin, for controlling the vertical positions of the pins. An assembly is provided for moving the wedge members horizontally, and the moving force is limited to a value less than that which can lift the total weight of the roll and the chocks at the supporting pins. An assembly is also provided for engaging the peripheral face of the roll near the chocks and for moving the roll from a non-grinding to a fixed grinding position in the chocks.

4 Claims, 5 Drawing Figures
ROLL GRINDING DEVICE INCLUDING CHOCK POSITIONING MEANS

REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my co-pending application Ser. No. 202,770, filed Nov. 29, 1971, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a roll grinder, and, in particular, to a roll grinding device adapted to be attached to such a roll grinder without removing its bearings and chocks to fix the bearings and chocks in their proper positions, thereby provide a support for the roll, whereby the roll which is used in rolling or other operations can be re-ground.

Heretofore, since such rolls have been generally supported by bearings at opposite ends of their bodies, when such a roll was to be re-ground it has been necessary to first remove the chocks which receive the bearings and then to support the roll by a cradle of the roll grinder at the journal portions thereof.

However, the mounting and removing of the chocks for every re-grinding of the roll requires considerable time and labor, and it is possible to damage the bearings and the fixing means.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a grinding device which can be mounted on a roll grinder without removing its bearings and chocks, and by which an excellent re-grinding is possible without using any special or complicated machinery.

The present invention is directed to a roll grinding device for a roll grinder, which comprises, characterizingly, a plurality of pins for supporting chocks, each having a slope at its lower end; a plurality of wedges, each having a slope adapted to be mated with the slope of a pin, for determining the vertical position of said pin; means such as fluid piston and cylinder units for moving the wedges in the horizontal direction and for limiting the moving force of said wedges such that it is less than the force which causes a lifting of the total weight of the roll and the chocks at the position of the pins; and shoes adapted to urge the peripheral face of the roll near the chocks to a grinding side for fixing the position of the roll in the chocks.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and features of the present invention will become apparent from the following description of a preferred embodiment of the present invention shown in the attached drawings, in which:

FIG. 1 is a schematic plan view of an embodiment of the apparatus of the present invention when a roll is mounted;

FIG. 2 is a side elevational view of a cradle having pins for supporting the weight of the roll at the chocks;

FIG. 3 is an enlarged sectional view taken along line III—III in FIG. 2, showing the mechanism for actuating the supporting pins;

FIG. 4 is a schematic view of an oil pressure system for actuating the supporting pins; and

FIG. 5 is an enlarged elevational view taken along line II—II in FIG. 1, showing shoes for preventing the roll from vibrating in the radial gap between the roll and the bearings. The gap between the inside of the bearing 17 and the outside of the support spindle 19 is greatly exaggerated for purposes of illustration.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A roll 15 having support spindles 19 at either end thereof is initially provided with a driving dog 1 rotated by any suitable means — as, for example, an electric motor. The roll 15 is then mounted on a grinder. Then, as shown in FIG. 1, a center 14 of a loose tall stock 2 is advanced and, together with a center of a head-stock 3, supports the roll 15 as well as centers the same. The grinding wheel may translate with respect to the roll or vice versa, but conventionally, and as shown, the grinding wheel translates reciprocally with respect to the roll. The relative motion of the two may be secured by any conventional means — as, for instance, a rack secured to the frame, a spiral gear mounted on the housing containing the grinding wheel, a suitable motor contained in the housing to drive the spiral gear, and means for reversing the direction the spiral gear is driven at either end of the grinding wheel’s traverse.

In this case, beneath two chocks 16, a cradle 4 is provided, a slight gap d being provided between the chocks 16 and the cradle 4 (See FIG. 2). Further, a plurality of supporting pins 5, e.g., four, are provided on the upper face of the cradle 4, and all of the supporting pins 5 about the lower faces of the chocks 16 by means of an oil pressure operation, the supporting pins being stopped by appropriate control means at positions where they bear the loads equally. This is necessary because the lower faces of the chocks 16 with which the supporting pins 5 are engaged are not completely flat. Accordingly, the supporting pins are provided for eliminating troubles during the grinding operation, such as swinging due to unsteadiness or setting which causes an undue amount of wear on the bearings.

The operating mechanism of the supporting pins 5 is shown in FIGS. 3 and 4. In FIG. 4, numeral 9 is a distributor valve, and the pump PF is a power source which forces pressurized fluid into conduits in order to move the pistons 7 in the cylinders 6. When the supporting pins 5 receive the lower portions of the chocks 16 and a push button actuating the pressure controlling means PC is depressed, a solenoid SOL 1 associated with valve 9 is energized to feed fluid under pressure into the cylinders 6. For example, four cylinders 6 are provided so that four pistons 7 in the cylinders are actuated to shift four wedges 8 laterally or to the right as shown in FIG. 3, to thereby move the supporting pins 5 upwardly.

When the pushing force derived from the oil pressure cylinders 6 is smaller than the total weight of the chocks 16 including at least roll 15, the supporting pins 5 do not push the chocks 16 upwardly but it does eliminate the gap between the pins 5 and the lower faces of the chocks 16 (See FIG. 2). In this manner, the respective supporting pins 5 are stopped at the positions where the gap between the pins 5 and the lower faces of the chocks 16 is eliminated, i.e., when the upper faces of the pins 5 contact the lower faces of the chocks 16.

Since the wedges 8 are held in their positions, the supporting pins 5 are not moved downwardly by the weight of the chocks 16 and the roll 15, even though the push button of the oil pressure operation is released, or the center 14 is retracted to separate it from...
the roll 15 after the completion of the aforementioned centering operation and before the grinding operation. An adjustment screw 11 and a tightening screw 12 constitute fastener means for preventing the chocks 16 from slipping laterally and falling down.

Although, in this manner, it is possible to grind the body portion of the roll 15 by receiving the chocks 16 comfortably, the bearings in the chocks 16 will be unstable with respect to the grinding pressure applied from the side because the bearings have radial gaps regardless of whether they are of the flat type or of the rolling type. Accordingly, the precision working of workpieces such as a complete circle and circular cylinder is very difficult.

To alleviate this problem, a stabilizing mechanism shown in FIG. 5 is provided for stabilizing the supporting positions at which the body of the roll 15 is received. The numeral 13 represents shoes, and, when the body of the roll 15 is engaged by the shoes 13, the roll 15 is shifted in the horizontal direction by a certain amount \( \delta \) because the center \( O_1 \) of the support spindle 19 is lower than the center \( O_2 \) of the bearing 17 by a half of the gap there-between. The shoes 13 are mounted on the frame of the machine, as may be seen in FIG. 5, and the motion thereof required to keep them in urging contact with the roll 15 may be provided by means of a screw and motor, fluid-cylinders, or any other appropriate means, many of which are well known to the art per se. The shifted amount \( \delta \) can be calculated from the following formula where \( W \) is the weight of the roll 15, \( e \) is the difference between the diameter of the bearing 17 and the diameter of the support spindle 19, and \( P \) is the urging force of one of the shoes 13:

\[
\delta = \frac{P \cdot e}{\sqrt{(2e)^2 + W^2}}
\]

Accordingly, if the urging force \( P \) of the shoes 13 is as large as possible without scratching or flawing the roll 15, and the shift amount \( \delta \) in the horizontal direction is large, the body of the roll 15 is reduced by the grinding operation, and the center position of the roll is changed while the amount \( \delta \) remains constant. Therefore, it is not necessary to move the shoes while grinding, unless the reduction of the roll radius reaches \( \delta \) and the urging force becomes substantially zero.

In accordance with the present invention, if, as shown in FIG. 2, either the distance \( X \) or \( Y \) from the face receiving the chocks 16 is constant, the centering operation of the center 14 can be eliminated by provid-

ing sheet metal 10 of a predetermined thickness on the upper face of the cradle 4, positioning the chocks 16 on the sheet metal and thereafter raising the supporting pins 5; setting, for the front and back direction, the adjusting screw 11 provided on the bracket 18 depending upon the distance \( X \); and tightening the screw 12 so that it is in urging contact with the screw 11.

According to the present invention, as will be clear from the foregoing description, owing to the combination of a suitable number of supporting pins 5 for receiving the chocks 16, which are moved vertically and held in their positions by the wedges 8, and the shoes 13 for preventing the roll from vibrating, the roll 15 can be supported by the bearing portions 17 of the chocks 16, leaving the chocks as they are, and can be very easily reground under the same conditions as those under which the roll is used. Thus, the necessity of the mounting and removing of the chocks 16 is eliminated. Therefore, the working operation can be considerably simplified and the roll being reground is not subject to any vibration.

In particular, according to the present invention, since the mechanical construction is very simple, it can be applied to the conventional universal type roll grinder without any modification.

What is claimed is:

1. A roll grinding device for a roll supported by chocks, said device comprising: a plurality of movable supporting pins for supporting the chocks, said pins having sloped lower faces, a plurality of movable wedges having sloped upper faces adapted to mate with the sloped faces of said supporting pins for determining the vertical positions of said supporting pins, means for moving said wedges and for limiting the moving force to a value less than that which can lift the total weight of the roll and said chocks, and means for fixing the position of the roll within the chocks.

2. The roll grinding device of claim 1 wherein said means for moving said wedges comprises a fluid actuated piston and cylinder unit.

3. The roll grinding device of claim 1 wherein said wedges are movable in a substantially horizontal direction, and said pins are movable in a substantially vertical direction.

4. The roll grinding device of claim 1 wherein said means for engaging and urging the roll comprises a plurality of shoes.