Oct. 15, 1940. A. A. TUNLEY ET AL 2,217,974

CHOCOLATE AND LIKE REFINER ROLL MACHINE

Original Filed April 3, 1934 2 Sheets-Sheet 1

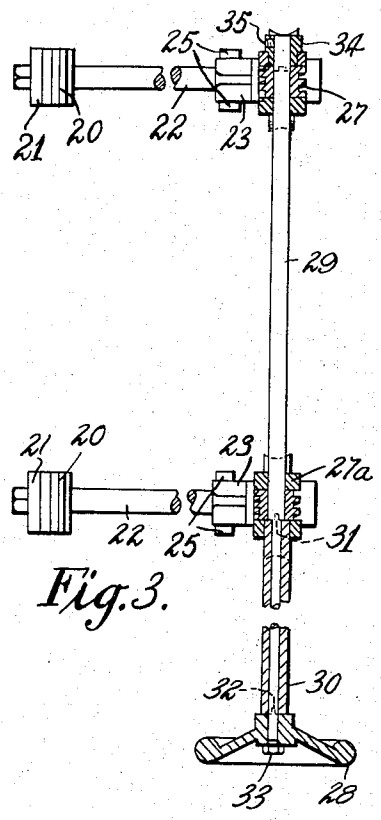


Fig. 3.

Fig. 1.

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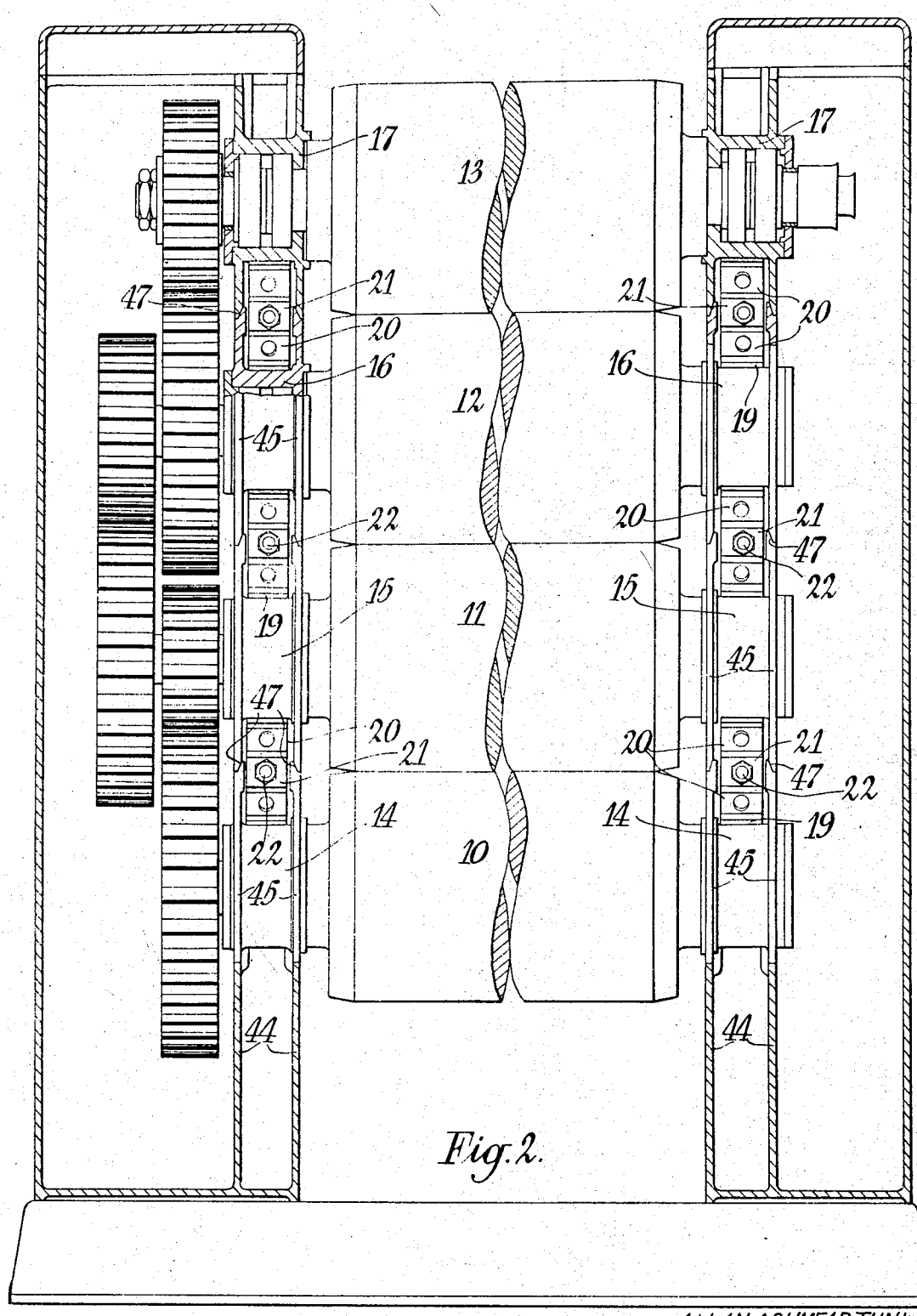


Fig. 2.

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UNITED STATES PATENT OFFICE

2,217,974

CHOCOLATE AND LIKE REFINER ROLL MACHINE

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Original application April 3, 1934, Serial No. 718,798. Divided and this application April 3, 1937, Serial No. 134,765

1 Claim. (Cl. 83—12)

This invention relates to refiner roll machines for grinding chocolate and like material to a very fine paste.

The object of the present invention is to provide improved means whereby the working clearance or nip between co-operating pairs of rolls may be adjusted without disturbing or requiring a corresponding readjustment of another or others of the rolls of the series.

According to a feature of the invention, in a five-roll refiner or like machine having a series of co-operating rolls, a fixed abutment is provided which may be the trunnion housing of one roll and novel means are provided between the abutment (or abutment roll) and the next adjacent roll, and between each succeeding pair of rolls adapted to vary the distances between the axes of adjacent rolls, the arrangement being such that when an adjustment is made, all the rolls on the side of the adjusted roll remote from the abutment (or abutment roll) are bodily displaced while maintaining their respective clearance or nip.

The invention consists in making the bearing housings or like mountings of the rolls dependent one upon the other so that the displacement of the upper of an intermediate pair of the vertical series of rolls, displaces those above it as a unit correspondingly, and providing means operating with wedge-like action between the bearing housings of each pair of rolls, designed and adapted to vary, with minimum friction and a high degree of accuracy, the distance between the axes of the rolls to adjust the working clearance or nip between such.

According to one form, the bearing housings of a series of rolls are joined together by linking them intermediate the adjustable members such as eccentrics or cams, while in another form the housings of each roll bear upon the housings beneath by gravity and with or without supplementary resilient pressure, through the intermediary of an anti-frictional adjustable wedge device, eccentric, or other variable member. The second form of the invention is shown, described, and claimed in our copending United States Patent No. 2,080,364, filed April 3, 1934, issued May 11, 1937, of which this application is a division. The present invention is also described and claimed in our British Patent No. 417,723, dated April 7, 1933.

In the accompanying drawings which illustrate the application of the invention to a five-roll chocolate refiner,

Figure 1 is a cross section of the refiner, the section being taken through the roll adjusting mechanism,

Figure 2 is a corresponding front view partly in section,

Figure 3 is a detail of the toggle adjusting mechanism.

In the drawings, Figures 1 and 2 show the invention applied to, say, a five-roll refiner in which a series 10, 11, 12, 13 of the rolls are arranged with their axes substantially in a vertical plane, the lowermost roll 10 of the series is mounted in bearing housings 14, the vertical positions of which are maintained fixed, the bearings 15, 16, 17 of the rolls 11, 12, 13 above it being slidably mounted in vertical guideways 18. Speaking of one side of the machine only, for convenience, the uppermost side of the lowermost (fixed) bearing housing 14 and the lowermost side of the uppermost housing 17, and the upper and lower sides of the housings 15 and 16 of intermediate rolls are provided with faces or plates 19 located parallel with the axes of the refiner rolls. The bearing plates 19 are mounted on the housings by pins 19a engaging apertures in the housings. Mounted between the opposing faces 19 are wedge means adjustably mounted so that slight frictional movements thereof tend to adjust the axes of the adjacent pair of rolls.

According to the preferred form, the wedge means comprises a toggle device consisting of a pair of substantially upright thrust-transmitting toggle plates 20 and an adjustable thrust-producing block 21 which is adjustable in a direction at right angles to the plane of the axes of the refiner rolls. The plates 19 on the housings and the block 21 are provided with grooves to accommodate the edges of the toggle plates 20.

Each toggle block 21 may be carried by a screw-threaded spindle 22 passing through it and by which it is actuated for adjusting the toggle. According to one mode, each spindle 22 passes through a mounting 23 supported in the framework 24 by trunnions 25 in order to accommodate vertical displacements of the ends of the spindles associated with the blocks. The ends of the spindles are threaded to receive worm wheels 26 which mesh with worms 27 carried by the mounting 23. Rotation of the worms is effected by a hand wheel 28.

The toggle adjustment may be separately effected in connection with the bearing housings on each end of the rolls or the toggles for each pair of rolls may be adjusted together by operating their spindles 22 from a common hand wheel through bevel or other gear.

According to a convenient arrangement (see Figure 3) an actuating spindle 29 extends between the worms 27, 27a associated with a pair of adjacent rolls. The spindle is reduced at one end to accommodate a slidable sleeve 30 which is provided with a clutch 31 coupling it to the worm 27a and a second clutch 32 coupling it to the operating hand wheel 28. The latter is splined to the spindle and a nut 33 is provided so that the hand

wheel may be drawn back to de-clutch it from the spindle.

At the other end the spindle is provided with a short sleeve 34 forming a clutch element which is coupled to the worm wheel 27. The sleeve 34 is fixed to the spindle by a set screw 35.

By this arrangement when the parts are in the position shown in Figure 3 rotation of the shaft 29 will cause an adjustment of both ends of the rolls, i. e., a displacement of the roll. On slacking back the nut 33 and declutching the hand wheel 28 from the sleeve 30, only the worm 27 will be actuated with consequent adjustment of the corresponding ends of the rolls relatively to the other ends.

The uppermost bearing housing 17 of the series is provided with a resilient spring device comprising a spring 36 located horizontally and acting through a rod 37 upon a bell crank lever 38, one arm of which engages a lever 39 pivoted to the framing 24 and bearing upon the housing 17 whereby a resilient pressure is brought to bear upon the housing and consequently presses downwardly all the bearing housings and maintains a close contact between them and their toggle means. As an alternative to employing resilient spring pressure, counterweighted levers may be employed to produce a similar effect by gravity or a combined gravitational and resilient pressure may be employed.

Fixed and accurate adjustment is the keynote of the problem, and this problem is solved by having adequate pressure tending to force the rolls together and providing unyielding and incompressible wedge or toggle means which acts variably to limit the inward movement of the rolls, or variably to thrust them outward against the spring load. It will be seen, therefore, that the function of the springs 36 is to thrust the rollers together hard against the separating means and, so to speak, follow up the displacement on the one hand, while on the other hand enabling the rolls automatically to be moved outward under the thrust of the wedging means.

Any roll, such as the initial roller 40 of the refiner, which is out of the vertical plane of the main series of rolls may be provided with adjustment means 41 independently with respect to the roller 10 with which it co-operates.

According to the above arrangement assuming it is desired, for example, to adjust the clearance of nip between the first and second rolls 10 and 11 of vertical series of rolls, the hand wheel of the appropriate toggles is rotated to retract or thrust in the block 21 according to whether it is desired to increase or decrease the roll clearance. If the clearance be increased then the second roller 11 and those above it, 12 and 13, are raised in accordance with the amount of adjustment effected, but as the rolls 12 and 13 above are moved as a unit, the adjustment produces no alteration of the clearances between 11 and 12 and between 12 and 13. If the block 21 is adjusted to decrease the clearance then the second roller and those above it will be lowered as a unit a corresponding extent. Similarly, the clearance between any pair of rolls of the series may be adjusted.

The bearing housings 14 to 17 for the vertical series of rolls are carried by levers 42 which are pivoted in the framework 24 at 43. Levers 42 and pivots 43 take the working thrusts exerted horizontally by the rolls, avoiding the necessity for heavy front and rear guideways for the housings. The usual style of mounting for these housings or blocks is ineffectual in roll mills of this kind, because from a practical point of view, it is impossible to construct blocks sliding in vertical guides without back lash or rocking play. We have, therefore, adopted the pivoted arm arrangement in order to remove from the construction the possibility of error in this respect. Obviously, it would be futile to devise an adjustment means adapted to secure the very high degree of accuracy required in chocolate refining rolls if the bearings or their supports themselves had clearances permitting material displacement to occur.

Conveniently the levers 42 and the toggles and their adjusting means are located in compartments formed by parallel walls 44 of the side frame members.

In order to close the spaces between the bearing housings 17, the latter are provided with plate elements 45 which loosely engage rebates 46 in the edges of the frame members 44. Adjacent edges of the plate are formed with overlapping parts 47.

The plates 45 of the lowest housings 14 engage a horizontal surface 48 which support the housing in a definite position so that the housing 14 acts as an abutment to take the thrust of the toggles or wedge means. The levers 42, frame members 44, slidable plates 45 and their overlapping parts 47 provide a mechanism in which the parts, with the exception of the rolls, are totally enclosed, so that oil and grease can not be splashed about and onto the rolls.

Certain modifications in the structure shown may be made without departing from the invention. For example, instead of providing the feeding roll with an independent adjusting device, this roll may be fixed and provide the abutment, in which case, the roll 10 may be adjustable as to height by toggle means between the housing of such roll and a suitable part of the framework.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

In a multiple roll refiner or like machine including a vertical series of co-operating rolls each mounted in journal housings carried on the ends of levers pivoted to a fixed support, each journal housing of said series below the topmost roll being in weight-supporting relationship with the journal housing adjacent it, in combination, resilient pressure means acting upon the end roll of the series of rolls to urge the adjacent rolls of said series together, and means for adjusting and maintaining the nip between adjacent rolls counter to the action of said resilient pressure means, each of said adjusting means comprising a thrust-producing block-like element between each pair of adjacent rolls movable lengthwise in a plane perpendicular to the plane of the axes of the rolls, and co-operative incompressible thrust transmitting means between said element and the adjacent housings adapted for slight rotational movement between said element and roll, said thrust-producing elements and thrust-transmitting means being bodily displaceable vertically with their associated journal housings.

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