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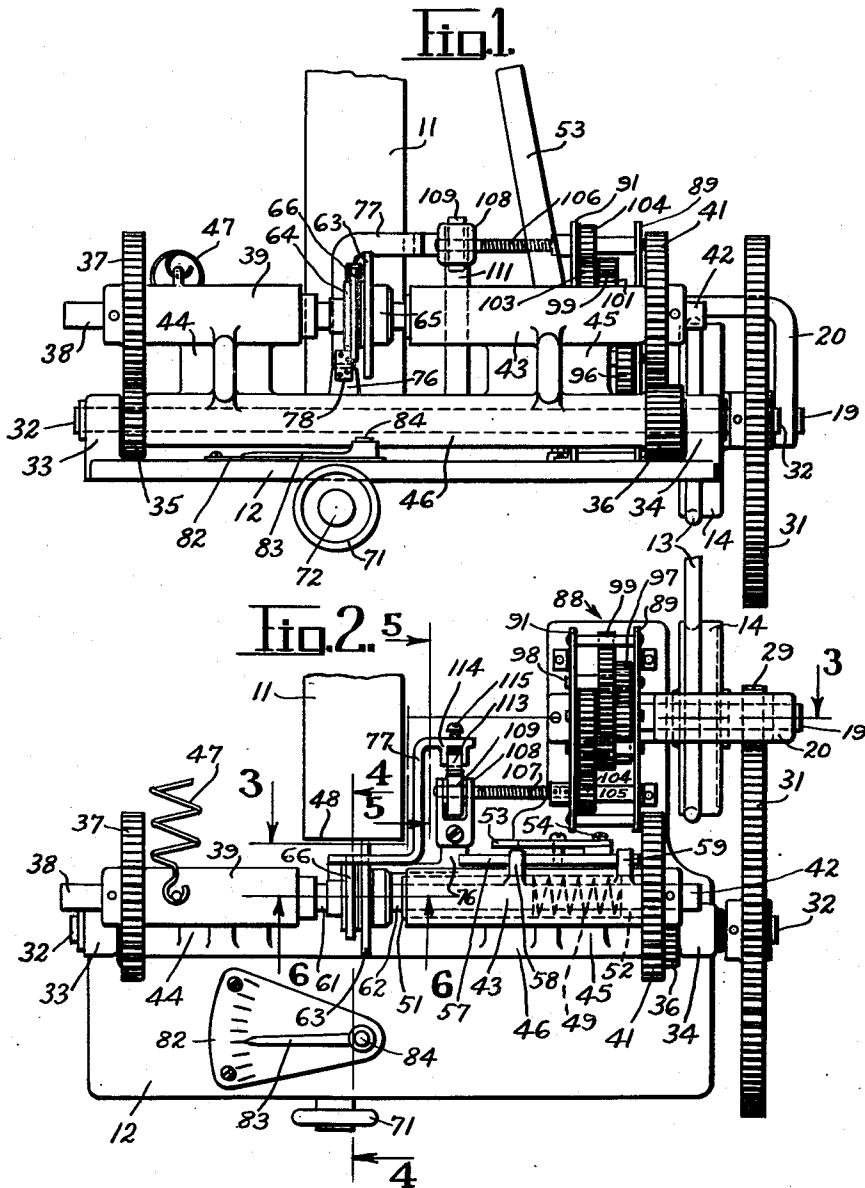
P. WILHELM

2,357,154

LENS GRINDING MACHINE

Filed April 17, 1943 .

3 Sheets-Sheet 1



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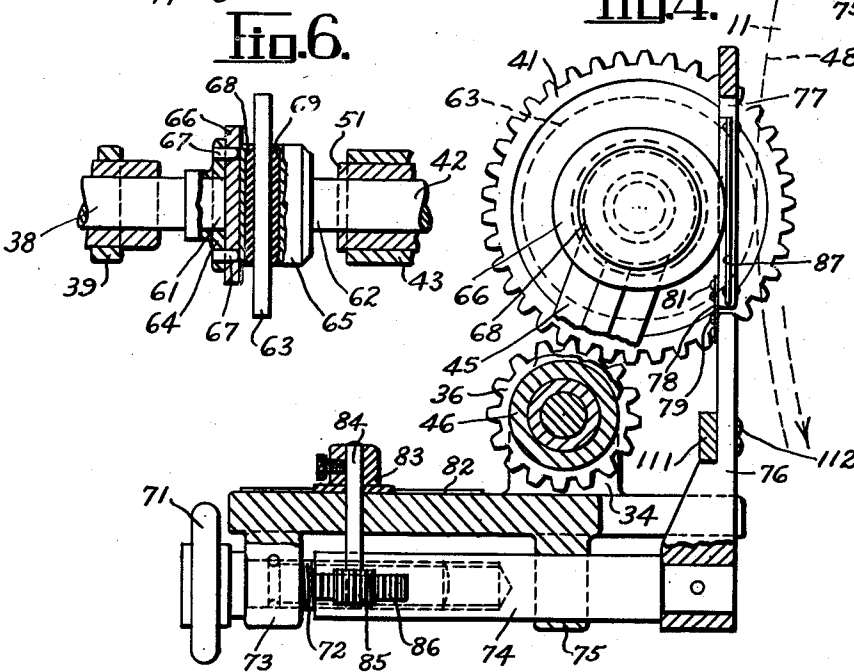
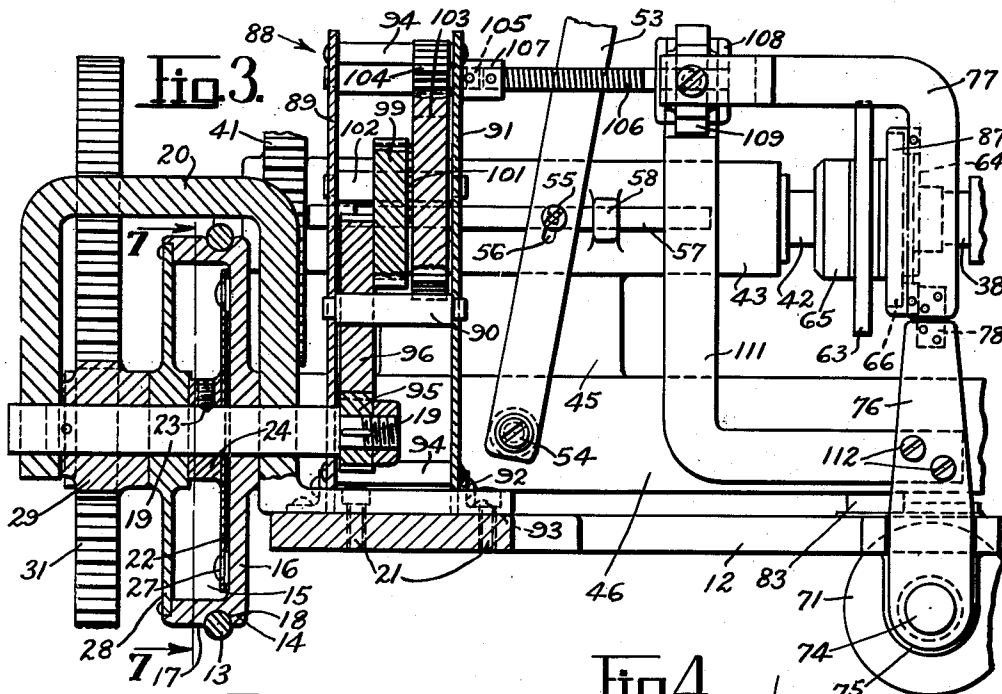
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3 Sheets-Sheet 2



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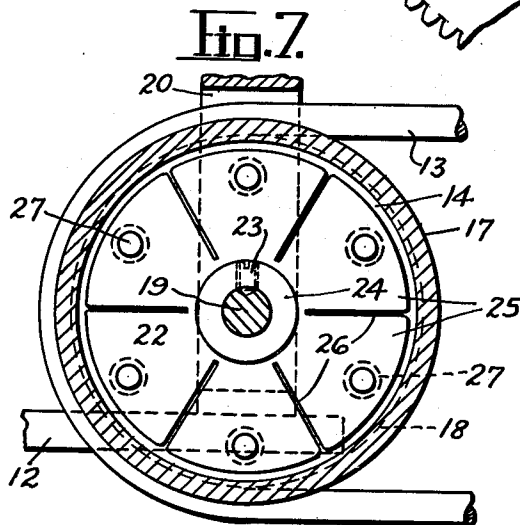
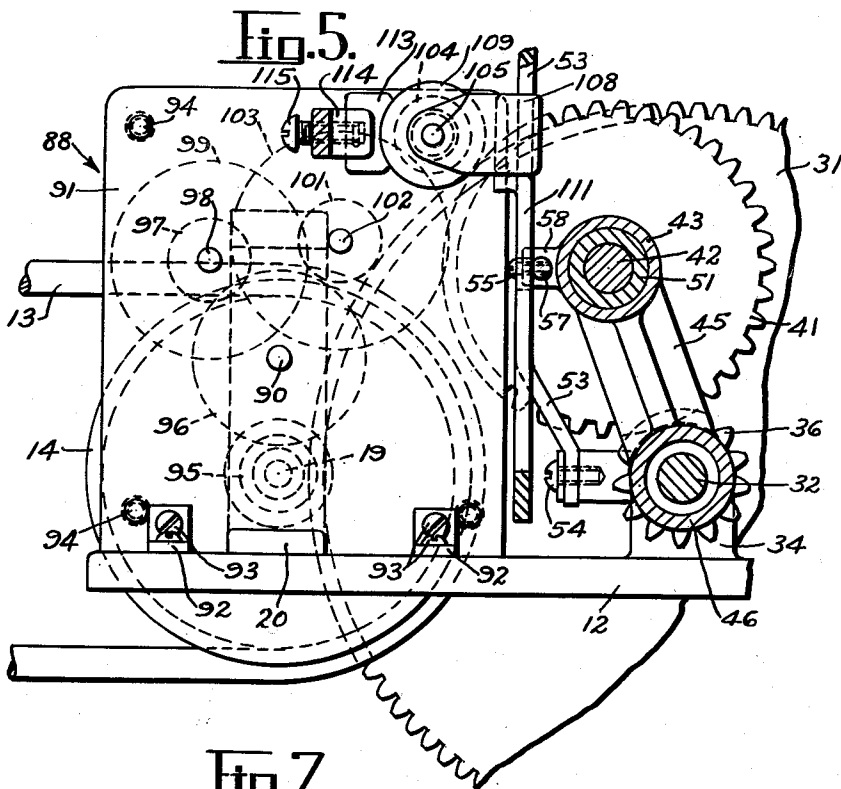
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3 Sheets-Sheet 3



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LENS GRINDING MACHINE

Paul Wilhelm, Waterbury, Conn.

Application April 17, 1943, Serial No. 483,471

12 Claims. (Cl. 51-101)

This invention relates to lens grinding machines, and more particularly to improvements in machines of such nature whereby the periphery of a spectacle, or like, lens may be automatically ground to any desired, and/or predetermined, shape.

One object of this invention is to provide in a lens grinding machine of the above nature, means whereby the lens being ground will be automatically and continuously held in engagement with the grindstone during the entire grinding operation.

Another object of this invention is to provide means in a lens grinding machine of the above nature to interrupt the rotation of the lens when the periphery of the lens at its point of contact with the grindstone is not of the desired shape, to maintain the lens stationary until said peripheral point has been ground to the desired shape, and at such a time to again start the lens rotating to present another point of its periphery to the grindstone.

Still another object of this invention is to provide in a machine of the above nature means to intermittently rotate a lens, which is being ground by contact with a rotating grindstone, whenever the peripheral point of the lens, which is in contact with the grindstone, is of the desired shape and to accomplish this operation in a smooth and easy manner to prevent sudden and abrupt engagement of the lens with the grindstone.

A further object of this invention is to provide in a lens grinding machine, having a rotating grindstone and means to rotate a lens in contact therewith, improved means to interrupt the rotation of the lens, including a slip-clutch device, and brake means adapted to be controlled by the shape of the periphery of the lens being ground, to actuate the said slip-clutch device.

A still further object of this invention is to provide a lens grinding machine of the above nature which will be relatively simple in construction, inexpensive to manufacture, readily manipulated, compact, and very efficient and durable in use.

With these and other objects in view, which will appear as the description proceeds, there has been illustrated in the accompanying drawings a form in which the features and principles of this invention may be conveniently embodied in practice, it being understood that various changes may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the drawings:

Figure 1 is a partial front view of a lens grinding machine having the features and principles of this invention incorporated in the structure thereof;

Figure 2 is a top plan view of the parts shown in Figure 1;

Figure 3 is an enlarged sectional view taken on the line 3-3 of Figure 2;

Figure 4 is an enlarged sectional view taken on the line 4-4 of Figure 2;

Figure 5 is an enlarged sectional view taken on the line 5-5 of Figure 2;

Figure 6 is an enlarged sectional view taken on the line 6-6 of Figure 2; and

Figure 7 is a sectional view taken on the line 7-7 of Figure 3.

Referring to the drawings wherein like reference numerals designate like parts throughout the several views, the reference numeral 11 denotes the rotatable grinding wheel, or grindstone, of a lens grinding machine in which the features and principles of this invention are incorporated. The grindstone 11 is suitably mounted in respect to a base 12 upon which the lens rotating mechanism of the machine is mounted. The mechanism for rotating the grindstone generally comprises an electric motor (not shown) which is suitably connected to the grindstone for such a purpose, and to the lens rotating mechanism to actuate it by means of a belt 13.

The lens rotating mechanism (see Figures 3 and 7) includes a slip-clutch device comprising a pulley 14 which is hollowed out to provide a cylindrical chamber 15 having an end wall 16, and a peripheral face 17 in which a belt groove 18 is provided to receive the belt 13. The pulley 14 is mounted for free rotation upon a shaft 19 which is journaled in an inverted U-shaped bracket 20 secured to the base 12 by screws 21. A resilient brake disc 22 is disposed within the chamber 15 and secured to the shaft 19 by means of a set screw 23 screw-threaded through a hub member 24 suitably attached to the disc 22 by being an integral part thereof or by welding it thereto. The disc 24 is preferably split into sections 25 by radial saw cuts 26 and a button 27 of felt, leather, or like material, is attached to each section 25 between it and the end wall 16 of the chamber 15 to provide a friction drive between the shaft 19 and the pulley 14. The chamber 15 may be filled with a lubricating material such as grease if desired to reduce wear of the engaging buttons 27 and the

end wall 16, a cover plate 28 being provided to close the chamber 15.

A pinion 29 is secured on the shaft 19 (see Figures 1 and 2) and is in mesh with a gear 31 which is secured to a horizontal shaft 32 journaled in suitable bearings held in lugs 33 and 34 upstanding from the base plate 12. A pinion 35 disposed adjacent to the bearing lug 33 is secured to the shaft 32 and a pinion 36 is secured to the shaft 32 adjacent to the bearing lug 34. The pinion 35 is in mesh with a gear 37 secured to a shaft 38 journaled in a supporting sleeve 39 and the pinion 36 is in mesh with a gear 41 secured to a shaft 42 journaled in a supporting sleeve 43. The sleeves 39 and 43 are connected by webs 44 and 45, respectively, to an elongated supporting sleeve 46 which is pivotally supported upon the shaft 32 between the bearing lugs 33 and 34. A coiled spring 47 connected to the sleeve 46 through the sleeve 39 and web 44 and to a stationary part of the machine (not shown) constantly biases the sleeves 39 and 43 and with them the shafts 38 and 42 toward the working face 48 of the grinding wheel, or grindstone, 11.

The shaft 42 is constantly biased axially toward the shaft 38 by a spring 49, disposed within the sleeve 46, by reacting between a bearing member 51 slidable in the sleeve 46 and a bearing member 52 secured to and disposed in the end of the sleeve 46 adjacent to the gear 41. The shaft 42 with the gear 41, and other parts mounted thereon, to be hereinafter described, are axially moved against the action of the spring 49 by means of a handle bar 53, the lower end of which is pivoted to the sleeve 46 (see Figure 3) by a screw 54. The bar 53 is suitably secured by a screw 55, passed through a slot 56 in the bar 53, to a rod 57 slidably supported in lugs 58 and 59, extending from the sleeve 46. The end of the rod 57 adjacent the gear 41 engages this gear, when the bar 53 is swung in the proper direction, to shift the gear 41 and with it the shaft 42 axially away from the shaft 38. The pinion 36 is of suitable width to allow for this shifting of the gear 41.

The ends 61 and 62 of the aligned shafts 38 and 42 respectively are in opposed relation and means is provided to clamp a lens 63, to be ground, between them. This lens clamping means (see Figure 6) includes a collar 64 secured on the end 61 of the shaft 38 and a collar 65 secured on the end 62 of the shaft 42. A form-plate 66 is detachably secured to and located on the end face of the collar 64 by pins 67 extending from the collar 64 and into suitable holes in the form-plate 66. A disc 682 of anti-scratching and friction gripping material, such as rubber, is suitably secured to the end face of the form-plate 66 adjacent the lens 63 and a similar disc 69 is suitably secured to the end face of the collar 65 adjacent the lens 63 whereby the lens 63 will be firmly and anti-slippingly gripped between these discs 68 and 69 when disposed therebetween, the shaft 42 being moved away from the shaft 38 by the bar 53 to separate these discs 68 and 69 to permit such disposition of the lens 63. The form-plate 66 is of the desired peripheral shape required for the completely ground lens 63 but is proportionately smaller, radially across the face thereof.

The proportions of the completely ground lens 63 in respect to the form-plate 66 is controlled by a hand wheel 71 (see Figure 4) which is secured on the outer end of a screw 72 journaled in a bearing lug 73 depending from the base 12,

The screw 72 is screw-threaded into an end of a rod 74 slidably supported in a depending lug 75. The rod 74 has an upstanding bracket 76 secured on its other end. The vertical portion of a bent arm 77 is resiliently secured to the upper end of the bracket 76 by a leaf spring 78 which is secured to the opposing ends of each by rivets 79 and 81 respectively. The vertical portion of the arm 77 is positioned to be constantly in engagement with the form-plate 66 due to the spring action of the spring 47 and thus limits the amount of the shafts 38 and 42 and with them the lens 63 can be moved toward the grindstone 11. Thus adjustment of the relationship between the screw 72 and the rod 74 by manipulation of the handwheel 71 will vary the proportional size between the form-plate 66 and the lens 63. This proportion is usually indicated on a dial 82 disposed on the top surface of the base 12 by a pointer 83 which is secured to the upper end of a vertical shaft 84 extended upwardly through the base 12. At its lower end the shaft 84 is secured to a pinion 85 which meshes with rack teeth 86 formed on the outer periphery of the slidable rod 74. To reduce possible wear between the form-plate 66 and the arm 77 a replaceable strip of hardened metal 87 may be provided on the arm 77 between it and the form-plate 66.

By means of the above described structure the lens 63 and the form-plate 66 are adapted to be continuously rotated in unison from the source of power, not shown, through the instrumentality of the belt 13, the slip-clutch 14, the pinion 29, the gear 31, the pinions 35 and 36, the gears 37 and 41, and the shafts 38 and 42. In order to obtain the desired result of interrupting this rotation of the lens and form-plate to allow the grinding of the lens 63 to the desired and/or approximate size and shape during one revolution of the lens a suitable and novel control means for the slip-clutch 14 is provided. This control means in its simplest form comprises a brake adapted to be applied to the shaft 19 to cause slippage between the friction buttons 27 and the end wall 16 of the pulley 14.

As illustrated in the drawings the slip-clutch control means, above referred to, includes (see Figures 1, 2, 3, and 5) speed increasing gearing indicated in its entirety by reference numerals 88 and herein comprising, for the purpose of illustration, a series of meshing gears and pinions supported between side frames 89 and 91. The side frames 89 and 91 extend upwardly from and are secured to the base 12 by angle pieces 92 and screws 93, and are secured together by spacing rods 94. The gearing illustrated includes a pinion 95 secured to an extended end of the shaft 19, a gear 96 secured on a shaft 90 and meshing with the pinion 95, a pinion 97 meshing with the gear 96, and secured on a shaft 98 having a gear 99 secured thereto, a pinion 101 meshing with the gear 99 and secured on a shaft 102 having a gear 103 secured thereto, and a pinion 104 meshing with the gear 103 and secured on a shaft 105. The shaft 105 extends beyond the side frame 91 and has one end of a flexible shaft 106 secured thereto by means of a collar 107.

The other end of the flexible shaft 106 is journaled in a bifurcated supporting bracket 108 and has a brake drum 109 secured thereto and disposed between the respective arms of the bracket 108. The bracket 108 is secured to, or integral with the upper end of the vertical portion of a bent arm 111, the horizontal portion of which

arm 111 is extended to be secured to the bracket 76 by screws 112 (see Figure 3). The provision of the flexible shaft 106 permits movement of the arm 111 without interfering with the rotation of the brake drum 109. A brake shoe 113 is slidably supported for movement toward and away from the brake drum 109 between the guiding arms of a bifurcated end portion 114 of the horizontal portion of the bent arm 77. An adjusting screw 115 screw-threaded through the end portion 114 is adapted to adjust the position of the brake shoe 113 in respect to the brake drum 109 to take up for wear and to adjust the pressure of the shoe on the drum. The leaf spring 78 is tensioned to constantly bias the arm 77 toward the arm 111 and thus the brake shoe 113 toward the brake drum 109.

Operation

It will be assumed that an unground lens 63 is disposed between the discs 68 and 69, by proper manipulation of the arm 53, and tightly gripped by them due to the action of the spring 49, that a suitable form-plate 66 is releasably held on the collar 64 by the pins 67, that the grindstone 11 is rotating in the direction of the dotted arrow in Figure 4, and that the shaft bearing sleeves 39 and 43 are being held away from the grindstone against the action of the spring 47 whereby the lens is held out of contact with the grindstone 11. Under these conditions the form-plate 66 is out of contact with the arm 77 and the brake shoe 113 is in engagement with the brake drum 109 effectively, through the gearing 88, holding the friction disc 22 stationary, whereby the shaft 19 is held against rotation and the lens 63 is not being rotated.

The sleeves 39 and 43 upon being released move toward the grindstone until the lens 63 is in engagement therewith, or the form-plate 66 is in engagement with the arm 77. If the lens engages the grindstone before the form-plate engages the arm 77 sufficiently to release the brake shoe 113 from the brake drum 109, the grinding of the periphery of the lens will start and will continue until the form-plate 66 engages the arm 77. If the form-plate 66 engages the arm 77 before the lens engages the grindstone, the brake-shoe 113 will be moved away from the brake drum 109 and the shafts 38 and 42 will be rotated until a point on the lens sufficiently engages the grindstone to cause the form-plate to move away from the arm 77 and cause the brake shoe to engage the brake drum and interrupt rotation of the lens 63.

As soon as the lens 63 has been ground, at the point of contact of its periphery with the grindstone, to a size and form proportional with the size and form of the form-plate 66, this form plate will engage the arm 77 to cause the brake shoe 113 to be disengaged from the brake drum 109 sufficiently to allow the clutch disc 22, through the friction buttons 27, to slipingly grip the surface of the backplate 16 and permit rotation of the lens driving shafts 38 and 42. This slip motion of the clutch action will, of necessity, be a smooth and easy one, whereby no abrupt engagement of the lens with the grindstone will occur, when the lens again engages the grindstone, and thus there will be no possibility of the periphery of the lens being chipped.

The above described intermittent action will continue throughout one revolution of the lens 63 on its horizontal axis, whereby the periphery of the lens will be ground proportionally to the

size and shape of the selected form plate 66. Should it be desired to further decrease the size of the lens 63, the hand wheel 71 will be rotated in the proper direction to move the arm 77 closer to the grindstone whereby the lens 63 will again engage the same for further grinding. From the foregoing it will be understood that the brake means, in control of the rotating movement of the lens, is directly actuated by the lens portion in engagement with the grindstone which, through the instrumentality of the form-plate 66, the arm 77, the brake shoe 113, the brake drum 109, the gearing 88, and the slip-clutch device, intermittently causes rotating movement of the lens.

While the novel features and principles of this invention have been shown and described specifically as applied to a grinding machine for optical lenses, it is to be understood that the same are not to be limited to such use as these novel features are adapted for use with other types of machines whereby a product having a periphery of irregular or regular contour is formed. For instance the product, instead of being a lens, may be a relatively flat member having a peripheral contour similar to that of a cam or circular disc. Thus a broad aspect of this invention includes the combination in a disc periphery-forming machine having means to form either a regular or an irregular peripheral shape on a disc, of the novel control means disclosed herein for intermittent rotation of the disc.

It will be understood that the novel features and principles of this invention may be embodied in other specific forms without departing from the spirit and essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the claims rather than to the foregoing description to indicate the scope of the invention.

Having thus fully described the invention, what is claimed as new and for which it is desired to secure Letters Patent, is:

1. In a disc periphery-forming machine having operating means positioned to be engaged by the periphery of a disc to form a peripheral shape on the disc, means to support the disc for movement into and out of engagement with said operating means, interruptable driving means to rotate the disc, clutch means to interrupt the action of said driving means, brake means arranged to control the action of said clutch means, mechanically operable means actuated by the contact of an unformal portion of the disc with said operating means to set the brake means and stop rotation of said disc, said mechanically operable means including a form-plate movable and rotatable with the disc and an arm engageable by said form-plate when the disc is formed at its point of contact with the operating means to the determined shape, said arm being operably connected to said brake means to release it to allow rotation of the disc by said clutch means when the arm is moved by the engagement of said form-plate therewith.

2. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the said to be ground thereby, clutch means adapted to interrupt the operation of said driving means,

and brake means operable by said form-plate to actuate said clutch means when the point of contact of the lens with the grindstone has been ground to size, to cause operation of said lens and form-plate driving means.

3. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, means to bias said lens and form-plate holding means toward said grindstone, clutch means adapted to interrupt the operation of said driving means, brake means arranged to control the operation of said clutch means and through it the operation of said driving means, said form-plate being arranged to actuate said brake means when the area of contact of the lens with the grindstone has been ground to size to cause operation of said driving means to rotate said holding means.

4. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, said driving means including a slip-clutch device including a first member frictionally engaging a driven second member, brake means adapted to restrain the first member against movement by the second member to interrupt the operation of said driving means, and means actuated by contact of said form-plate therewith to release said brake when the point of contact of the lens with the grindstone has been ground to size, to permit operation of said lens and form-plate driving means.

5. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, said driving means including a slip-clutch device including a first member frictionally engaging a driven second member, means drivingly connected to said first member and comprising a speed increasing device drivingly connected to a first brake member, a second brake member adapted to engage the first brake member to restrain the first clutch member against movement by the second clutch member, and a movable support for said first brake member adapted to be moved by said form-plate when the lens area in engagement with the grindstone is ground to size.

6. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, said driving means including a slip-clutch device including a first member frictionally engaging a driven second member, means drivingly connected to said first member and comprising a speed increasing device drivingly connected to a first brake member, a second brake member adapted to engage the

first brake member to restrain the first clutch member against movement by the second clutch member, spring means to bias said first brake member into engagement with said second brake member, and a movable support for said first brake member adapted to be moved by said form-plate when the lens area in engagement with the grindstone is ground to size.

7. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, said driving means including a slip-clutch device including a first member frictionally engaging a driven second member, means drivingly connected to said first member and comprising a speed increasing device drivingly connected to a first brake member, a second brake member adapted to engage the first brake member to restrain the first clutch member against movement by the second clutch member, means to move said brake members toward and away from said grindstone to vary the size of the ground lens, and a movable support for said first brake member adapted to be moved by said form-plate when the lens area in engagement with the grindstone is ground to size.

8. In a lens grinding machine, a rotatably mounted grindstone, a form-plate, a lens and a form-plate holding means, means to rotatively drive said lens and form-plate holding means, said lens and form-plate holding means being mounted for movement toward and away from said grindstone to cause the lens to engage the same to be ground thereby, said driving means including a slip-clutch device including a first member frictionally engaging a driven second member, means drivingly connected to said first member and comprising a speed increasing device drivingly connected to a first brake member, a second brake member adapted to engage the first brake member to restrain the first clutch member against movement by the second clutch member, spring means to bias said first brake member into engagement with said second brake member, means to move said brake members toward and away from said grindstone to vary the size of the ground lens, and a movable support for said first brake member adapted to be moved by said form-plate when the lens area in engagement with the grindstone is ground to size.

9. In a lens grinding machine having a rotating grindstone and a rotatably mounted lens holding devices, a form-plate carried by said lens holding device, said holding device being mounted for movement toward and away from the grindstone, means to bias the holding device toward the grindstone to press the lens thereagainst for grinding, means to rotate said lens and form-plate including a friction clutch comprising a driven member and a lens driving member, said clutch members being frictionally engaged for the driven member to drive the driving member, a rotatable brake drum, means to drive said brake drum from said driving member at a speed faster than the latter, and a brake shoe adapted to engage said brake drum and actuated by the form-plate when the lens area, in contact with the grindstone, is ground to size to release the brake shoe from engagement with the brake drum.

10. In a lens grinding machine having a rotating grind-stone and a rotatably mounted lens holding device, a form-plate carried by said lens holding device, said holding device being mounted for movement toward and away from the grindstone, means to bias the holding device toward the grindstone to press the lens there-against for grinding, means to rotate said lens and form-plate including a friction clutch comprising a driven member and a lens driving member, said clutch members being frictionally engaged for the driven member to drive the driving member, a rotatable brake drum, means to drive said brake drum from said driving member at a speed faster than the latter, a first arm, a brake shoe carried by said first arm, a second arm upon which said brake drum is carried, a common support for said arms, means to bias the said first arm toward said second arm to cause the brake shoe to engage the brake drum, means to adjust the position of said support to move the arm toward and away from the grindstone, said first arm being positioned to be engaged and moved by the form-plate, when the lens area in engagement with the grindstone has been ground to size, to move the brake shoe out of engagement with said brake drum.

11. In a disc periphery-forming machine having operating means positioned to be engaged

by the periphery of a disc to form a peripheral shape on the disc, means to support the disc for movement into and out of engagement with said operating means, intermittently operable driving means to rotate the disc, brake means arranged to control the intermittent action of said driving means, and mechanically operable means actuated by the contact of an unformed portion of the disc with said operating means to set the brake means and stop rotation of said disc.

12. In a disc periphery-forming machine having operating means positioned to be engaged by the periphery of a disc to form a peripheral shape on the disc, means to support the disc for movement into and out of engagement with said operating means, intermittently operable driving means to rotate the disc, brake means arranged to control the intermittent action of said driving means, mechanically operable means actuated by the contact of an unformed portion of the disc with said operating means to set the brake means and stop rotation of said disc, said mechanically operable means including a form-plate movable and rotatable with the disc, and an arm engageable by said form-plate and operably connected to said brake means to release the brake means when the arm is engaged by the form-plate.

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