Aug. 23, 1949. G. J. MITCHELL 2,480,085

BALL MILL FOR CONTINUOUS SIFTING AND GRINDING

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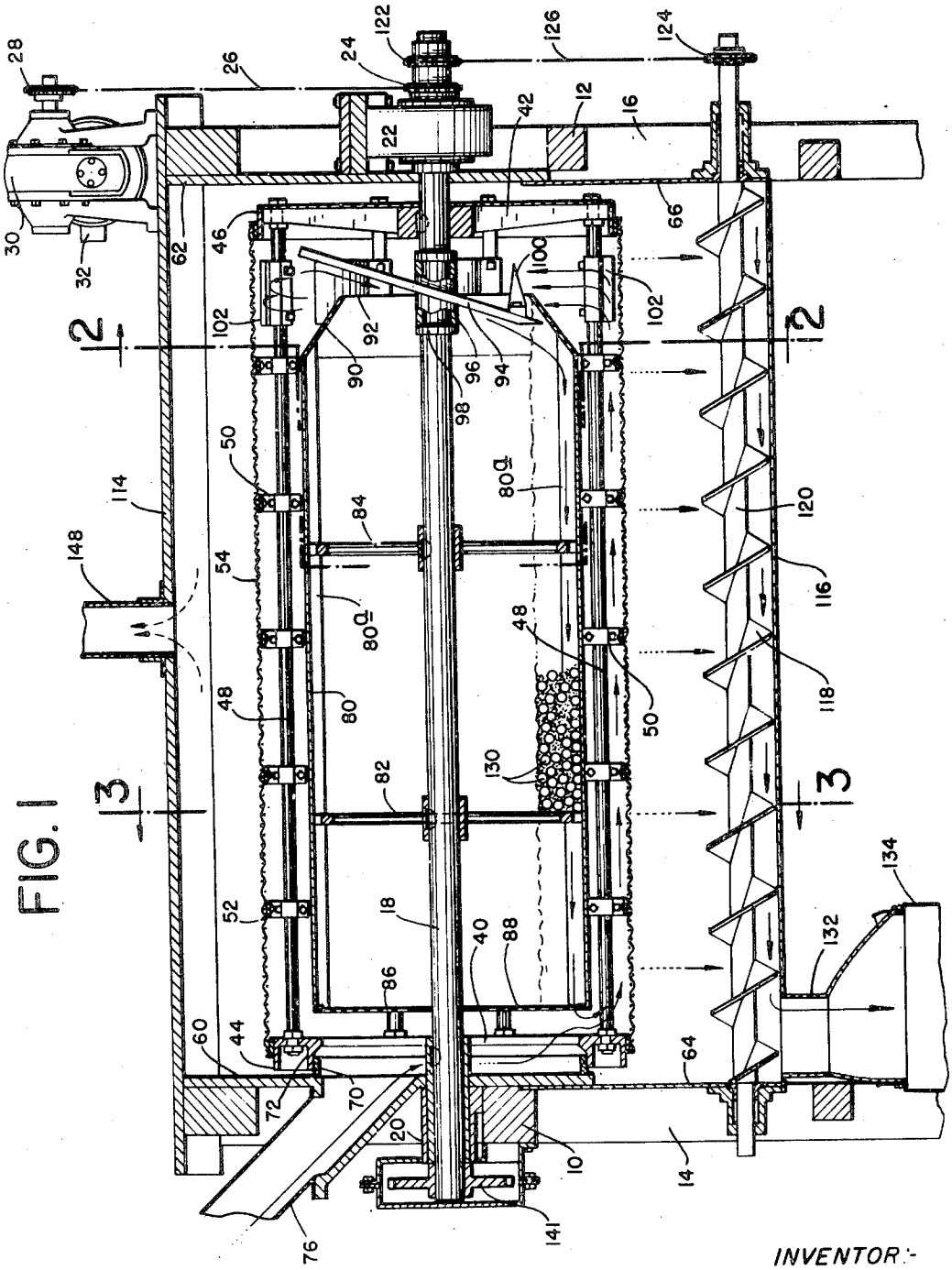


FIG. 1

INVENTOR:
GEORGE J. MITCHELL
BY Arthur R. Blythe ATTY.

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FIG. 2

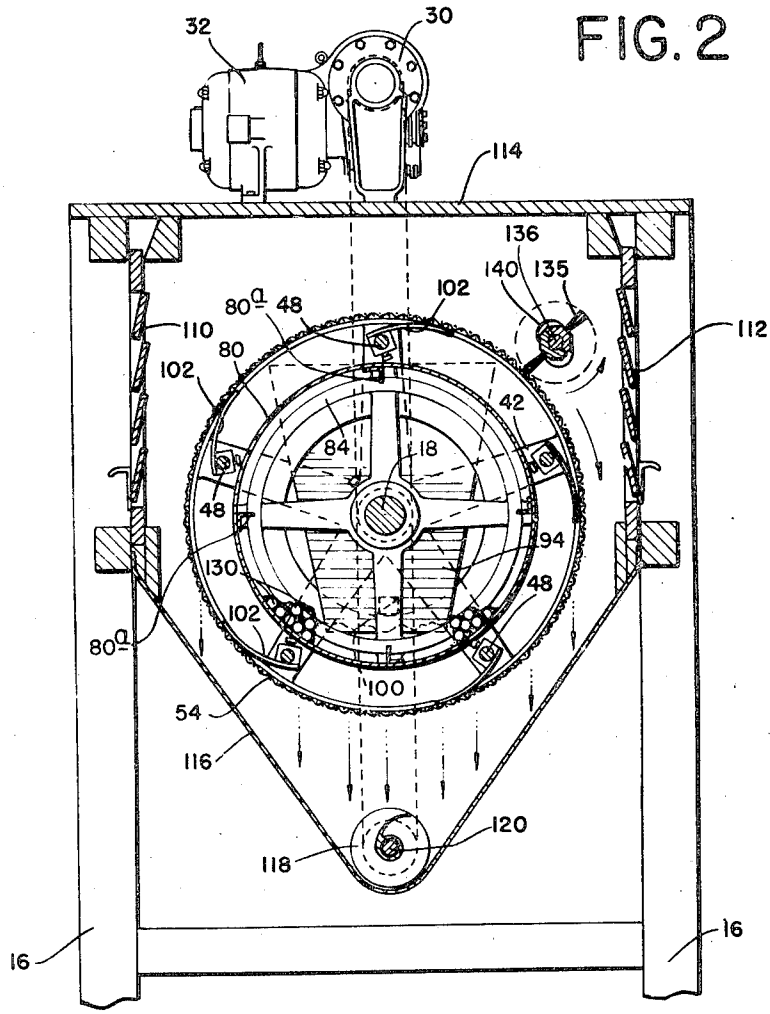


FIG. 4

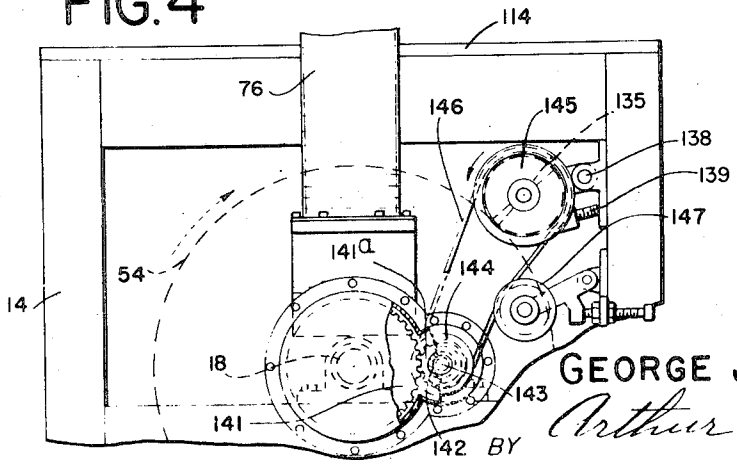
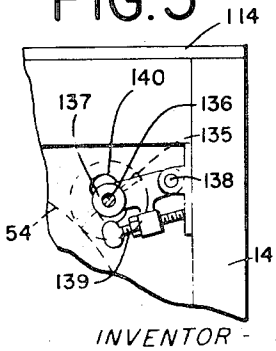


FIG. 5



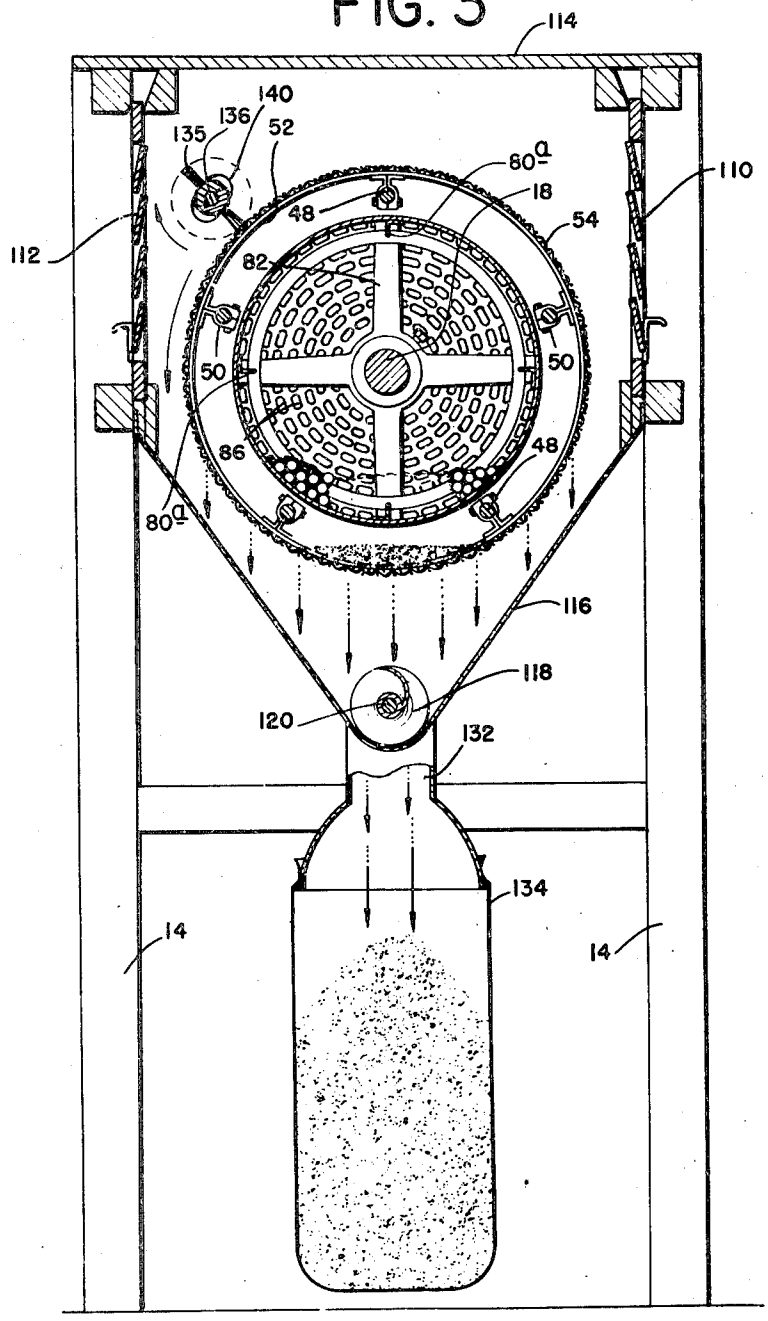
INVENTOR
GEORGE J. MITCHELL
BY Arthur R. Loby
ATTY

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FIG. 3



INVENTOR.-
GEORGE J. MITCHELL
BY Arthur R. Loyke ATTY

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UNITED STATES PATENT OFFICE

2,480,085

BALL MILL FOR CONTINUOUS SIFTING AND GRINDING

George J. Mitchell, Minneapolis, Minn., assignor to General Mills, Inc., a corporation of Delaware

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2 Claims. (Cl. 241—80)

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This invention relates to ball mills and particularly to those where the material to be ground is continuously circulated.

An object of this invention is to provide a ball mill in which the material to be ground is circulated through the mill, is sifted, and the overs are continuously fed back to the entering end of the mill for further grinding, thereby continuously effecting removal of the finely ground material from the coarser which speeds up the grinding operation.

This and other objects, as will hereinafter appear, are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings in which:

Figure 1 is a longitudinal vertical section through a machine embodying the invention;

Figs. 2 and 3 are vertical transverse sections on the lines 2—2 and 3—3 respectively on Fig. 1;

Fig. 4 shows a fragmentary end elevation of the receiving end of the machine; and

Fig. 5 is a fragmentary view similar to that of Fig. 4 showing certain details thereof.

The embodiment illustrated comprises a framework 10, 12 of wood or the like having legs 14, 16 for supporting the machine on the floor. A shaft 18 is suitably journaled in bearings 20, 22 which are carried by the main frame, this shaft being driven by means of a sprocket 24 and chain 26 from a sprocket 28 and through a suitable gear reduction 30 operated by a motor 32.

Spiders 40, 42 are keyed on the shaft 18 and their peripheries 44 and 46 respectively are preferably circular in shape. These spiders also carry through-bolts 48 on which are secured clips 50 about which are secured bands 52 of the same general configuration as the peripheries 44, 46. A suitable screen 54 of any well known type is then secured about the peripheries 44, 46 and the bands 52.

The ends of the machine are closed by means of walls 60, 62 and plates 64, 66. The wall 60 carries an angular strip 70 which lies inside a shoulder 72 within the periphery 44. A feed chute 76 feeds material to be ground through the spider 40 and into the space enclosed by the screen 54.

The ball mill itself will now be described. It consists essentially of a metal drum 80 having flights 80a therein, and carried by spiders 82, 84 on the shaft 18 and closed at the entering end of the machine by a head 86 which is provided with perforations 88 for the purpose which will later be pointed out.

At the opposite end the drum has a frustoconical end 90 which is open at 92 to permit the

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insertion of a chute 94 which has a sleeve 96 freely journaled on the shaft 18 between suitable collars 98 and which is provided with a weight 100 for holding the chute in the vertical position shown in Fig. 1.

Scoops 102, secured on the through-bolts 48 are inserted to pick up material at the right-hand end of the screen as shown in Fig. 1 and to carry it up and drop it on the chute 94 where it then passes into the right-hand end of the drum.

Referring now particularly to Figs. 2 and 3, the upper removable side walls in the machine 110, 112 may be made of wood and lowered as shown and provided with a cover 114, while the bottom of the machine 116 is preferably made from a bent plate which is rounded at the bottom to provide a housing for a screw conveyor 118 which is driven from the shaft 18 by means of sprockets 122 and 124 and with chain 126.

The operation of the machine is as follows. A quantity of steel balls or the like 130 are placed in the drum which is then caused to rotate by means of the motor 32. Materials to be ground such as bran is fed into the chute 76. As the screen rotates, this material will then travel to the right and any fine material therein passes through the screen 54. The overs of the screen are then picked up by the scoop 102 and dumped on the chute 94 where they pass to the right-hand end of the drum. As the drum is rotated this material then passes to the left through the drum and is continuously ground by the action of the balls as it passes to the left and out through the openings 88 which are large enough to permit the material being ground to pass through but which retain the balls. This same material again passes over the screen where the finer portions are removed and the coarser are again returned to the drums by means of the scoop 102 and the chute 94.

Thus it will be seen that I have provided a very simple and efficient self-contained ball mill and screen which first screens any material to be ground after which it is passed through the ball mill and again screened and the overs again pass through the ball mill until they are ground sufficiently to pass through the screen. The material passing through the screen is propelled by the conveyor 118 to a chute 132 beneath which a bag or the like 134 may be secured for catching the raw material.

A well known cleaning brush 135 is employed to sweep the reels and is mounted upon a shaft 136 journaled in bearing 137 which are in the

form of arms pivoted at 138 and adjustable by means of a screw 139. The shaft 136 extends through an arcuate slot 140 which is concentric to the pivot 138. This mechanism permits the adjustment of said brush 135 relative to the screen 54.

The brush 135 is driven through the well known gear train as follows: a gear 141 secured on the shaft 18 of the machine drives a pinion 141a mounted upon a sleeve 142 journaled on a stub shaft 143, and the numeral 144 indicates a pulley that is also journaled upon a sleeve 142 and drives a pulley 145 that is keyed to the shaft 136 through a belt 146. Said belt 146 is provided with a customary belt tightener 147.

It will be noted that the machine housing is provided with a vent pipe 148 for the purpose of removing dust from the machine. In reference to the walls of the machine 110 and 112 it will be noted that these walls are removable sections also lowered as illustrated for the purpose of venting the machine.

While I have shown and described but a single embodiment of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made which do not depart from the spirit and scope of my invention as disclosed in the appended claims.

I claim as my invention:

1. A ball mill comprising a tubular drum mounted for rotation about a substantially horizontal axis, balls therein, a tubular screen mounted for rotation outside the drum, one end of the drum being perforated to permit the passage of material being ground to the head end of the screen while the balls are retained, means for transferring material from the tail end of the screen to the head end of the drum, and means for feeding material to be ground to the head end of the screen so that it passes through the screen before grinding.

2. A ball mill comprising a shaft, a tubular drum mounted thereon for rotation about a substantially horizontal axis, balls within the drum, a tubular screen mounted for rotation outside the drum, one end of the drum being perforated to permit the passage of material being ground to the head end of the screen while the balls are retained, a chute freely journaled on the shaft and having a weight maintaining the chute in an upright position regardless of rotation of the shaft, said chute extending upwardly and outwardly from a point inside the entering end of the drum to a point in the discharge end of the screen, and scoops mounted within the screen and adapted to lift said material and deposit it on the chute so that it flows into the entering end of the drum.

GEORGE J. MITCHELL.

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