Aug. 5, 1930. W. PRATT 1,772,365

ABRADING MACHINE

Filed Sept. 28, 1923

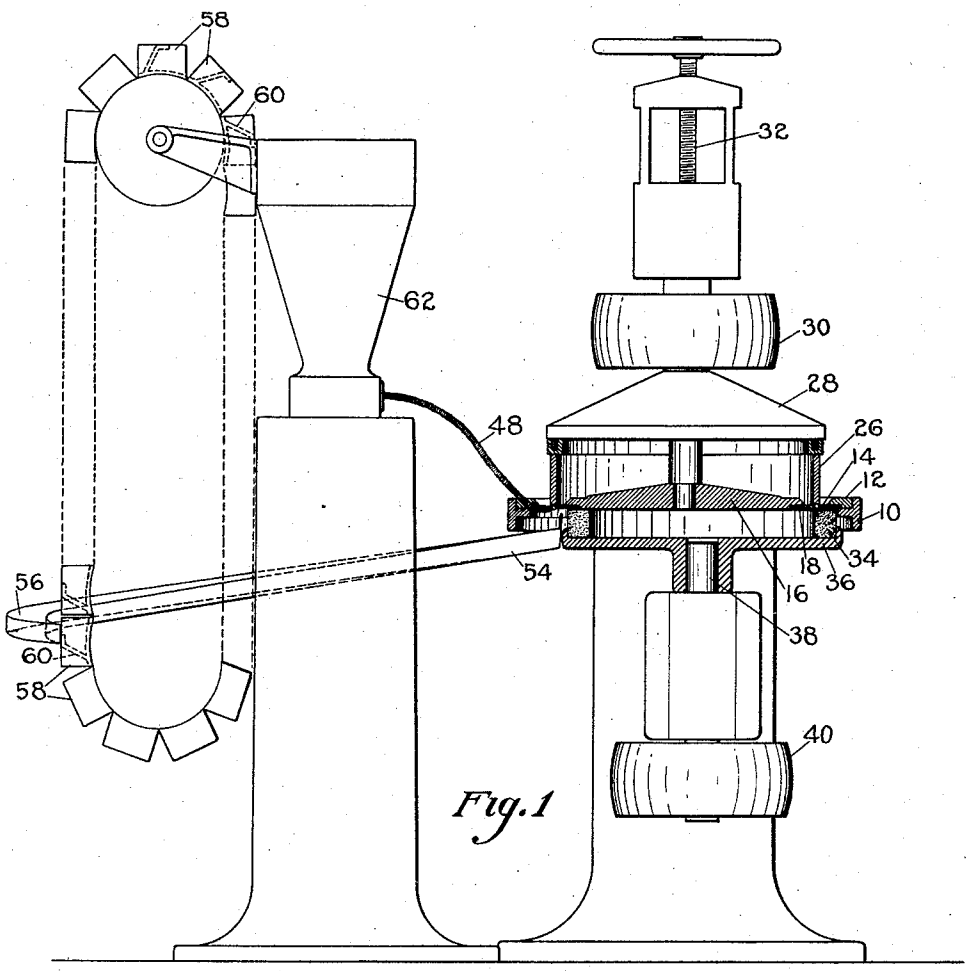


Fig. 1

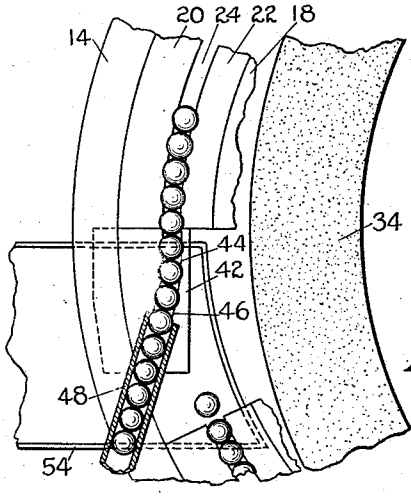


Fig. 2

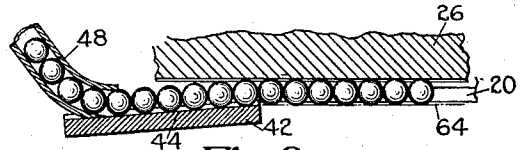


Fig. 3

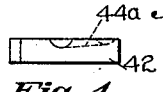


Fig. 4

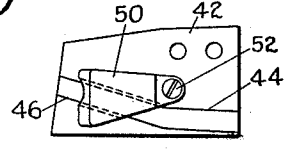


Fig. 5

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Patented Aug. 5, 1930 1,772,365

UNITED STATES PATENT OFFICE

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ABRADING MACHINE

Application filed September 28, 1923. Serial No. 665,326.

This invention relates to abrading machines and is herein shown as embodied in a machine for grinding balls.

One well known machine for grinding balls comprises a horizontal, circular ball holder or track, a pressure ring bearing on the balls in the track to feed them around in the track and a rotary grinder bearing upwardly against the balls to reduce them to size and sphericity. In such a machine, the circular track is filled by hand with balls when the pressure ring is raised, the ring being lowered again for the grinding operation. Hitherto, this stopping of the grinding operation and lifting of the ring to introduce the balls has been considered necessary because of the apparent impossibility of otherwise getting the balls into the track between the pressure ring and the grinder. The capacity of the ball track limits the quantity of balls that can be treated at one setting and it is necessary to raise the pressure ring and stop grinding whenever a ball is to be taken out and tested, as for the purpose of showing how far the grinding has proceeded. With such a machine, ball production is slow and intermittent, and separate operations of the machine for small batches of balls, ground at different times, results in a lack of uniformity in the product.

An object of the invention, therefore, is to provide an improved ball grinding machine of this character which will operate without constant interruption and increase production with less attention on the part of the operator. Another object is to provide a grinder of this type which will operate, at one setting, on a large batch of balls to secure uniformity. Still another object is to provide such a machine with means for introducing balls during the grinding operation.

To these ends and also to improve generally upon devices of the character indicated my invention consists in the various matters hereinafter described and claimed.

Referring to the drawings, Figure 1 is a front view of the apparatus, partly in vertical section;

Figure 2 is an enlarged plan view of a portion of the apparatus;

Figure 3 is a diagrammatic vertical section;

Figure 4 is a front view of the feed plate; and

Figure 5 is a plan view of the feed plate.

The numeral 10 indicates a circular support mounted on a standard and carrying a clamping ring 12, the lower edge of which is recessed to receive a ring 14, which, if desired, may be formed in a plurality of sections bolted to the ring 12. Mounted centrally inside the ring is a normally fixed disc 16 which is recessed on its under side at the periphery to receive a substantially circular plate 18. Preferably the plate 18 is formed in segmental sections bolted to the disc. The opposing edges of the ring 14 and the circular plate 18 are bevelled or inclined, as at 20 and 22 to form a circular, horizontal ball guide, channel or track 24 around which the balls are fed by a slowly rotating pressure member 26.

The pressure member 26 is in the form of an annular ring the under side of which bears downwardly upon the balls and presses them against the inclined sides of the ball guide. A ball groove wears in the pressure member forming side lips overhanging the balls. The pressure member is yieldably mounted on a member 28 which is rotated on a vertical axis by a pulley 30 and the pressure member may be vertically adjusted to regulate the pressure by means of a hand-operated screw 32. The pressure member bears with sufficient pressure on the balls to control their traverse and during this operation the grinding is effected by an abrading member in the form of a ring 34 which bears upwardly against the balls where they project below the guide and the ring is fixed to a disc 36 on a vertical shaft 38 driven at high speed by a pulley 40.

It should be noted that the shaft 38 of the abrading member is eccentrically mounted with respect to the center of the ball track and the width of the abrading member and the eccentricity are such that the abrading member wipes across the path of the balls and is thus worn evenly. This eccentric mounting also leaves the balls exposed on their under sides at a portion of their path

as will appear by referring to Figures 1 and 2. Here the continuity of the ball track or channel is interrupted, the ends of the channel coming at the sides of a gap in which a hardened feed plate 42 is fixed. The feed plate has a groove 44 which is tangent to the ball guide so that the transfer of balls from the plate to the guide will occur without any resistance. A groove extension 46 extends at an obtuse angle to the groove 44, thus extending laterally beyond the edge of the pressure member and in this extension is laid the end of a flexible feed tube 48, the tube being cut away on its under side, to let the balls enter the groove and the tube being fastened by a clamp plate 50 secured by a screw 52 to the feed plate.

Below the exposed portion of the ball guide at the gap in the latter is an inclined chute 54 which conducts the balls downwardly from the delivery end of the track or channel around a 180° turn at 56 and into a series of buckets 58 having inclined bottoms 60. The buckets are supported on endless chains passing over sprocket wheels and continuously driven in any suitable manner. As the balls are elevated in the buckets, they are discharged onto the reverse sides of the inclined bottoms 60 and directed into a hopper 62 mounted on a standard. The hopper may be of any suitable construction in which the balls are gathered and fed one by one into the feed tube 48 above mentioned.

As indicated in Figure 3 the bottom of the groove 44 lies below the level of the balls in the ball guide, this level being indicated by the broken line 64. It is apparent that the pressure member 26 would interfere with any mere lateral introduction of the balls on a level with the ball guide, especially if a groove had been worn in the lower edge of the pressure member. The groove 44 is preferably inclined as shown and this inclination may be effected either by inclining the plate 42 or by making the entrance end of the groove 44 deeper than the end nearest the ball guide, as shown in Figure 4 at 44^a. The lateral groove extension 46 allows the balls to pass freely under the pressure member and then the balls are forced up the incline by the pressure of the stream of balls in the feed tube 48. As soon as the balls enter the ball guide they are fed around under control of the pressure member.

With the above apparatus, it is not necessary to raise the pressure member to take out a ball for testing purposes because a ball may be readily picked out of the chute at any time without interrupting the operation of the machine. Again, a large batch of balls can be treated at one setting, the capacity not being limited by the length of the ball guide but being increased by the capacity of the chute, the buckets and the hopper. Thus all of the balls in a large batch are treated uniformly and the absence of interruption enables the operator to operate more machines.

Although the invention has been described by reference to a specific apparatus, it should be understood that, in its broader aspects, the invention is not necessarily limited to the embodiment selected for illustration.

I claim:

1. In a ball grinding machine, in combination, a horizontal annular ball guide constructed and arranged to support the balls with their upper and lower portions projecting beyond the guide, a rotary pressure member bearing on the upper portions of the balls to carry them around in the guide, a rotary abrading member arranged to engage the under portions of the balls and eccentrically mounted with respect to the ball guide to leave the balls exposed at a part of their path, a plate at the exposed part of the path and having a ball groove inclined upwardly towards the ball guide, and means for causing the balls to feed up said inclined groove to the ball guide; substantially as described.

2. In a ball grinding machine, in combination, a horizontal annular ball guide constructed and arranged to support the balls with their upper and lower portions projecting beyond the guide, a rotary pressure member bearing on the upper portions of the balls to carry them around in the guide, a rotary abrading member arranged to engage the under portions of the balls and eccentrically mounted with respect to the ball guide to leave the balls exposed at a part of their path, a plate at the exposed part of the path and having a ball groove inclined upwardly towards the ball guide, and an inclined tube connected to the groove, the pressure of a stream of balls in the tube forcing the balls up the inclined groove to the guide; substantially as described.

3. In a ball grinding machine, in combination, a horizontal annular ball guide constructed and arranged to support the balls with their upper and lower portions projecting beyond the guide, a rotary pressure member bearing on the upper portions of the balls to carry them around in the guide, a rotary abrading member arranged to engage the under portions of the balls and eccentrically mounted with respect to the ball guide to leave the balls exposed at a part of their path, a plate interrupting the continuity of the ball guide and having a ball groove tangent to said ball guide, said groove supporting the balls below and out of contact with the pressure member; substantially as described.

4. In a ball grinding machine, in combination, a ball guide comprising a disc and a ring surrounding the disc and spaced therefrom to form a horizontal ball track, said guide allowing the balls to project above and below the disc and ring, a pressure member

bearing on the balls, a rotatable abrading member under the balls and eccentrically mounted with respect to the ball guide to leave the balls exposed on their under side at a portion of their path, a grooved plate set into the ring and having the bottom of its groove slightly below the lowest points of the balls in the guide, and an inclined tube leading to the groove, the pressure of a stream of balls in the tube feeding the balls onto the guide into contact with the pressure member; substantially as described.

5. In a ball grinding machine, in combination, a horizontal annular ball guide comprising inner and outer fixed plates forming a channel with inclined side walls, the balls bearing on the side walls and projecting above and below the plates, a rotary pressure member pressing the balls down against the fixed plates and carrying them around in the channel, a rotary abrading member arranged to engage the under portions of the balls and eccentrically mounted with respect to the ball guide to leave the ball guide and the balls exposed at a part of their path beyond the periphery of the abrading member, and means for forcing a stream of balls under the pressure member and up into the ball guide at said exposed part of the path; substantially as described.

In testimony whereof I hereunto affix my signature.

WILLIAM PRATT.