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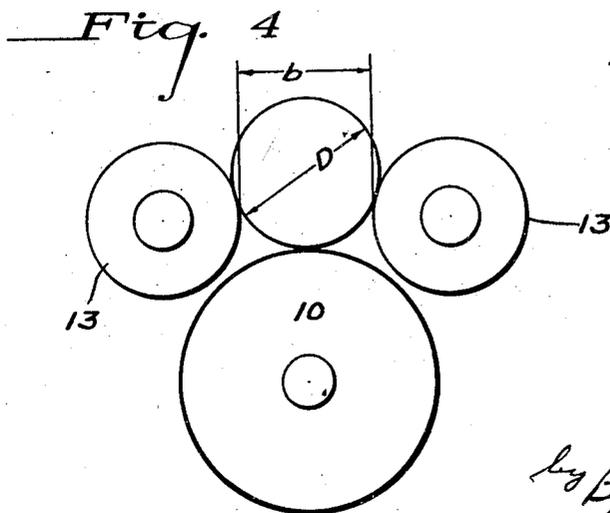
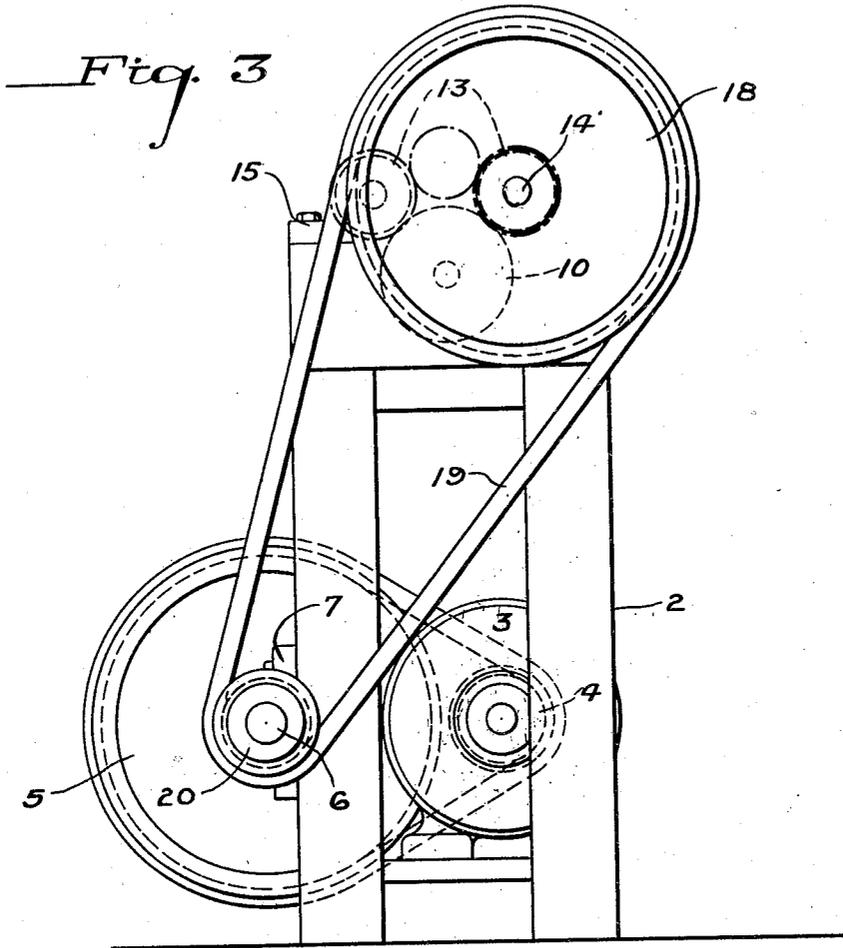
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GRINDING MACHINE AND METHOD OF GRINDING

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# UNITED STATES PATENT OFFICE

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## GRINDING MACHINE AND METHOD OF GRINDING

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The present invention relates broadly to the art of grinding and polishing, and more particularly to an improved method and apparatus for the grinding to a predetermined diameter of substantially circular articles.

It is customary at the present time in a number of different arts to form substantially circular objects by stamping, molding, and the like. The stamping operations are usually, though not always, confined to metal bodies, and the molding steps are valuable more particularly with the plastic arts, such as glass. With both stamping and molding processes, the resulting article not infrequently has a fin, burr or projection thereon which it is desirable to remove.

The present invention provides a method and apparatus by means of which articles of the general character herein contemplated may be treated for the removal of such imperfections.

In the accompanying drawings there is shown, for purposes of illustration only, a preferred embodiment of the present invention, it being understood that the drawings do not define the limits of my invention as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the invention or the scope of my broader claims.

In the drawings,—

Figure 1 is a side elevational view of one form of apparatus effective for carrying out the present invention;

Figure 2 is a top plan view of the apparatus illustrated in Figure 1;

Figure 3 is an end elevation looking at the right hand end of the machine as viewed in Figures 1 and 2; and

Figure 4 is a diagrammatic view illustrating the automatic nature of the machine with respect to the amount of material which can be removed.

In accordance with the present invention, there may be provided a grinding machine comprising a suitable supporting frame 2 having mounted thereon a motor 3, the armature shaft of which carries a pulley 4. This pulley is in substantial alignment with a similar but preferably larger pulley 5 car-

ried by a shaft 6 mounted in bearings 7 on the frame.

Mounted preferably on the upper portion of the frame in bearings 8 is a shaft 9 having grinding means 10 thereon of any convenient description. This grinding means preferably, however, comprises a series of individual units mounted on the shaft and clamped thereon between a collar 11 and a follower head 12, whereby a substantially continuous grinding surface is provided.

Also carried by the frame in spaced relation and preferably uniformly spaced on opposite sides of the axis of the grinding element 10 is a pair of supports 13. These supports are preferably in the form of rolls mounted on shafts 14 suitably journaled at their opposite ends in bearings 15. As will be clearly apparent from an inspection of Figure 4, the supports 13 are so spaced that the distance  $b$  between the closest portions of their peripheries is less than the diameter  $D$  of an article to be ground. Due to this relationship, the supports actually carry the article and determine the amount of material which can be removed therefrom by the grinding element 10 by controlling its ultimate approach to such element.

In order to prevent localized grinding of an article such as might occur if the grinding element itself were relied upon to effect rotation thereof, the shafts 14 carrying the supports are preferably provided with gears 16 meshing with an idler gear 17 on a stub shaft 17' supported in one of the bearings 15. For rotating the gears, one of the shafts 14 may be provided with an extension 14' carrying a pulley 18 around which passes a belt 19 driven from a smaller pulley 20 on the shaft 6. By reason of this construction, the supports 13 may be continuously rotated in the direction indicated by the arrows A.

The grinding element 10 may also be rotated by the motor 3 by providing its armature shaft with a pulley 21 around which passes a belt 22 leading around a similar pulley 23 on an extension 9' on the shaft 9. By this means the grinding element is continuously rotated during the operation of

the apparatus in the direction indicated by the arrow A'.

It is desirable to effect a feeding movement of the articles lengthwise of the element 10 during the rotational movement thereof. By properly determining the speed of rotation of the articles and the length of the grinding element, the time required to effect longitudinal travel of an article from one end of the element to the other may be so regulated that the desired grinding thereof is insured. This is conveniently accomplished in accordance with the present invention by forming feeding threads 24 on the support 13, the threads being shaped to cooperate with the peripheral contour of the articles engaged thereby, as will be apparent. The pitch of the threads will in turn determine the rate of travel of the articles.

The present invention provides an apparatus for supporting the articles in edgewise position to a grinding element, for feeding such articles lengthwise of the grinding element, and for definitely limiting the maximum amount of grinding which can occur.

I claim:

1. In a grinding machine, a movable grinding element, rotatable supports adjacent said grinding element and in spaced relationship to each other and said element, said supports being located above the grinding element, and means to rotate the supports to insure longitudinal feeding movement of an article carried upon and by said supports.

2. In a grinding machine, a movable grinding element, movable supports adjacent said grinding element positioned above said element and in spaced relationship to each other and to said element, said supports being constructed to insure feeding movement longitudinally of the element of articles in position between said supports, and means for positively effecting rotation of said element and said supports.

3. In a grinding machine, a rotatable grinding element, rotatable supports adjacent said grinding element and above the same, said supports being substantially uniformly positioned on opposite sides of, and substantially parallel to, the axis of said rotatable element and being constructed to insure feeding movement longitudinally of the element of articles in position between said supports, and means for rotating said element and said supports.

4. In a grinding machine, a rotatable grinding element, rotatable supports adjacent said grinding element and above the same, said supports being substantially uniformly positioned on opposite sides of the axis of said rotatable element and being constructed to insure feeding movement longitudinally of the element of articles in position between said supports, and means for

rotating said element and said supports in the same direction.

5. In a grinding machine, a rotatable grinding element, rotating supports above and on opposite sides of said grinding element, said supports being spaced a distance less than the diameter of the article to be ground and sufficiently close to said element to permit contact between an article and said element, and means for producing a feeding movement of an article longitudinally of said element.

6. In a grinding machine, a rotatable grinding element, rotating supports above and on opposite sides of said grinding element, said supports being spaced a distance less than the diameter of the article to be ground and sufficiently close to said element to permit contact between an article and said element, and means for producing a feeding movement of an article longitudinally of said element, said means comprising feeding threads formed on at least one of said supports.

7. In the method of grinding circular articles, the steps comprising engaging and supporting an article on opposite sides thereof only and entirely below the horizontal center line, grinding said article at substantially its lowermost portion while so supported, and moving said article longitudinally relatively to the grinding surface during the grinding operation.

8. In the method of grinding circular articles, the steps comprising engaging and supporting an article on opposite sides thereof only and entirely below the horizontal center line, grinding said article at substantially its lowermost portion while so supported, moving said article longitudinally relatively to the grinding surface during the grinding operation, and continuously rotating said article during the grinding thereof.

9. In a grinding machine, an elongated grinding element, supports adjacent said grinding element and above the same and in spaced relationship to each other and to said element to support by gravity the articles to be ground, and means to insure feeding movement of an article carried by said supports in a direction lengthwise of the grinding element.

10. In a grinding machine, a grinding element, supporting means adjacent said element providing spaced supports above the same for the gravity support of an article to be ground, said supports being spaced a distance less than the diameter of such article and sufficiently close to limit the maximum grinding action thereof under the influence of gravity, and feeding means on one of said supporting means.

11. In the method of grinding circular articles, the steps comprising engaging an

article on opposite sides thereof entirely below the horizontal center line, grinding the article while so supported, moving the article lengthwise of the grinding surface during the grinding operation, limiting the amount of grinding of such article by the positioning of the point of engagement therewith, and maintaining the grinding engagement entirely by gravity.

12. In the method of grinding circular articles, the steps comprising rotatably engaging an article on opposite sides thereof below the horizontal center line, grinding said article while so supported, and moving said article longitudinally relatively to the grinding surface during the grinding operation entirely by engagement with said opposite sides.

In testimony whereof I have hereunto set my hand.

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