Feb. 26, 1963 B. M. BEARDS 3,079,095

MACHINE OR MILL FOR CRUSHING OR PULVERISING MATERIALS

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Fig. 1

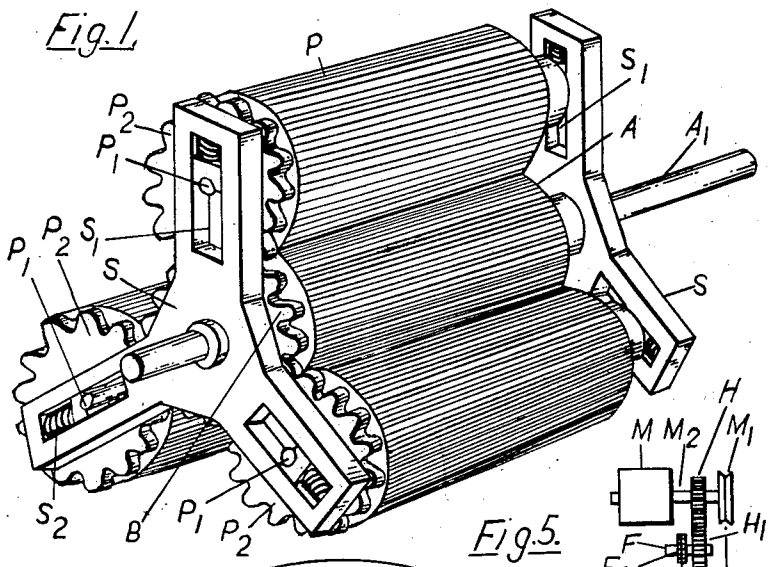


Fig. 5

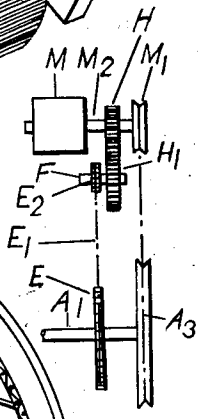
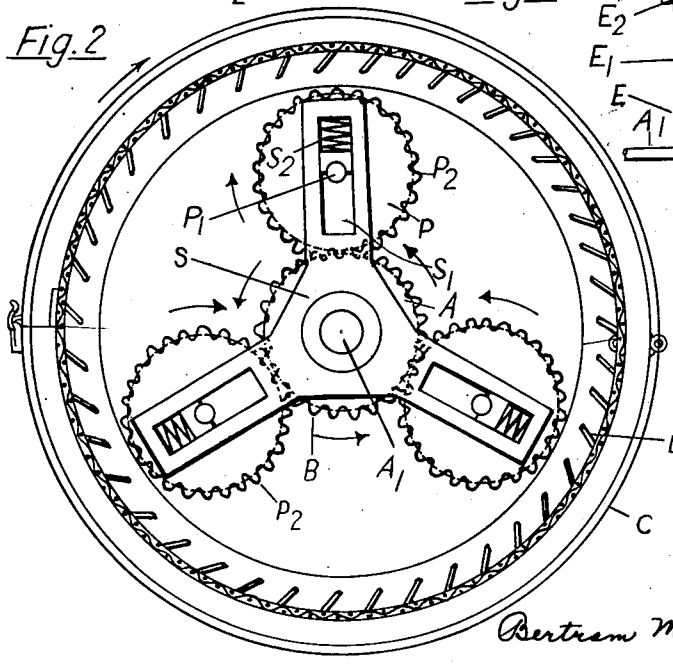


Fig. 2



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Fig.3.

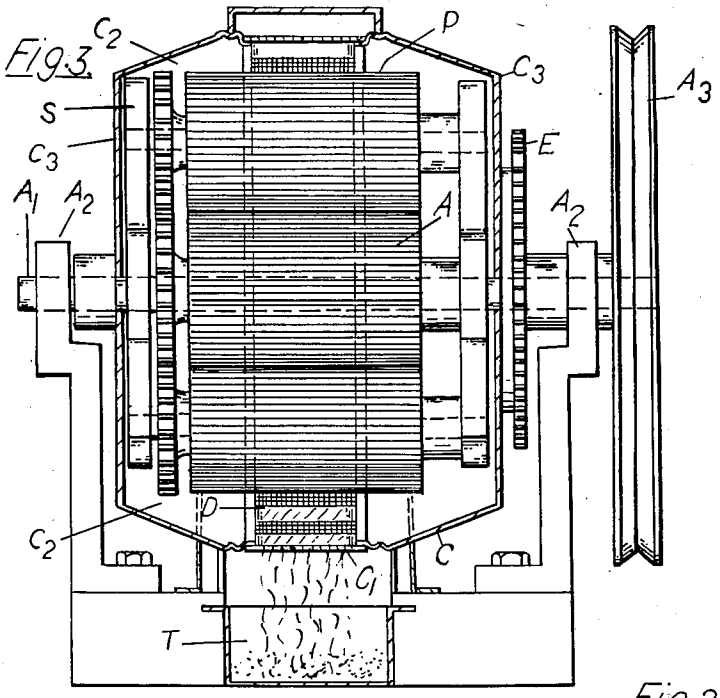


Fig.4.

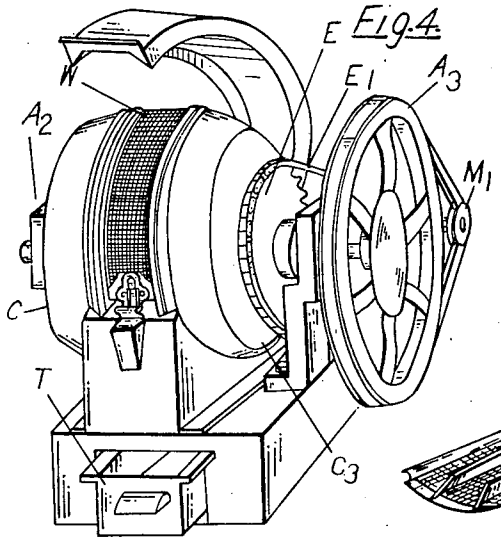
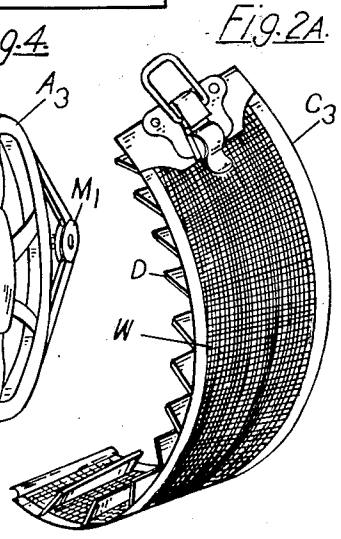


Fig.2A.



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MACHINE OR MILL FOR CRUSHING OR PULVERISING MATERIALS

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5 Claims. (Cl. 241—85)

This invention relates to a machine or mill for crushing or pulverising materials such as grains, chemicals or any other material in solid or wet including slurry state.

According to this invention the mill comprises a revolving central crushing roller and a set of planetary crushing rollers in contact with the said central crushing roller, means for causing the central crushing roller and each of the planetary rollers to revolve around their own respective axis, means for causing the planetary rollers to revolve around the central crushing roller and a casing housing all the rollers and means for causing the said casing to revolve around the planetary rollers, conveying means provided with the casing for feeding the material to be crushed to the crushing rollers.

According to another feature of this invention each of the planetary rollers revolves in a direction opposite to the direction of rotation of the central crushing roller, the set of planetary rollers revolving around the said central roller also in a direction opposite to the direction of rotation of the said central roller.

The planetary rollers are mounted in a common supporting means comprising a spider one at each end of the central roller, the arms of the spider having radial slots, the shaft ends of the planetary rollers engaging said slots and a loading spring in each slot held transversely against the shaft end.

On one end of the shaft of each of the planetary rollers is mounted a pinion which is in mesh with a pinion mounted on the shaft of the central roller, whereby the central roller can drive each of the planetary rollers.

All the rollers are housed within a casing to the side walls of which are secured the spider arms and means are provided for rotating the casing in a direction opposite to the direction of rotation of the central roller. The casing has conveying means such as buckets or blades fitted spacedly at the inside of its peripheral wall, which wall may be provided with openings for the discharge of the pulverised or crushed material. Any known driving means are employed to drive the central roller and the casing with the spiders and the planetary rollers.

The invention will now be more fully described with reference to the accompanying drawings in which:

FIG. 1 shows in perspective the arrangement of the central roller, the planetary rollers and the gearing arrangement;

FIG. 2 shows schematically vertical section of the mill to illustrate the directions of movement, the positioning of the rollers and the casing;

FIG. 2A shows a part of the casing which is removable;

FIG. 3 shows a further section of the mill;

FIG. 4 shows the complete machine;

FIG. 5 shows schematically one driving arrangement.

Referring to the drawings, A is the central crushing roller mounted on its shaft A_1 supported in pedestals A_2. The shaft A_1 carries a flywheel cum driving pulley A_3 which is driven by belt as illustrated by a motor M and pulley M_1.

Around the central crushing roller A and in contact therewith are mounted a set of planetary crushing rollers P. The number of planetary rollers can vary e.g. two or more rollers can be employed. In the present embodiment three such rollers are shown. The ends of the

shafts P_1 of the planetary rollers are engaged by radial slots S_1 in the arms of spiders S which form the support means for the shafts of the planetary rollers. S_2 are the loading springs in the slots disposed transversely to the shafts P_1. The springs enable the rollers to adjust themselves during the crushing operation. The spiders are rotatably mounted in bearings on the shaft A.

The shaft A_1 carries a pinion B which meshes with pinions P_2 fitted at one end of the shafts P_1 of each of the planetary rollers. The pinions B and P_2 are disposed between a spider at one end and the ends of the rollers.

All the rollers and the spiders are housed within a casing C which consists of a peripheral wall C_1, side walls C_3 and connecting tapering walls C_2 so that the said tapering walls cause the material to slide towards the inside of the peripheral wall.

At the inside of the wall C_1 of the casing are fitted blades D which are angularly disposed to the casing. The said wall C_1 has perforations W such as formed by a mesh for the screening and discharge of the crushing material. The peripheral wall of the casing may comprise of two or more removable curved pieces for introducing the material to be crushed.

On the outside of the casing is fitted a chain wheel E which is driven by a chain E_1 from a chain wheel E_2 on a lay shaft F which is driven by reduction gearing from the motor M. The spiders S are fixed to the inside of the side walls C_3 of the casing so that the casing and the spiders rotate together in the same direction.

From the arrows of direction of movement marked in the drawings it will be noticed that each of the planetary rollers P revolves in a direction opposite to the direction of rotation of the central crushing roller A. Further the set of planetary rollers as also the casing revolve in a direction opposite to the direction of rotation of the central roller A.

The peripheral wall of the casing which may have perforations throughout is shown housed within a stationary channel section cover G in two halves the lower half having an opening to allow the discharge material to drop into a slidable tray T.

Referring to the driving means as herein illustrated the shaft M_2 of the motor drives the lay shaft F through gear wheels H and H_1 which lay shaft in turn drives the casing through chain and chain wheel E_1 and with the rotation of the casing rotate the spiders and consequently the planetary rollers around the axis of the central roller. The casing can be made to rotate independently of the spiders.

Further instead of loading springs S_2 it is also possible to adjust the positions of the shafts of the planetary rollers by the usual block and screw arrangement, the block slidably engaging the radial slots S_1.

For operating the mill or machine a charge of material to be crushed is deposited inside the casing by removing a curvel piece C_3 and then after closing the mouth by the same piece, the machine is rotated. The blades D convey the material and drop the same between the central crushing roller A and one of the planetary rollers P. The crushed material is taken up again and again by the blades D with the help of the revolving casing and is further crushed till the material of required fineness comes out of the perforations W in the casing and is discharged into a slidable tray T. If slurry is used then no perforations are provided and the crushed charge is removed through a closable opening provided in the casing.

I claim:

1. A mill for crushing or pulverising materials comprising a revolving central crushing roller and a set of planetary crushing rollers in contact with the said central crushing roller, means for causing the central crush-

ing roller and each of the planetary rollers to revolve around their own respective axis, means for causing the planetary rollers to revolve around the central crushing roller and a casing housing all the rollers and means for causing the said casing to revolve around the planetary rollers, conveying means provided with the casing for feeding the material to be crushed to the crushing rollers.

2. A mill for crushing or pulverising materials comprising a revolving central crushing roller and a set of planetary crushing rollers in contact with the said central crushing roller, means for causing the central crushing roller and each of the planetary rollers to revolve around their own respective axis, means for causing the planetary rollers to revolve around the central crushing roller and a casing housing all the rollers and means for causing the said casing to revolve around the planetary rollers and wherein each of the planetary rollers, the set or assembly of planetary rollers and the casing all revolve in a direction opposite to the direction of rotation of the central roller, conveying means provided at the inside of the casing for raising the material to be crushed and feeding same to the crushing rollers.

3. A mill for crushing or pulverising materials comprising a central crushing roller, a set of planetary rollers in contact with the said central roller, a pinion mounted on the shaft of the central crushing roller and meshing with pinions one on each shaft of the planetary rollers to drive the said planetary rollers, a spider, one at each end of the central roller, the arms of the spider having radial slots, the shaft ends of the planetary rollers engaging said slots and a loading spring in each slot held transversely against the shaft end, the spider being secured to the inside walls of the casing, conveying means provided on the inside of the casing for raising the material and feeding same to the crushing rollers, and means for driving the casing in a direction opposite to the direction of rotation of the central crushing roller, the planetary rollers also revolving in a direction opposite to the direction of rotation of the said central roller.

4. A mill for crushing or pulverising materials comprising a central crushing roller, a set of planetary rollers in contact with the said central roller, a pinion mounted on the shaft of the central crushing roller and meshing with pinions one on each shaft of the planetary rollers to drive the said planetary rollers, a spider, one at each end of the central roller, the arms of the spider having radial slots, the shaft ends of the planetary rollers engaging said slots and a loading spring in each slot held transversely against the shaft end, the spider being secured to the inside walls of the casing, and means for driving the casing in a direction opposite to the direction of rotation of the central crushing roller, the planetary rollers also revolving in a direction opposite to the direction of rotation of the said central roller, conveying means provided at the inside of the casing for raising the material to be crushed and feeding same to the crushing rollers, said conveying means comprising blades or buckets spacedly fitted on the inside of the casing, the said casing having perforations to allow the crushed material to be discharged, a part of the wall of the casing being removable to allow the charge of material to be fed to the mill.

5. A mill as claimed in claim 4 in which the blades are inclined at an angle to the peripheral wall of the casing, and the casing when perforated is enclosed within a cover which has a discharge opening leading to a slidable tray.

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