A. F. ROCKWELL.

BALL GRINDING MACHINE.

APPLICATION FILED JULY 23, 1908.

949,912. Patented Feb. 22, 1910.

Fig. 1.

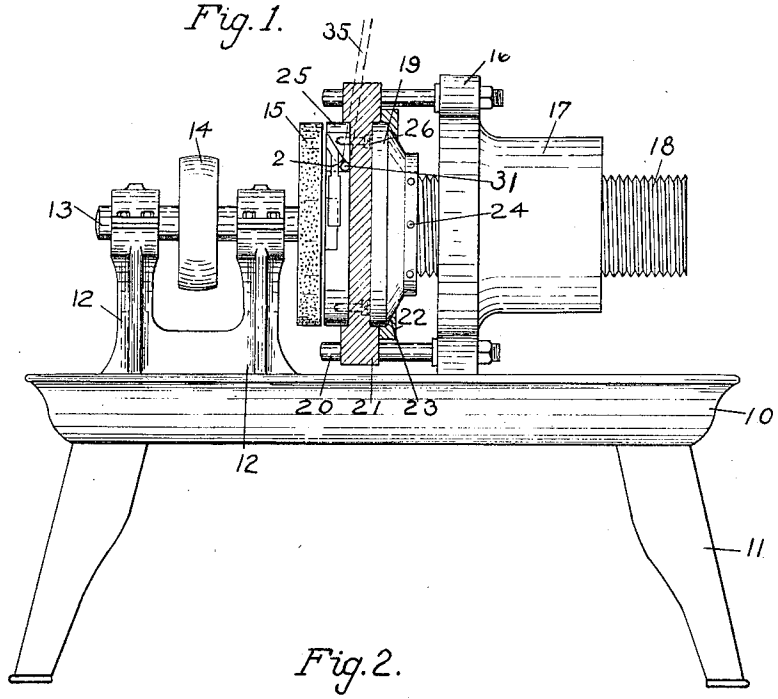


Fig. 2.

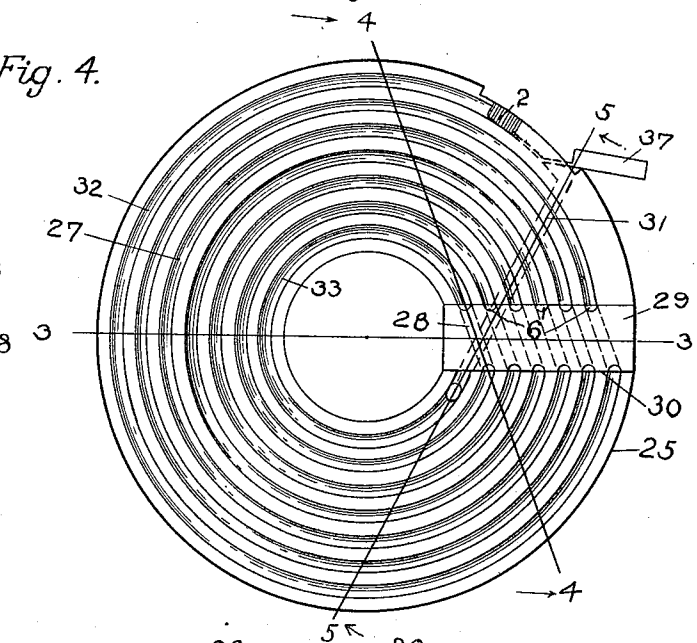


Fig. 4.

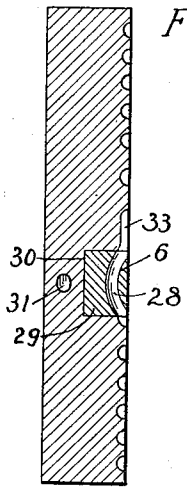
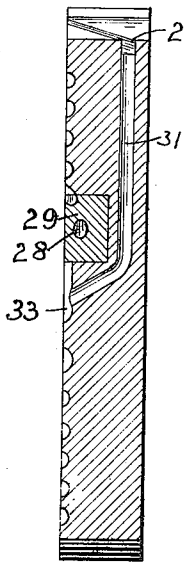


Fig. 5.



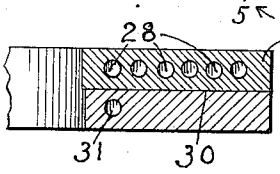


Fig. 3.

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BALL-GRINDING MACHINE.

949,912. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed July 23, 1908. Serial No. 445,006.

To all whom it may concern:

Be it known that I, ALBERT F. ROCKWELL, a citizen of the United States, residing at Bristol, county of Hartford, State of Connecticut, have invented a certain new and useful Ball-Grinding Machine, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to grinding machines, and is particularly applicable to machines for grinding balls. In machines of this class it has been customary to employ grinding disks having a plurality of concentric grooves in which the balls are received and ground, the balls, after traversing any groove, being deposited promiscuously upon a table where they mix with the balls from all other grooves and then roll into any groove into which chance may direct them for further grinding. In such a construction a ball traversing only some grooves does not receive the same grinding which is received by other balls which have traversed other grooves. Furthermore, the balls loosely spread upon the table have a tendency to roll together at the entrances to the grooves and thus clog such entrances and thereby interfere with the continuous and uniform operation of the machine.

One object of my invention is to provide means whereby each ball is definitely fed from one grinding groove to another definite grinding groove, thus positively causing each ball to traverse exactly the same path through the machine, the result being uniform grinding for each ball and consequent uniformity in the completed product.

A further object is to provide simple and inexpensive means whereby the balls are transferred from groove to groove without jamming or clogging.

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.

In the accompanying drawings Figure 1 is a side elevation of a machine embodying my invention, certain of the parts being broken away; Fig. 2 is a face view of the grinding disk which serves as a base plate for the articles being ground; Fig. 3 is a fragmentary sectional elevation on about the line 3—3 of Fig. 2; and Figs. 4 and 5 are, respectively, sectional elevations on about the lines 4—4 and 5—5 of Fig. 2.

In the illustrated embodiment of my invention, 25 indicates a stationary grinding member, usually of metal, which serves as a bed-plate for the balls, and 15 represents the coöperating, rotating grinding disk of abrasive material. The concentric grinding grooves 27 in the said bed or guide disk 25 produce grinding channels in which the balls are received. A transfer groove or passage, 28, connects the delivery end of each grinding groove with the receiving end of the next such groove. Thus, all of the grinding grooves are definitely connected to produce a continuous raceway through the machine and each ball, upon leaving one grinding groove, is definitely directed to another definite groove. The result is that each ball is forced to traverse the one definite path through the machine and thus receives the same grinding action received by every other ball, whereby a uniform product is obtained. Preferably the transfer grooves 28 are of approximately the size of the balls; that is to say, they are large enough to permit each ball to readily pass but are too small to permit two or more balls to jam together. Thus all clogging or jamming is obviated and the balls traverse the entire raceway in a steady stream. As shown particularly in Fig. 4, each transfer groove, in the illustrated embodiment of my invention, is at substantially the level of a grinding groove at the receiving end of the transfer groove, then extends in what may be termed a downward or backward direction and then rises to join the next grinding groove. Thus the balls are transferred in a simple manner and without interfering with the grinding action. To insure ready passage of the balls, the transfer grooves incline in the direction of rotation of the disk 15. For convenience in manufacture, I prefer to form the transfer grooves in a block 29 which is received in a suitable radial recess 30 in the said disk 25, thereby permitting the transfer grooves to be readily bored and also permitting the block to be easily slipped into and out of position as occasion may require, the grooves

thus being included between the faces of the disk 25 and obviating objectionable extensions. The portions 6 of the block which extend across the grooves 27 serve as projections to deflect the balls into the transfer grooves. I have found it best to introduce the balls into the inner channel (embodying the groove 33) and to then let them pass to the other grooves. As each outer groove is of greater circumference than the said inner groove or channel, the balls received in such outer grooves from the inner one have a chance to become spaced from each other and to thus have greater freedom to present all points of their surfaces to the grinding action. A convenient means for introducing the balls is the supply channel or duct 31 formed in said disk 25 and extending from the edge of said disk to said inner grinding groove 33. Preferably, a slot 2 is cut obliquely across the edge of the said disk 25, as particularly shown in Fig. 1, the last grinding groove, 32, delivering to said slot or passage and the said supply channel also opening thereinto. Balls can be delivered to said supply channel 31 in any suitable manner, as through a pipe 35 from a reservoir. If it be desired to have the balls pass only once through the machine, a suitable deflector 37 can be placed in the discharge passage 2 to lead the ground balls away. If, however, it be desired to subject the balls to repeated operations of the machine, the deflector is not used and the supply from the reservoir is cut off after the machine is filled with the desired number of balls, in which event the ground balls discharging from the last groove 32 enter the passage 2 and are returned by said passage to the supply channel 31. Thus, by a simple and inexpensive structure, I provide a machine in which each ball is compelled to traverse just the path traversed by each other ball, and all tendency of the balls to jam together is obviated. Smooth and uninterrupted operation of the machine is assured and I secure great uniformity of the ground product.

The particular machine here illustrated embodies a bed 10 upon legs 11, standands 12 supporting the shaft 13 which has a driving pulley 14 and carries the abrasive disk 15, a standard 16 whose hub 17 receives the adjusting screw 18, said standard having guide rods 20, and the holding plate 21 to which the disk 25 is secured by the screws 26, said holding plate being guided upon said rods 20 and having the collar 22 (provided with a beveled face 23) which secures said holding plate to the head 19 of said screw but permits the latter to rotate to adjust the grinding member 25 toward and away from the grinding member 15, 24 indicating holes to receive a tool for thus rotatably adjusting said head 19.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a grinding machine, a grinding member having a plurality of grooves, and means for directing each article acted upon through the same path through said grooves; substantially as described.

2. In a grinding machine, a grinding member having a plurality of grooves, and a transfer passage definitely connecting each of said grooves with another definite one thereof; substantially as described.

3. In a grinding machine, a grinding member having a plurality of grooves, and a transfer passage definitely connecting each of said grooves with another definite one thereof and being of approximately the same size as the articles acted upon, whereby said articles do not jam upon each other in the transfer passage; substantially as described.

4. In a grinding machine, a grinding member having a plurality of grooves, and a transfer passage definitely connecting each of said grooves with another definite one thereof and inclined from one groove to the other in the direction of grinding rotation; substantially as described.

5. In a grinding machine, a grinding member having a plurality of grooves, and a transfer passage connecting one of said grooves with another thereof and included between the faces of said grinding member; substantially as described.

6. In a grinding machine, a grinding member having a plurality of grooves and provided with a recess, and a block in said recess and having a transfer passage connecting one of said grooves with another thereof; substantially as described.

7. In a grinding machine, a grinding member having a plurality of grooves and provided with a recess, and a block in said recess and having a transfer passage connecting one of said grooves with another thereof, said block having a portion obstructing the delivery end of a groove to deflect the articles being acted upon; substantially as described.

8. In a grinding machine, a grinding member haying a grinding raceway whose diameter increases as said raceway progresses from the center of revolution, and means for feeding articles to said raceway at its inner portion; substantially as described.

9. In a grinding machine, a grinding member having concentric grooves, a transfer passage definitely connecting each of said grooves with another one thereof, and means for feeding articles to the inner groove; substantially as described.

10. Two members coöperatively supported for grinding operation, a series of grooves arranged upon one of the members, com-

municating passages between each of the adjacent grooves, and a communicating passage extending between the two grooves located at each side of the series.

11. Two members coöperatively supported for grinding operation, one of said members having grooves concentrically arranged and with passages between the adjacent grooves similarly located with respect to a radial line, and with a passage between the outer and inner grooves arranged with respect to the same radial line, and means for causing grinding movement of one member with respect to the other.

12. A grinder with means for rotating it, a ball holder coöperatively supported with respect to the grinder and having a series of concentrically arranged grooves in its surface with communicating passages having their outlets inclined in the direction of rotation of the grinder and extending between each of the adjacent grooves, and a passage inclined in the direction of rotation of the grinder and extending between the outer and inner grooves, and means for causing travel of a ball in a predetermined manner through said communicating passages.

13. A grinder with means for rotating it, a ball holder coöperatively supported with respect to the grinder and having a series of grooves concentrically arranged in its surface, communicating passages all similarly arranged with respect to a radial line and extending between each of the adjacent grooves, a communicating passage arranged with respect to the same radial line and extending between the outer and inner grooves, and means for causing travel of a ball in a predetermined path between all of the grooves.

14. A grinder with means for rotating it, and a ball holder having grooves concentrically arranged in its surface with passages inclined in the direction of rotation of the grinder and extending below the surface between each of the adjacent grooves, said passages being similarly located with respect to a radial line, and a passage below the surface connecting the outer and inner grooves and inclined in direction of rotation of the grinder.

In testimony whereof, I hereunto affix my signature, in the presence of two witnesses.

ALBERT F. ROCKWELL.

Witnesses:
PETER A. CAWLEY,
JOSEPH D. BROWN.