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(54) **Roller mills.**

(57) A roller mill for bruising, rolling or crushing cereals as an animal foodstuff comprises a support in which a plurality of metal rollers 3, 4, 5 are arranged in a downward succession of counter-rotatable operating pairs with the peripheries of each pair providing a nip therebetween. The nips of the rollers form a passage through which the cereals can pass to be progessively flattened. Means are provided to adjust the width of gap in each nip to determine the degree of flattening to be applied to cereals passed therebetween. At least one roller (3) is adapted to be driven.

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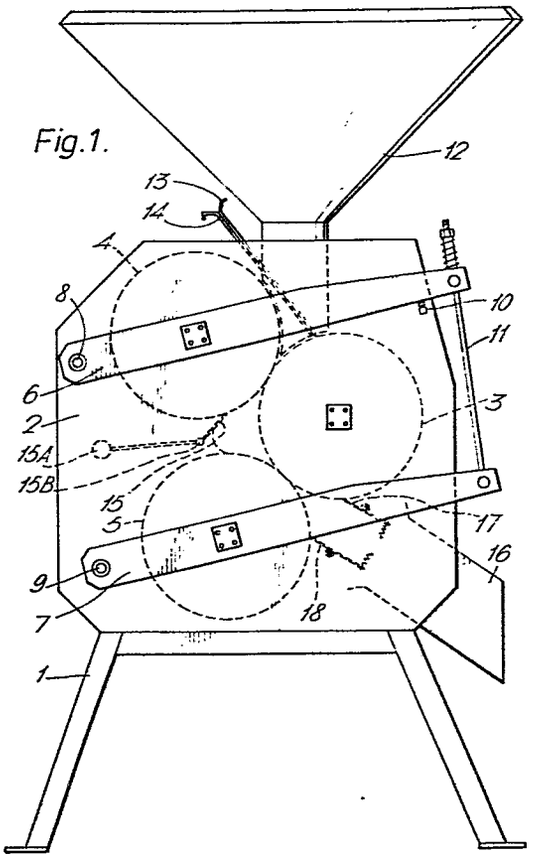
Fig.1.



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ROLLER MILLS

This invention relates to a roller mill for rolling, bruising or crushing cereals, for example barley or oats, to achieve a flattening effect on such grains to make them more palatable and digestible as a foodstuff to animals.

Roller mills are known comprising a pair of counter-rotatable metal rollers, the axes of which are in longitudinal spaced relationship. The rollers are mounted on a support with the peripheries of the rollers thereof in near or close proximity to define therebetween a nip into which cereals can be fed to be flattened. The peripheral surface of each roller has a series of spaced flutes therearound and transverse thereof to catch the cereals and feed them through the nip. One roller is normally mounted between two opposed members of one part of the frame with its axle at both ends in bearings, one in each member and is for rotatable movement only. The other roller is mounted between two opposed members of an other part of the frame, normally hinged to the one part with its axle at both ends in bearings, one in each member and is low friction rotatable. Thw other roller is under the influence of biasing means urging its peripheral surface into contact with that of the one roller. Adjustable tops can be provided to be abutted by part of the hinged assembly thereby to prevent actual abutment or contact between the two roller surfaces and the adjustment of the stops can determine the working gap at the nip between the peripheries of the rollers. The biasing means, while urging the other roller towards the one roller, and therefore flattening any cereals fed through the nip to a degree determined by the width of gap and size of cereals, also serves to increase temporarily the gap width against the biasing to enable non-crushable foreign matter to pass therethrough without damaging the peripheral surfaces of the rollers. Power means is provided to rotate the one roller.

The roller mills heretofore are capable of only a limited output and the degree of flattening to the cereals achieved apart from the type and size of cereals used, depends on the speed of rotation of the rollers, the other roller being counter-rotated by passage of cereals through the nip transferring the movement from the driven roller.

An object of the present invention is to provide a roller mill with a capability of giving a greater output of flattened cereals than heretofore and a capability of pre-determining the degree of flattening given to the cereals fed through the mill.

In accordance with the present invention, a roller mill comprises a support in which a plurality of metal rollers are arranged in counter-rotatable operating pairs with the peripheries of each pair providing a nip therebetween, the pairs of rollers being arranged successively with the nips thereof forming a passage through which cereals can pass to be progressively flattened, means being provided to adjust the width of gap in each nip to determine the degree of flattening to be applied to cereals passed therebetween, and means to rotate one of said rollers.

Preferably, three rollers are provided arranged in two operating pairs with the nip passage extending downwardly and with their axles parallel and located in a triangular formation. The roller against whose surface the other two rollers co-operate is preferably the driven roller.

Preferably also, the other two rollers located above and below the driven roller are each mounted on lever arm units separately fulcrummed to the support at the same end of the lever arms and jointly biased together at the other end, the upper lever arm unit serving as a lever of the third form and the lower lever arm unit serving as a lever of the second form.

Preferably further, adjustable stop means are provided for at least the upper lever arm unit to determine

the gap width of the upper nip.

An embodiment of the present invention will now be described, by way of example, with reference to the accompany drawing, which shows a side elevational view of a roller mill according to the present invention.

Referring to the drawing, the roller mill has a support in which a plurality of three metal rollers are arranged in counter-rotatable operating pairs. The support comprises a stand 1 having two opposed longitudinals on which are mounted two side plates 2 which are held in spaced position thereon by an arrangement of spacers and bolts (not shown). The side plates 2 carry bearing mountings for an axle of a roller 3 located between the side plates 2. The passage formed by the nips of the rollers extends downwardly with the axles of the rollers parallel and located in a triangular formation. The roller 3 is the driven roller, being that roller against whose peripheral surface the surfaces of the other two rollers 4 and 5 co-operate to form nips. The surfaces or rollers 4 and 3 form an upper nip and the surfaces of rollers 5 and 3 form the lower nip.

Two lever arm units 6 and 7 are provided each comprising two identical lever arms 5 yoked together as a pair, the arms of each unit lying laterally on the outside of corresponding side plates 2. The roller 4 is mounted on bearings in the arms of lever arm unit 6 as shown, and roller 3 is mounted on bearings in the arms of lever arm unit 7. The units 6 and 7 are separately fulcrummed to the side plates 2 by yoke pins 8 and 9 at the same end of the lever arms and are jointly biased together and the other end as shown and as described hereunder. The upper lever arm unit 6 serving as a lever of the third form, and the lower lever arm unit 7 serving as a lever of the second form. The lever arm units 6 and 7 are jointly biased by each set of two arms being pinned together with one end of a rod 11 low-friction rotatable on the pin between arms of unit 7 and journalled at towards its other end in a bore

through the pin between arms of unit 6. A collar (not shown) is then located over the other end of the rod 11 to abut against the bored pin. The other end of the rod 11 is screw-threaded and engaged by a nut, a helical spring having been positioned between the collar and the nut. This spring provides the biasing means to adjust (by rotation of the nut) the pressure of the surfaces of the roller 4 or roller 5 against roller 3 and also allows for temporary movement against the biasing to allow for non-crushable foreign matter to pass through the nips without damaging the surfaces of the rollers.

Adjustable stop means 10 are provided for abutment by the arms of upper lever arm unit 6 and are for determining the gap width of the upper nip and determines the amount of flattening of cereal between rollers 5 and 3.

A hopper 12 is provided to feed into the upper nip as shown, the hopper being supported by side plates 2. A feed plate 14 is provided for adjustment towards or away from the surface of roller 3 to control the amount of cereal that can be fed ~~between arms of unit 6. A collar (not shown) is then located over the other end of the rod 11 to abut against the bored pin. The other end of the rod 11 is screw-threaded and engaged by a nut, a helical spring having been positioned between the collar and the nut. This spring provides the biasing means to adjust (by rotation of the nut) the pressure of the surfaces of roller 4 or roller 5 against roller 3 and also allows for temporary movement against the biasing to allow for non-crushable foreign matter to pass through the nips without damaging the surfaces of the rollers.~~

~~Adjustable stop means 10 are provided for abutment by the arms of upper lever arm unit 6 and are for determining the gap width of the upper nip and determines the amount of flattening of cereal between rollers 5 and 3.~~

~~A hopper 12 is provided to feed into the upper nip as shown, the hopper being supported by side plates 2. A feed plate 14 is provided for adjustment towards or~~

into the first nip and a shut-off plate 13 enables the space between the end of the feed plate 14 and the surface of roller 3 to be closed off.

To enable the arms of the arm units to move, slots are provided in the side plates 2 to allow movement of the axles of rollers 4 and 5.

Flutes are provided on the peripheral surfaces of the rollers 3, 4 and 5.

Means to rotate the driven roller are those conventionally used such as direct drive through gearing from motor or a coupling to be connected to a power-take-off shaft of a tractor.

Accurate control of the amount of grain taken to the first nip by roller 3 is achieved by adjusting the gap between the feed plate 14 and roller 3.

In use, cereals are fed into the hopper then into the first nip or stage between rollers 3 and 4 where they are partially flattened and directed onto roller 5 to be fed into the second nip or stage to be further flattened and from whence into a chute 16 to be discharged therefrom into a collection bin or the like. A combined scraper and deflector plate 15 is provided as shown. The plate 15 is maintained in contact with roller 4 by a counter-balance weight 15A as shown operating about a pivot point 15B. The surface of roller 4 is scraped clean by plate 15 which also deflects the first stage cereal on to roller 5. The surfaces of rollers 3 and 5 are scraped clean by means of spring-loaded scrapers 17 and 18 as shown.

Without departing from the scope of the invention, more than three rollers can be provided to provide further stages for flattening the cereal.

CLAIMS

1. A roller mill comprises a support (1, 2) characterised in that a plurality of metal rollers (3,4,5) are arranged in counter-rotatable operating pairs with the peripheries of each pair providing a nip therebetween, the pairs of rollers being arranged successively with the nips thereof forming a passage through which cereals can pass to be progressively flattened, means being provided to adjust the width of gap in each nip to determine the degree of flattening to be applied to cereals passed therebetween, and means to rotate one of said rollers.

2. A roller mill as claimed in Claim 1, characterised in that three rollers (3,4,5) are provided arranged in two operating pairs with the nip passage extending downwardly and with their axles parallel and located in a triangular formation.

3. A roller mill as claimed in Claim 2, characterised in that the roller (3) against whose surface the other two rollers (4, 5) co-operate is preferably the driven roller.

4. A roller mill as claimed in Claim 2 or 3, characterised in that the other two rollers(4, 5) located above and below the driven roller (3) are each mounted on lever arm units (6, 7) separately fulcrummed to the support (1, 2) at the same end of the lever arms and jointly biased together at the other end, the upper lever arm unit (6) serving as a lever of the third form and the lower lever arm unit (7) serving as a lever of the second form.

5. A roller mill as claimed in Claim 1, 2, 3 or 4, characterised in that adjustable stop means are provided for at least the upper lever arm unit (6) to determine the gap width of the upper nip between rollers (3,4).

Fig.1.