Oct. 12, 1926. 1,602,438

G. C. KOSIAN

TUMBLING MILL

Filed Jan. 15, 1923 2 Sheets-Sheet 1

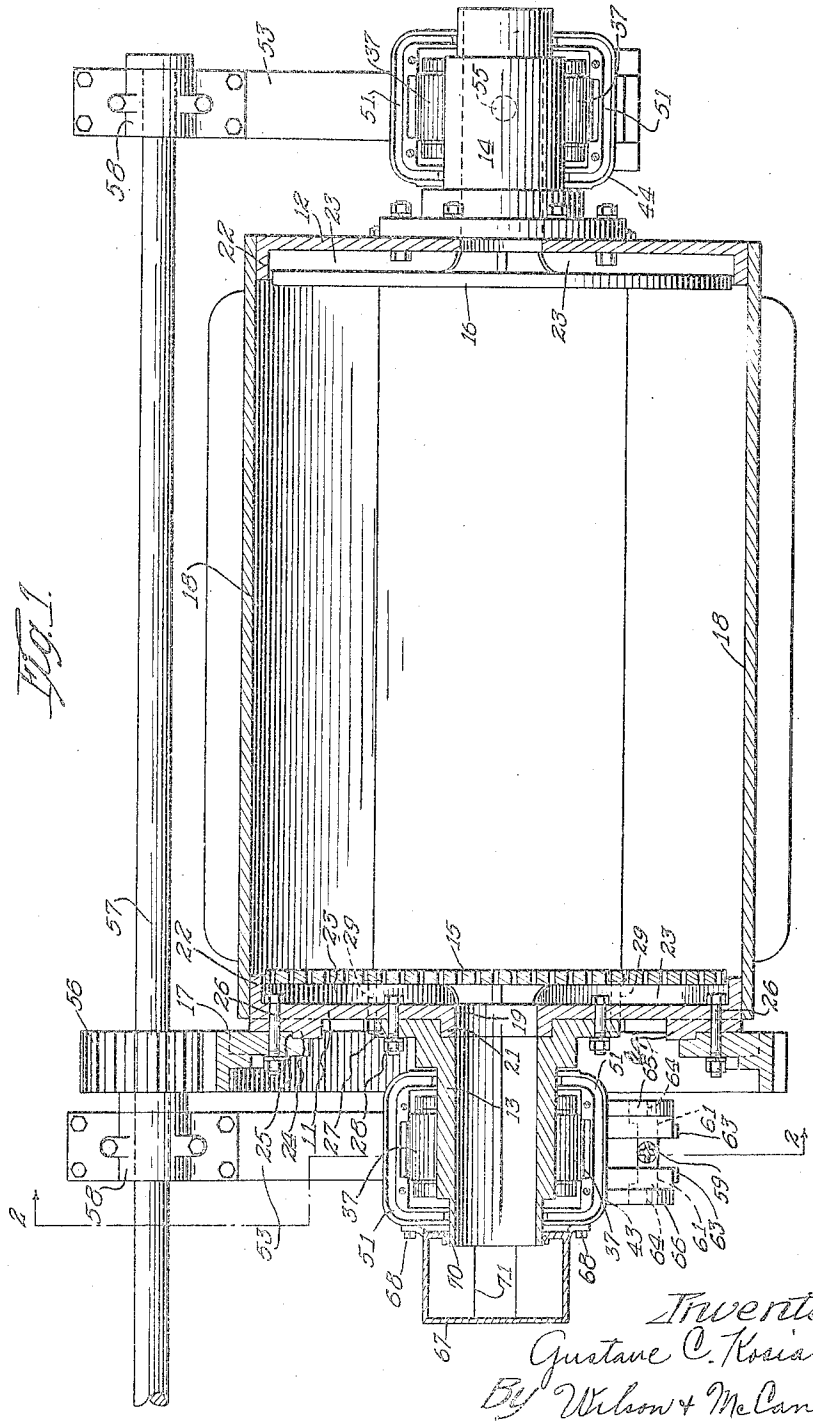


Fig. 1.

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Fig. 2.

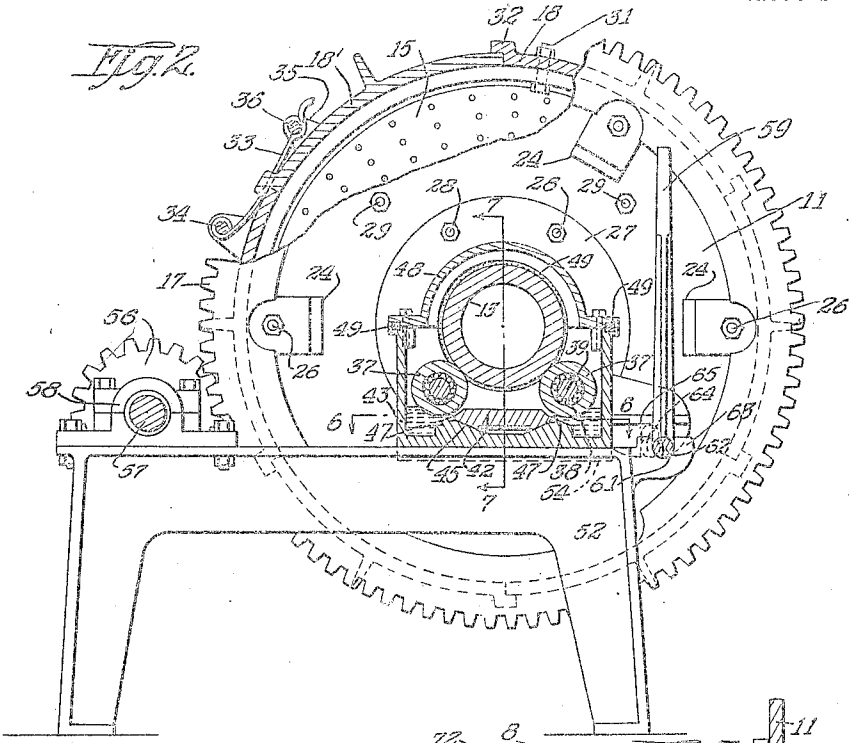


Fig. 3.

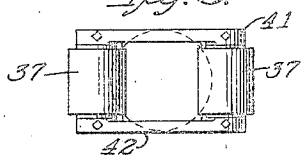


Fig. 4.



Fig. 5.

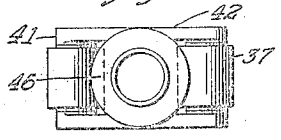


Fig. 6.

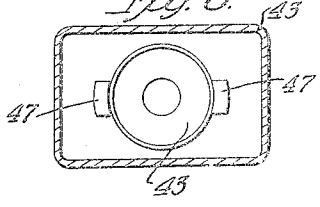


Fig. 7.

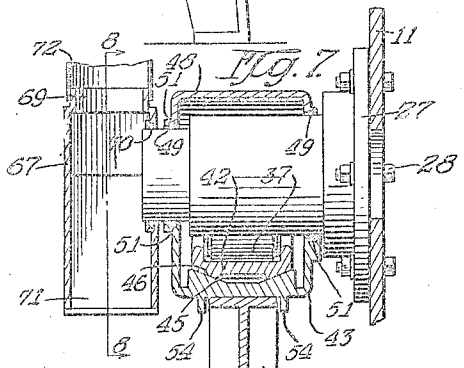
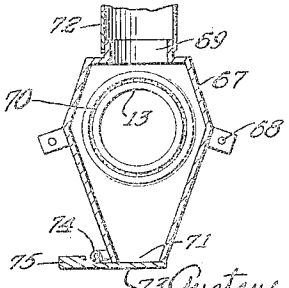


Fig. 8.



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UNITED STATES PATENT OFFICE.

GUSTAVE C. KOSIAN, OF ROCKFORD, ILLINOIS, ASSIGNOR TO ROCKFORD MALLEABLE IRON WORKS, OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS.

TUMBLING MILL.

Application filed January 15, 1923. Serial No. 612,678.

This invention relates to apparatus for cleaning castings and other objects by tumbling them, preferably packed with small abrading elements, such as shot, metal stars and the like, in a rotary barrel or drum.

Apparatus of this character and especially that used for tumbling medium and large size castings, operates under severe working conditions not only because of the heavy vibration and pounding set up by the tumbling action, but also because of the dust and fine particles thrown off and which unless positively controlled, are very destructive to the bearings and other parts. Tumbling apparatus heretofore used commercially has been unsatisfactory because its construction was inimical to efficient operation under the conditions mentioned. Consequently, such apparatus has been comparatively short lived and costly and inconvenient to maintain and operate.

The primary object of the present invention is to improve tumbling apparatus of the character described, especially in regard to the construction and mounting of the tumbling barrel, with the view to reducing frictional wear, lowering power consumption and cost of up-keep, and enabling more convenient operation.

As to the construction of the tumbling barrel, my invention contemplates a novel assembly of parts making up a trunnion type barrel including end heads to which are detachably secured trunnions, drum plates, supplemental heads and a gear ring. Other features and inherent advantages pertaining to the tumbling barrel will be described hereinafter.

Regarding the mounting, I have aimed to provide an improved journal means for revolubly supporting heavy tumbling barrels and for lubricating and protecting them from wear. I have also provided a novel means whereby the bearings will be self-aligning.

Another object is to improve the mounting of the tumbling barrel in connection with the gear drive for obtaining easier starting and less wear on the parts.

Still another object is to provide a tumbling mill which will be durable, thoroughly practical for commercial purposes, and capable of production at a comparatively low cost.

Other objects and attendant advantages will be appreciated by those skilled in this art as the invention becomes better understood by reference to the following description when considered in connection with the accompanying drawings, in which—

Figure 1 is a horizontal sectional view through a tumbling mill embodying my invention;

Fig. 2 is a transverse sectional view taken substantially on the line 2—2 of Fig. 1 with part of the tumbling barrel in section;

Figs. 3, 4 and 5 are top, side and bottom views respectively, of one of the roller saddles removed;

Figs. 6 and 7 are sections taken substantially on the line 6—6 and 7—7, respectively, of Fig. 2; and

Fig. 8 is a section taken on the line 8—8 of Fig. 7.

The tumbling barrel is composed of the following parts designated generally, namely, end heads or plates 11 and 12, trunnions 13 and 14, supplemental heads 15 and 16, a gear ring 17 and drum plates 18, one of which 18′ constitutes a charging door. Each of said heads has cast integrally therewith a central opening 19, an annular flange 21 on its outer side, a peripheral flange 22 and radial ribs 23 on its inner side. The head 11 has pads 24 machined to provide concentric shoulders 25 upon which are seated complemental shoulders of the gear ring 17. Said gear ring is secured to the head by bolts 26. Each trunnion, seated on the flange 21 of its respective head, has an annular flange 27 secured by bolts 28 to said head and has a hollow center providing an air passage communicating with the opening 19 in said head. Each supplemental head 15 suitably perforated throughout, is clamped to the ribs 23 of its respective head by bolts 29, the supplemental head being of less diameter than the internal diameter of the head flange 22 so as to afford an annular air space for the passage of sand and waste material as will be described later. The drum plates 18, removably secured to the head flanges 22 by bolts 31, each have a flange 32 along one of its longitudinal edges overlapping the edge of the adjoining plate, as shown in Fig. 2,

thus substantially closing the drum against leakage of dirt and admission of air. All of the principal parts making up the barrel structure are preferably in the form of heavy castings, which require little or no machining and are very desirable for the work intended for a tumbling mill. This construction permits removal of any of the drum plates, and in fact, any of the tumbling barrel parts, without removing the trunnions from their journal mountings. This is especially desirable in the event that replacement of any of the parts is necessary.

The drum plate 18′ which I employ for the charging door is preferably quickly-removable and may be secured in closed position by suitable means, such for example as a series of heavy spring clamps 33, pivotally connected at 34 to an adjoining drum plate and having a seat 35 in its opposite end adapted to be sprung beneath and to bear against a bolt 36 carried by the plate 18′. By springing the outer end of each clamp 33 inwardly, the bolt 36 may be withdrawn, permitting said clamp to be swung outwardly, so as to release the charging door, which in the present instance will be bodily removed when loading and unloading the tumbling barrel.

Each trunnion is revolubly supported in a journal bearing consisting of a pair of rollers 37 in turn mounted through the intermediary of anti-friction rollers 38 on shafts 39 fixed to the arm 41 of a saddle bracket designated generally by 42. The roller saddle brackets for the trunnions 13 and 14 are supported upon and within lower journal box or casing sections, designated generally by 43 and 44, respectively. Each lower casing section, open at its top, constitutes a lubricant reservoir, and is shaped to provide an inwardly dished seat 45 for the reception of the frusto-conical bottom 46 of its respective saddle bracket, and to provide diametrically opposed lugs 47 adapted to prevent lateral displacement of the saddle bracket and to bear lateral thrust imposed on the tumbling barrel at times during the operation as will be explained later. The roller saddle brackets, it will be observed, merely rest in the seats 45 and are free to swivel, oscillate or tilt on their respective mountings for allowing their rollers to come into alignment with the trunnions. In other words, the mounting permits self-alignment of the rollers, and allows this alignment to be maintained when the tumbling barrel is shifted when connecting and disconnecting its gear 17 with a driving pinion described hereinafter. It will be seen, therefore, that my invention contemplates supporting the rollers with capacity for universal movement, that is, in any plane, in order to maintain said alignment.

A journal box cover or top section 48 closes the open top of and is bolted to each bottom casing section 43 and 44. The meeting edges of these casing sections, and likewise their edges circumscribing the trunnions at the inner and outer ends thereof, are packed, preferably by felt packing 49, held in grooves 51 in said casing sections. It will thus be seen that each trunnion bearing is completely inclosed and housed in a casing and that all joints and clearance openings are thoroughly packed so as to preclude admission of dust or other foreign matter into the interior. These castings also constitute lubricant reservoirs and the rollers 37 dip in the lubricant, as shown in Fig. 2, thereby keeping all the bearings well lubricated. The foregoing provides a very efficient, durable and comparatively inexpensive mounting for heavy tumbling barrels. It will be observed that the tumbling barrel is balanced upon and between the rollers 37 and that by excluding all foreign matter, providing self-contained lubrication and preventing excessive and unequal lateral strains on the bearings when shifting the tumbling barrel, the mountings will function very efficiently. Furthermore, these mountings reduce to a minimum the power consumption for driving the tumbling barrel.

The lower casing sections 43 and 44 are mounted respectively on the flat top surfaces of frame standards 52 and 53, the casing section 43 with capacity to slide lengthwise on its frame standard, and the casing section 44 to oscillate about a vertical axis. To this end the casing section 43 has depending guide lugs 54 over-reaching the sides of its standard 52, and the casing section 44 has a depending annular boss 55 fitting in a recess in its standard 53. This movement of the tumbling barrel is desired for bringing its gear 17 into and out of mesh with a driving pinion 56 fixed to a drive shaft 57, which is journaled in suitable bearings 58 mounted on the frame standards.

Means is provided for shifting the tumbling barrel into and out of gear comprising a hand lever 59 having trunnions 61 journaled in open-top bearing seats 62 in spaced lugs 63 reaching forwardly from the frame standards 52. On the outer end of each trunnion 61 is formed an eccentric arm 64 located in a vertical slot 65 in a lug 66 integral with and projecting forwardly from the lower casing section 43. It will be manifest that when the lever 59 is swung forwardly and downwardly from the position shown in Fig. 2, the casing section 43 will be slid forwardly on the frame standard 52, thereby shifting the tumbling barrel about the vertical axis of the lug or pivot pin 55 and unmeshing the gears 17 and 56. Reversal of this operation establishes the driving connection. This construction is ex-

ceptionally simple and durable and permits easy assembly of parts, it being noted that the lever 59 is retained in position by the lugs 66 overlying the trunnion 61, as shown in Figs. 1 and 2.

To the outer end of one of the trunnions, in this case the trunnion 13, is applied a suction connection in the form of a casing 67. This casing secured by bolts 68 to the casing 43, has a top suction opening 69 and a bottom discharge opening 71, to the former of which is connected a suction pipe 72. A packing 70 closes the joint between the casing 67 and the trunnion 13. A gate or closure 73 pivoted at 74 on the casing 67 and having a weighted end 75 closes the opening 71.

During operation the suction from the pipe 72 draws fresh air into the tumbling barrel through the hollow trunnion 14, and this air passing lengthwise through said barrel removes the fine dust and other waste particles from the contents of the barrel and carries them through the perforated supplemental head 15, the hollow trunnion 13 and into the casing 67. This casing constitutes a trap into which the heavier particles fall. Heavier particles of sand, scale, etc., not picked up by the suction, work through the perforations in and around the supplemental head at the drive end of the barrel, into the space between the head 11 and said supplemental head and will be guided by the ribs 23 into the trunnion opening and there drawn into the trap by suction. When the waste material accumulated in the trap on the bottom closure 73 overcomes the weight 75, the door will open allowing, such material to discharge. Said weight automatically closes the door.

It is believed that the foregoing conveys a clear understanding of the objects prefaced above, and while I have illustrated but a single working embodiment, it should be understood that changes might be made in details of construction without departing from the spirit and scope of the invention as expressed in the appended claims.

I claim:—

1. In combination, a hollow rotary tumbler body having a trunnion at each end, a journal for each trunnion arranged for universal self-adjustment relative to said trunnion in different positions thereof, movable means supporting said journals, a gear fixed to said body, a driving gear on a fixed axis, and means for shifting said movable means and the rotary body for moving its gear into and out of mesh with said driving gear.

2. In combination, a hollow rotary tumbler body having a trunnion at each end, a self-adjusting universally shiftable journal for each trunnion, a gear fixed to one end of said body, a driving gear on a fixed axis, and means for shifting said rotary body and its journals about an axis remote from the gear end of the body and moving its gear into and out of mesh with said driving gear.

3. In a tumbling mill, a tumbling barrel having a head plate formed with an integral peripheral flange, a central annular flange, gear pads on its outer side and radially disposed ribs on its inner side, drum plates bolted to said peripheral flange, a trunnion fitting said central flange, a gear ring seated on said pads, a supplemental head on said ribs, and bolts for securing said trunnion, gear ring and supplemental head to the head plate.

4. In a tumbling mill, a tumbling barrel comprising end heads, one of which has a central suction opening, drum plates connecting the heads, a perforated supplemental head supported at the inner side of said suction opening head, radially disposed ribs between said heads for guiding material toward said opening, a suction pipe connected with said opening, and means revolubly supporting the tumbling barrel.

5. A tumbling mill comprising a pair of frame standards elongated transversely of the mill and each having a comparatively flat top, a casing mounted on the top of each standard, one to oscillate about a vertical axis and the other to slide lengthwise upon its standard, a tumbling barrel interposed between the standards and having trunnions journaled in said casings, a gear on one end of the barrel, a driving pinion mounted on the standard carrying the sliding casing, and a lever mounted on the last mentioned standard and connected with its casing for moving the latter on its standard for bringing the gear into and out of mesh with said pinion.

6. A tumbling mill comprising a pair of frame elements extending transversely relative to the mill, and each having a comparatively flat top, a casing mounted on the top of each, one to oscillate about a vertical axis on a pivot mounted in the one frame element and the other to slide lengthwise on the other frame element, said last mentioned casing having means for guiding the same on said frame element against displacement therefrom, a tumbling barrel mounted between the frame elements having trunnions journaled in said casings on self-adjusting universally shiftable bearings therein, a gear on one end of the barrel, a driving pinion mounted on the frame element carrying the sliding casing, and means mounted on the last-mentioned frame element and connected with the casing thereon for moving the same and bringing the aforementioned gear into and out of mesh with the aforementioned pinion.

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