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ARTICLE ROTATING APPARATUS

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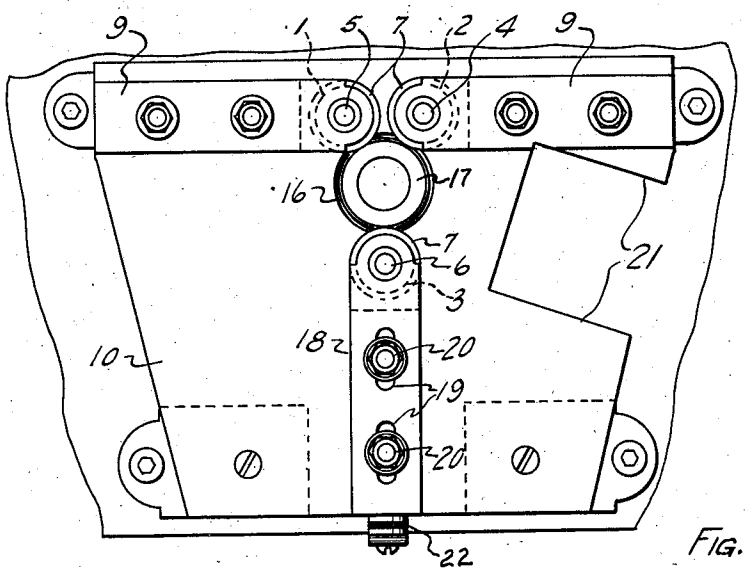


FIG. 1

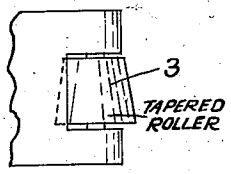


FIG. 3.

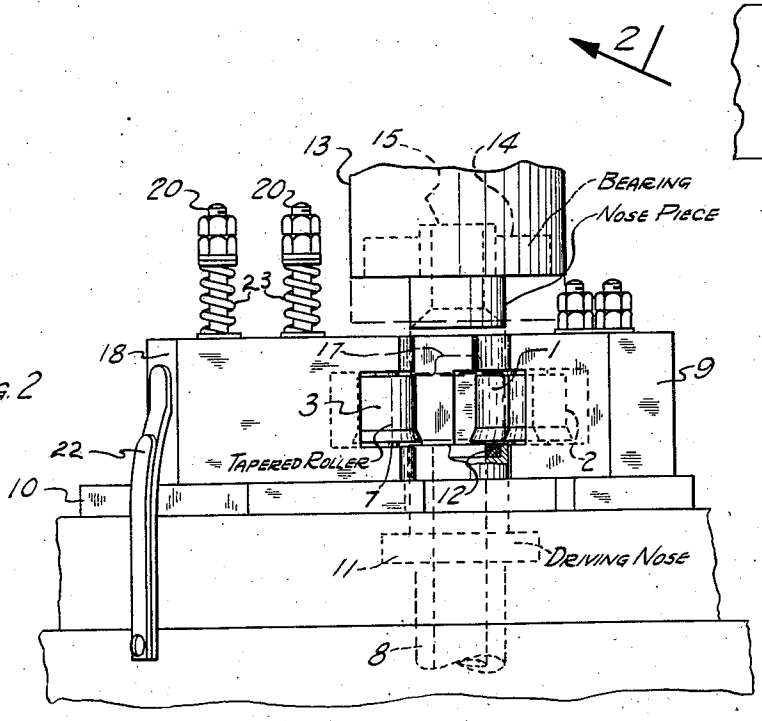


FIG. 2

INVENTOR
SAMUEL C. HURLEY JR.
By Benedict & Sunderland
ATTORNEYS

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ARTICLE ROTATING APPARATUS

Samuel C. Hurley, Jr., Danville, Ill.

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9 Claims. (Cl. 214—1)

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This invention relates to an improved apparatus for rotating articles on which it is desired to perform an operation such as an inspection, drilling of holes, centrifugal drying, polishing, grinding, etc.

More particularly, the invention relates to an apparatus and method for engaging and disengaging an article with a rotating means which is turned at a high rate of speed and which means cannot be stopped without loss of time and power.

It is an object of this invention to supply means for guiding the article to be rotated into the proper position for rotation, engaging the article with the rotating means, and disengaging the article from the rotating means after the desired operation has been performed, thereby stopping the rotation of the article without the necessity of stopping the rotating means.

A further object of the invention is to engage and disengage rotating articles with a high-speed rotating spindle without the necessity for altering the speed of the spindle.

Broadly, the invention comprises an improvement in an apparatus for spinning an article, including a rotating means, e. g., a rotating spindle and means for engaging the article with the rotating means. The improvement comprises a guide means which comprises tapered idler rollers engageable with and rotatable by the article when the article is rotatably engaged with the rotating means, the larger end of the taper being adjacent the rotating means whereby the rotating article will ride along the taper of the roller and out of contact with the rotating means when the engaging means is released, thereby disengaging the article from the rotating means and stopping the spinning motion of the article.

In a preferred embodiment, at least three rollers are used, at least one of which is tapered and preferably all three are tapered. The position of the rollers in relation to each other will depend upon the method of introducing the article into the machine.

In the embodiment illustrated in Fig. 1 is a top view of a simplified representation of the improved apparatus.

Fig. 2 is an elevation of Fig. 1 taken through line 2—2, partly cut away to show a detail of the driving nose. An article to be rotated is in position.

Figure 3 illustrates an alternate form of roller.

Referring to Fig. 1, rollers 1, 2, and 3 are mounted on bearings 4, 5 and 6; as illustrated, all three rollers have a taper 7 at the lower end. The bearings 4, 5, and 6 may be separate from

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the rollers, extending through a hole longitudinal thereto; or may form an integral part of the roller. Although in the preferred embodiment, the rotating axis of the rollers is vertical, it is understood that they could with the proper redesigning be placed on a horizontal axis or at any angle desired depending upon the position of the machine and the manner of introducing the article to be rotated. In general, the axis of the rollers is parallel with the rotating spindle 8. The preferred shape of the rollers is right cylindrical with one beveled or tapered end of greater diameter than the cylindrical part.

Bearings 4 and 5 are fixed in bearing yoke 9. The bearing yoke may be mounted on plate 10 fastened to the frame of the machine. The rotating spindle 8 is equipped with a driving nose 11 which may contain a clutch lining 12 against which the article is forced when it is being rotated.

The engaging means may comprise a carriage 13 which may be raised and lowered by appropriate means not shown. A bearing assembly which may comprise ball bearings in a suitable race, is mounted in the lower end of the carriage. A nose piece 15 which may be shaped in such a manner as to engage the article to be rotated is mounted in the lower end of carriage 13 in such a manner as to be raised and lowered as desired with the carriage. The nose piece 15 is mounted so that it bears upon and rotates freely within bearing 14 when the carriage 13 is brought into position to force nose piece 15 against the article 17. When the carriage is lowered, the article is forced against the clutch lining 12 on the driving nose 11. The article and the nose piece 15 rotate at substantially the same rate as spindle 8, hence the bearing between nose piece 15 and bearing 14 must be accurate and free-moving with little friction.

This device is particularly adapted to use in connection with round or cylindrical articles. The article 17 is placed in position in zone 16. The operation of the mechanism may be best described if reference is made first to Fig. 1. The article may be introduced in this particular apparatus from a position to the left and toward the upper part of Fig. 1 through a chute or other feeding mechanism, not illustrated for purposes of simplification. As the article slides or is pushed into position into zone 16, it rests on the tapered edges 7 of roller 1, 2, and 3, rollers 1 and 2 being mounted on fixed bearings and being equi-distant from the center of zone 16 on either side of the center line and designed to center the article in

position over the spindle and driving nose. Roller 3 may be positioned on a line passing through the center of zone 16 perpendicular to a line drawn through the centers of bearings 4 and 5; thus the center of bearing 6 is at the apex of a triangle, the base of which is formed by a line drawn through the centers of bearings 4 and 5. One side is formed by a line through the center of bearings 5 and 6 and the other side is formed by a line through the center of bearings 4 and 6. Bearing 6 is mounted in bearing yoke 18 but, because of the manner in which it is mounted, floats slightly. The holes 19, through which pass the bolts 20 holding the bearing yoke to the plate 10, are slightly oblong in shape so as to permit the roller to move back and forth slightly. The shape of the holes 19 are greatly exaggerated for purposes of illustration. The position of bearing yoke 18 and hence of roller 3 may be controlled by flat spring 22 mounted on the frame of the machine to thrust against yoke 18, and by the tension put on springs 23 mounted on bolts 20, by screwing down the nuts. Thus, when the article to be rotated is pressed into position by lowering carriage 13, it pushes the piece along roller 3 and thrusts roller 3 in a direction away from the center of zone 16, permitting the article to engage the surface of clutch lining 12 in driving nose 11. Since spindle 8 is spinning, the article, as well as nose piece 15, is rotated. Rollers 1, 2, and 3, being in contact with the piece, are also set into motion and spin with the piece.

As soon as the operation upon the article is complete and carriage 13 is raised to permit the piece to disengage, roller 3 is pushed back into position by means of spring 22. Immediately the piece, which is resting firmly against the taper 7, travels upward along the taper since there is no longer any counteracting force on the top of the article. This lifts the piece away from clutch lining 12 and, because no force is being applied to spin the piece, the friction quickly causes the article to stop spinning. In one embodiment, the next piece to be placed in position may be fed by any desired means into zone 16 and may push the article just handled out into a chute, the channel for which is indicated as 21. One of the greatest uses of my invention is in connection with photoelectric inspection machines. The particular methods of feeding the pieces into zone 16 and removing the piece are described as feasible methods for conducting the operation. The pieces may be dropped into position and/or removed mechanically, or by hand, depending on the type of operation being carried out and the rapidity with which the articles must be fed.

This apparatus is particularly useful in conjunction with the rotation of a piece which must be inspected. For example, certain complicated timing and actuating mechanisms are put in condition for service by being rotated at speeds of 4000–5000 R. P. M. Machines equipped with my invention may be used to determine whether parts or all of the mechanism are properly operable and to reject those which are defective. It is particularly adapted to use with relatively small articles of a round or cylindrical character.

A major advantage of this invention lies in the fact that it permits the rotating mechanism to continue to turn at a constant speed rather than to stop its rotation in order to position and remove the article each time. It is especially advantageous when the spindle must turn at high speeds, for example, above 1,000 R. P. M., where the starting and stopping of the spindle would occupy too much time and power.

Although I have described a simplified modification of my invention and indicated certain uses, it should be kept in mind that other modifications and uses come within its scope and I do not intend it to be limited by the illustrations given.

I claim as my invention:

1. In an apparatus for rotating an article, said apparatus comprising a rotating means including a spindle and means for engaging the article with the rotating means, the improvement comprising a guiding and disengaging means comprising at least three idler rollers having at least a portion of their length tapered, the center axes of which are substantially parallel the axis of rotation of the article, said rollers being engageable with and rotatable by the article when the latter is rotatably engaged with the rotating means, the larger end of the tapers being adjacent the rotating means whereby the rotating article will ride along the roller and out of contact with the rotating means when the engaging means is not actuated thereby preventing the article from engaging with the rotating means without the application of additional force thereupon, and resilient means urging one of said rollers toward the axis of rotation of said article.

2. In an apparatus for rotating an article comprising a rotating means including a rotating spindle and means for engaging the article with the rotating means, a guiding means comprising at least three idler rollers having at least a portion of their length tapered, the center axis of which are substantially parallel to the axis of the rotation of the article, said rollers being engageable with and rotatable by the article when the latter is rotatably engaged with the rotating means, the larger end of the taper being adjacent the rotating means, two of said rollers rotating around fixed bearings, a movable support comprising bearings in which the third of said rollers is mounted, means for guiding said support and limiting its motion toward and away from the center of the article being rotated to the extent of the taper when said engaging means is operated, resilient means urging said support toward said article normally to prevent the article from engaging said rotating means unless the engaging means is applied, whereby the rotating article will ride along the taper with the rollers and out of contact with the rotating means when the engaging means is released.

3. A centering and disengaging device of the character described comprising a rotating means, an engaging means, a disengaging means comprising at least three idler rollers having at least a portion of its length tapered, said rollers being engageable with and rotatable by the article when said article is rotatably engaged with the rotating means, resilient means urging one of said rollers toward the article, said rollers being positioned with the taper adjacent the rotating means whereby the article tends to ride along the taper and out of contact with the rotating means unless sufficient force is applied to the engaging means to overcome the lifting effect of the taper.

4. An apparatus for positioning and rotating an article comprising rotating means including a spindle and an article-engaging clutch associated therewith, means for engaging the article with said clutch, positioning and disengaging means comprising fixed positioning members and an idler roller having at least a portion of its length

tapered, resilient means urging an idler roller into engagement with said article, the larger end of the roller being adjacent the rotating means whereby the rotating article will ride along the taper of the roller and out of contact with the rotating means when the engaging means is released.

5. An apparatus for positioning and rotating an article, said apparatus comprising rotating means including a spindle and an article-engaging clutch associated therewith, means for engaging said article with said clutch, positioning and disengaging means comprising at least three idler rollers at least one of which is tapered over at least a portion of its length, a supporting structure for said rollers comprising roller-supporting bearings, the supporting structure for one roller being movable toward and away from the positioned article, resilient means associated with the last mentioned support urging the roller toward said article when positioned, said roller comprising a tapered portion being positioned with the larger end adjacent the rotating means whereby the rotating article is disengaged when the means for engaging the article with said clutch is released, and means for disengaging said engaging means from the article.

6. An apparatus for rotating an article, comprising a rotating means including a rotating spindle and an article-engaging clutch, a member for engaging the article with the rotating means, a guiding means comprising at least three idler rollers having at least a portion of their length tapered the axes of which are substantially parallel to the axis of rotation of the article, said rollers being normally engageable with said article and being rotatable by said article when

the latter is rotatably engaged with said rotating means, the larger end of the rollers being adjacent the rotating means, a fixed support for two of said rollers, a slidably mounted support for the third roller to permit movement toward and away from the axis of rotation of the positioned article, resilient means associated with the last mentioned support urging it toward the axis of rotation of said article whereby the rotating article will ride along the taper of the rollers and out of contact with the rotating means when the article-engaging member is released.

7. A device comprising a frame, a rotating spindle, a clutch face associated with said spindle, a yoke, at least two idler rollers mounted therein, a second yoke slidably mounted on the frame, a roller mounted in the second yoke, resilient means urging the slidably mounted yoke toward the first mentioned rollers, retaining members associated with the frame and passing vertically through said slidable yoke through elongated apertures therein, said retaining members having adjustable resilient means associated therewith to limit and restrict the movement of the slidably mounted roller, an article receiving zone, a rotatable nose piece mounted vertically over said article receiving zone, and means for moving said nose piece toward and away from said zone.

8. The apparatus of claim 7 wherein said rollers are tapered over at least a portion of their length.

9. The apparatus of claim 7 further characterized in that said rollers are cylindrical for a substantial part of their length and are tapered to an increasingly larger diameter through the remainder of their length.

SAMUEL C. HURLEY, JR.