Aug. 25, 1953 H. K. WIEMER 2,650,034

HOLLOW WATER COOLED ROLLER FOR ROLLER MILLS

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FIG. 1.

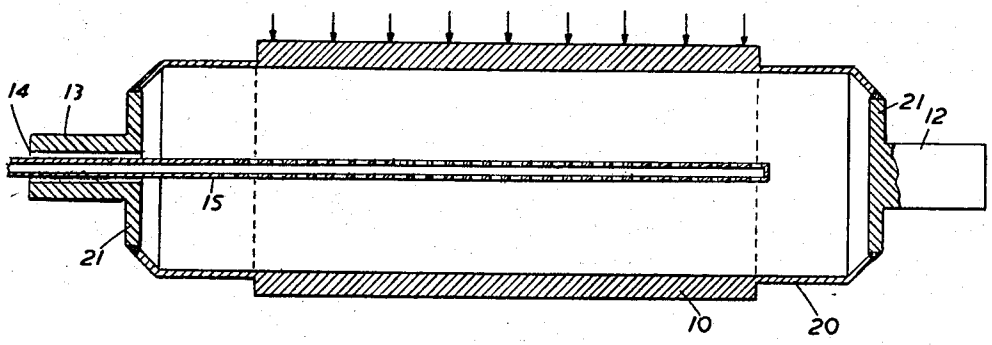
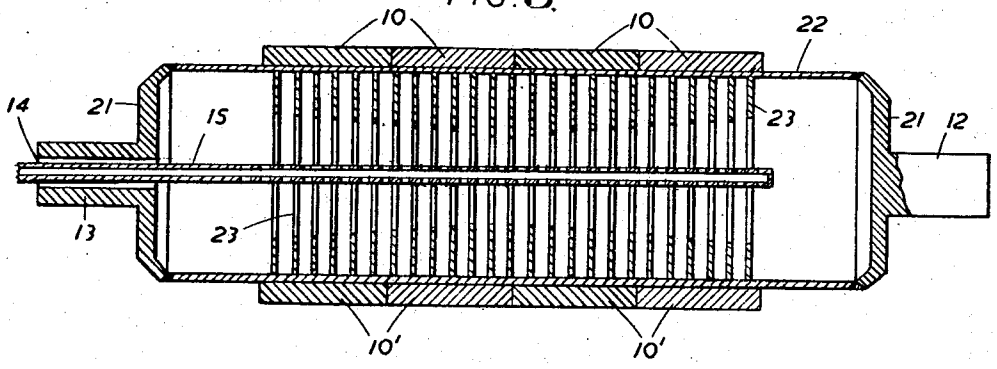


FIG. 2.



FIG. 3.



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HOLLOW WATER COOLED ROLLER FOR ROLLER MILLS

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6 Claims. (Cl. 241—67)

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This invention relates to rollers for rolling mills in the chocolate, cocoa, soap and paint industries. For the sake of illustration the application of the invention to the chocolate industry is hereafter described.

For grinding cocoa or chocolate masses or paints and the like roller mills are used, the rollers of which must be finished with extraordinary accuracy (they are ground to an accuracy of 1/1000 mm.) in order to produce a high grade ground product. In spite of the most careful finishing of such rolling mills they have disadvantages which it has long been sought to avoid in various ways without satisfactory result.

As usually employed in such rolling mills each roller consists of a hollow cylinder which is closed at both ends by disc shaped portions the journals being connected to these discs. One journal is bored and a small diameter tube extends through this bore and delivers cooling water supplied by the tube into the interior of the roller body, the bore itself forming also an overflow outlet. The two rollers if accurately finished make linear contact with one another. When the material to be ground is fed through the gap between the two rollers under the usual very high pressure (100–150 kilograms per centimeter length of roller) the walls of the rollers become somewhat deformed at the grinding position towards the middle since they are stiffened at the ends by means of the discs while the body of the rollers can yield resiliently at the middle. Consequently, the rollers are not stressed uniformly over their whole length by the material with the result that a different pressure is exerted at the middle from that exerted at the ends and the ground product produced is non-uniform.

An attempt has been made to overcome this disadvantage by making the rollers partly spherical. When two partly spherical rollers are pressed together at a suitable high pressure the resilience of the roller walls permits modification of the shape so that finally a rectilinear roller profile is produced at the contact position, the pressure being distributed uniformly over the whole length of the rollers. On the pressing together of the spherical rolls with consequent reduction in diameter occurring at the middle of the rolls however the contact of the rollers no longer remains pure linear contact but becomes a surface contact which is greatest midway of the length of the rolls and diminishes to zero at the ends of the rolls. As the result material being ground at the middle where the surface is large is differently treated from that

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at the ends and thus with this construction also grinding is not completely uniform over the whole length of the roller. Moreover in view of the form of the surface contact wear of the material of the rollers takes place more rapidly at the middle so that a hollow track is produced and the grinding operation is unfavourably affected. This disadvantage renders necessary frequent stoppage of the mill and tedious regrinding of the rollers.

These disadvantages are avoided by the rollers of the present invention which comprise a grinding cylinder having resilient axial extensions, such axial extensions having less wall thickness than the grinding portion of the said cylinder, supporting axles for the roller and end discs connecting the resilient axial extensions with the axles.

With this arrangement the rollers are resiliently bedded and therefore all the forces acting on them in the grinding process can be distributed uniformly over the whole length of the rollers, there being theoretically linear contact of the rollers at the meeting position, but actually a small contact surface constant in width over the whole length.

Two embodiments of the invention are illustrated diagrammatically in the accompanying drawing.

Fig. 1 shows an embodiment in vertical longitudinal section, Fig. 2 illustrating the contact surface resulting from the contact of such rollers. Fig. 3 shows a further embodiment also in vertical longitudinal section.

In the embodiment shown in Figs. 1 and 2 the body 10 preferably of chilled cast iron is completely smooth and has the same wall thickness throughout. This hollow body is connected by extensions 20 of less wall thickness projecting from its ends with discs 21 mounted on the supporting axles 12 and 13. These extensions 20 which are integral with the roller 10 in the embodiment illustrated, are shown as considerably thinner than the roller itself. For example the thickness of wall of the extensions 20 is 10 mm. when the roller body 10 has a wall thickness of 50 mm. in a length of roller of 1,000 mm. By virtue of the thin walled extensions 20 between the disc ends 21 and the roller body the resilience aimed at by the present invention is obtained. Thus in this construction also as is clear from Fig. 2, at the contacting part of two cooperating grinding rollers a grinding surface is produced which is approximately of the same width throughout its entire length. Although the width

of this grinding surface midway of the length of the rollers differs slightly from the width at the ends this difference has practically no effect.

The embodiment illustrated in Fig. 3 is similar to that shown in Figs. 1 and 3 but in this case the roller body 10 is structurally separated from the resilient part. This resilient part is formed by a hollow cylindrical body 22 of steel, a drawn steel tube of suitable diameter being connected with the disc 21 by welding or the like. The roller body of suitable length is pressed on to this hollow steel tube. In order to compensate for the small differences in resilience resulting from the connection with the resilient part of the roller, in this construction annular discs 23 are forced into the hollow tube 22 which discs form laminae spaced short distances apart within the hollow cylinder. The internal diameters of these annular discs vary from the ends of the hollow body towards the centre being smaller towards the centre.

Better cooling of the roller body 10 is obtained by means of these discs. The roller body 10 is formed of separate rings 10' which are easily produced and are interchangeable. According to the nature of the material to be ground the separate rings will consist of chilled cast iron, steel, granite, porcelain, Carborundum, Alundum or the like.

I claim:

1. A hollow water-cooled metal roller for roller mills for the grinding of chocolate, cocoa or the like, comprising a hollow metal cylindrical grinding portion having a resilient cylindrical axial extension at each end for distributing the forces acting on the roller substantially uniformly over the whole length of the cylindrical grinding portion, such axial extensions having less wall thickness than the grinding portion of the roller, a supporting axle for each end of the roller, end discs connecting the resilient axial extensions respectively with the axles, and means for conducting cooling water to the interior of the roller.

2. A hollow water-cooled metal roller for roller mills as claimed in claim 1, wherein the grinding portion of the roller comprises a roller body press fit over a thin walled hollow cylinder of steel.

3. A hollow water-cooled metal roller for roller mills as claimed in claim 2, including a series of annular discs at short distances apart located in and fitting the interior of wall of the roller along the hollow cylindrical grinding portion of the roller, the internal diameter of the annular discs decreasing from the ends towards the middle of the series of annular discs.

4. A hollow water-cooled metal roller for roller mills as claimed in claim 1, wherein the grinding portion of the roller comprises a plurality of metal rings embracing a thin-walled hollow steel cylinder.

5. A hollow water-cooled roller for roller mills for the grinding of materials, comprising a hollow thin-walled cylindrical steel member, a cylindrical roller body grinding portion secured to and embracing said thin-walled cylindrical member intermediate its ends leaving portions of the thin-walled cylindrical member at each end providing a resilient structure at each end beyond the cylindrical roller body grinding portion of the roller for distributing the forces acting on the roller substantially uniformly over the whole length of the cylindrical roller body grinding portion, said cylindrical roller body grinding portion of the roller comprising a series of similar adjacently-mounted rings, said rings being comprised of a material selected from the group of materials consisting of chilled cast iron, steel, porcelain, granite, Carborundum and Alundum, a supporting axle for each end of the roller, end discs connecting the ends of the thin-walled cylindrical member respectively with said axles, and means for conducting cooling water to the interior of the roller.

6. A hollow roller for roller mills for the grinding of materials, comprising a hollow chilled cast iron cylindrical roller body grinding portion intermediate the ends of the roller proper, a supporting axle at each end of the roller, a disc carried by each axle facing toward and spaced from the roller body grinding portion, and a hollow resilient metal structure located at each end of the roller body grinding portion for supporting said portion and being attached to the adjacent disc, the hollow resilient metal structures of the roller serving to distribute the forces acting on the roller substantially uniformly over the whole length of the grinding portion of the roller, said hollow metal structure being at least in part cylindrical, being of smaller diameter than said portion, and being axially arranged with respect to said hollow cylindrical roller body grinding portion and said disc and axle.

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