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J. HOFFMAN

3,112,581

CONTACT LENS FINISHING MACHINE

Filed Feb. 3, 1961

FIG. 1

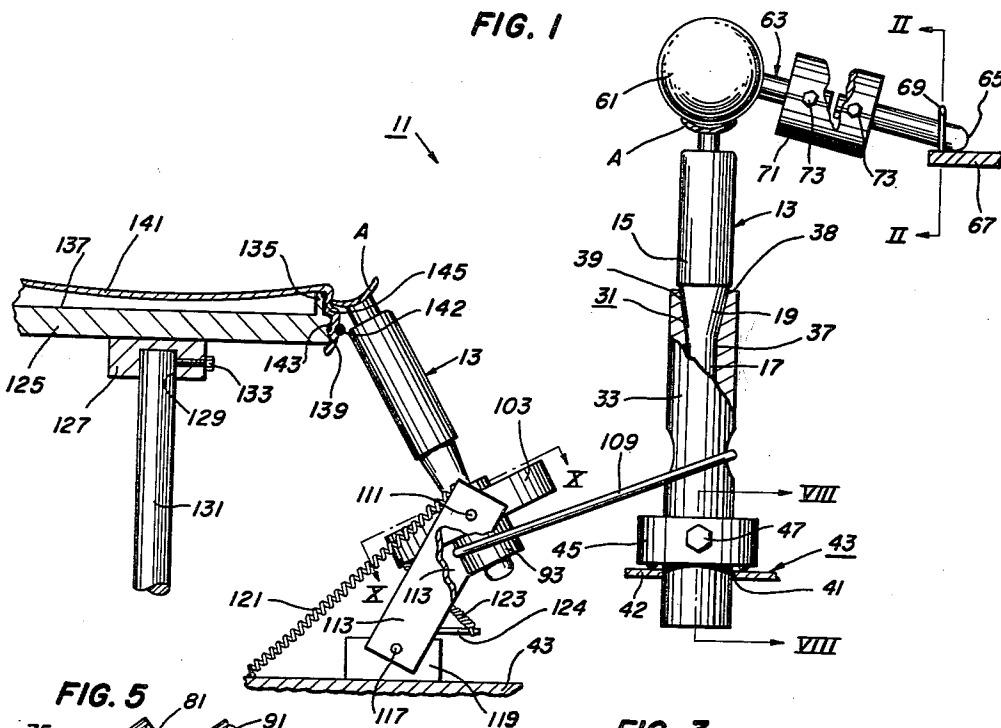


FIG. 5

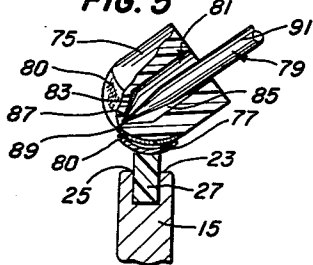


FIG. 4

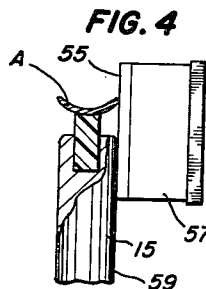


FIG. 3

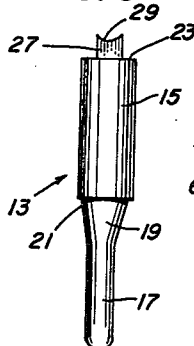


FIG. 2

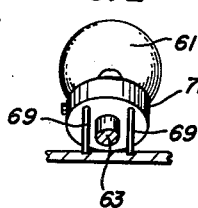


FIG. 6

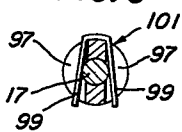


FIG. 7

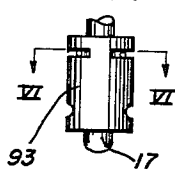


FIG. 8

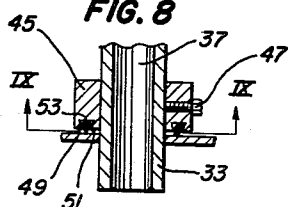


FIG. 9

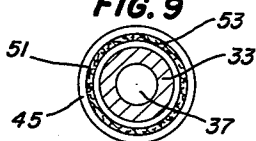
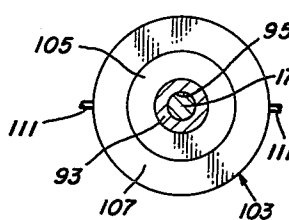


FIG. 10



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CONTACT LENS FINISHING MACHINE

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2 Claims. (Cl. 51—105)

This invention relates to a machine for finishing contact lenses. More particularly, the present invention relates to a machine that starts with lenses which already have optical surfaces on both sides and finishes each individual lens by cutting it down to the size or diameter desired, trimming the edges of the lens, grinding the inside curves, polishing the inside curves, and finally polishing the edges and the bevel of the outside or convex surface.

Heretofore, in finishing contact lenses it was a slow and tedious process in which a great deal of manual operations were performed, and which required that the person doing the finishing be highly skilled in the art. The present invention is directed towards providing a machine that performs the finishing operation in a fast and efficient manner without requiring a highly skilled operator to operate the machine.

Thus, one of the objects of the present invention is to provide a unique and improved means for finishing contact lenses.

A further object is to provide, in such a machine, an improved arbor for holding a contact lens throughout the finishing operation.

A further object is to provide, in such a machine, means for accurately and efficiently cutting the lens down to the size or diameter desired, and for trimming the edges of the lens.

A further object is to provide, in such a machine, efficient and accurate means for grinding the secondary and/or tertiary curves on the lens.

A further object is to provide, in such a machine, improved means for polishing the secondary and/or tertiary curves.

A further object is to provide, in such a machine, a unique means for polishing the edges and the bevel on the outside or convex surface of the lens.

A further object is generally to improve the design and construction of machines for finishing contact lenses.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary elevational view of the machine of the present invention with parts broken away and parts shown in section for purposes of clarity.

FIG. 2 is a fragmentary sectional view taken as on the line II—II of FIG. 1.

FIG. 3 is an elevational view of the arbor of the present invention.

FIG. 4 is a fragmentary elevational view of a portion of the machine of the present invention showing one of the operations therein and with portions being broken away for purposes of clarity.

FIG. 5 is a fragmentary elevational view of a portion of the machine of the present invention, showing another operation therein and with parts being broken away for purposes of clarity.

FIG. 6 is a fragmentary sectional view taken as on the line VI—VI of FIG. 7.

FIG. 7 is a fragmentary elevational view of a portion of the machine of the present invention.

FIG. 8 is a fragmentary sectional view taken as on the line VIII—VIII of FIG. 1.

FIG. 9 is a sectional view taken as on the line IX—IX of FIG. 8.

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FIG. 10 is a fragmentary sectional view taken as on the line X—X of FIG. 1.

Referring now to the drawings in which the various parts are indicated by numerals, the machine of the present invention, indicated in general as at 11, includes an elongated arbor 13 which includes a cylindrical main body portion 15, a reduced lower end portion 17 and a tapered intermediate conical portion 19 interconnecting the main body portion 15 and reduced lower end portion 17. Reduced lower end portion 17 is cylindrical and concentric with main body portion 15 as well as being concentric with the intermediate portion 19. The upper end 23 of main body portion 15 is provided with an upwardly opening socket 25, which is preferably square in cross section and receives an insert 27, which is preferably square in cross section and preferably formed from plastic or the like. Insert 27 extends above upper end 23 and terminates in a cupped or rounded seat 29 for receiving the convex surface of a lens, as lens A shown in the drawings. Lens A is placed on seat 29 and removably fixed thereto as by wax, pitch or the like, with the lens being concentric with arbor 13, i.e. the longitudinal center line of the arbor passes through the central portion of the lens. The plastic insert 27 forms an important part of the present invention since if the arbor 13 were made entirely out of metal there would be the danger of marring the lens surface by overheating when the hot wax, pitch or the like is used to mount the lens on the arbor. This would be so since in applying the hot wax, pitch or the like, the lens contacting portion of the arbor must be heated to make the wax, pitch or the like stick, and in heating the metal arbor there would be the danger of it becoming overheated so that it would mar the lens. In the arbor 13 of the present invention this danger is eliminated due to the plastic insert 27, because the plastic cannot be heated to the point that it would damage the lens A since the plastic would burn before reaching such a temperature. In addition, the plastic insert 27 is better than metal since it will not hold the heat like metal would.

Arbor 13 is removably received in a socket 31 of a chuck 33, in the manner best shown in FIG. 1. Socket 31 is shaped in a complementary manner relative to the intermediate portion 19 and lower portion 17 of the arbor, that is, chuck 33 is provided with a central cylindrical bore 37 slightly larger than lower end portion 17 and is provided with a flared portion 39 adjacent the upper end of the chuck against which intermediate portion 19 seats with main body portion 15 being spaced above the upper end 38 of the chuck, as best seen in FIG. 1. This particular arrangement hereinabove described causes the arbor 13 to be maintained concentric with chuck 33, as the chuck is rotated in a manner hereinafter described.

Chuck 33 extends downwardly through an aperture 41 in a portion 42 of a suitable supporting base 43. Below base portion 42, chuck 33 is coupled to suitable drive means, as a motor, not shown, which rotatably drives chuck 33 about a vertical axis carrying with it arbor 13 which also rotates about a vertical axis. A collar 45 encircles chuck 33 above base portion 42 and is fixed relative thereto by means of a set screw 47. Collar 45 is in close spaced adjacency to base portion 42 and is provided with an annular groove 49 having a narrowed mouth portion 51, as best seen in FIG. 8, so that packing 53 which is received in groove 49 will be held therein. Packing 53 is preferably of well known string-like construction as used in plumbing and the like, which packing is wound around inside of groove 49 and extends therebelow in sliding engagement with base portion 42 to form a seal between collar 45 and the base portion, whereby liquid or the like cannot pass through aperture 41 to the motor, not shown.

When performing the various operations on lens A, it is contemplated that once the lens is placed on arbor 13 it will remain on the same arbor throughout the entire finishing operation. All but one of the various finishing operations, to be described hereinafter, are preferably accomplished with arbor 13 received in chuck 33, as shown in FIG. 1. When only one chuck 33 is used, it will be understood that the various instrumentalities hereinafter described for performing the various operations are sequentially used on the lens A, and only the one being used at that particular time will be in place. For example, in FIG. 1 in the right-hand portion thereof is shown the second operation being performed on the lens, and in order to perform the first operation, which is shown in FIG. 4 and which will be more fully understood in the description to follow, the instrumentality shown in FIG. 1 should be removed.

Assuming that the lens A already has an optical surface on both sides and the lens A has been mounted on insert 27, as heretofore described, the first operation is performed by engaging the cutting edge 55 of a blade 57, as a razor blade or the like, vertically against the outer surface 59 of the main body portion 15, while at the same time engaging lens A, in the manner shown in FIG. 4. In other words, the outer surface 59 acts as a guide for cutting the lens down to a desired diameter, which diameter will be the same as the diameter of main body portion 15. By using outer surface 59 as a guide complete accuracy is obtained. After the lens A is cut down to the desired size, the usual bevel is cut on the inner and outer surfaces of lens A by means of blade 57. It will be understood that the blade 57 will have to be disengaged from outer surface 59 to cut these bevels. It will also be understood for different size lenses, arbors 13 having different size main body portions 15 will be needed.

The next operation in the finishing of lens A is the grinding operation wherein a spherical grinding stone 61 is used, as best seen in FIGS. 1 and 2. A stem 63 is fixedly attached to stone 61 by suitable means adjacent one end of the stem and extends radially outward from the stone. The end 65 of stem 63 remote from stone 61 is rounded and rests on and is supported by the base portion 67, which is preferably part of the overall base 43. A pair of upstanding spaced pins 69 are fixed to base portion 67 on opposite sides of stem 63, as best seen in FIG. 2, so that the lateral movement of the stem is restricted. With stem 63 supported on base portion 67, as above described, the grinding stone 61 rests on lens A for the grinding of the secondary and/or tertiary curves thereon. Stone 61 is concentric with lens A and maintains its concentric relationship at all times so that a curve of uniform width is generated on the concave surface of the lens. It will be understood by those skilled in the art that a larger grinding stone 61 will be needed for the tertiary curve and a smaller one for the secondary curve. In addition, a suitable weight 71 is mounted on stem 63 in a fixed position as by set screws 73 for applying pressure on stone 61 against lens A. Stem 63 is preferably formed in two parts, with one of the set screws 73 holding one of the parts and the other set screw holding the other part so that the effective length of the stem 63 may be varied. This division of the stem 63, it will be understood, should be disposed in weight 71 so that the two parts of the stem are respectively opposite the set screws 73.

The next operation is the polishing of the secondary and/or tertiary curves. This operation is shown in FIG. 5 wherein it will be seen a tool 75, having an end surface 77 in the shape of a portion of a sphere, is held against the lens by means of a rod 79. Tool 75 is formed of any suitable material as plastic, metal or the like, and is provided with a pad 80 of suitable material as cloth or the like, which material is disposed over end surface 77, with the pad being adhered thereto by suitable means as adhesive or the like. Tool 75 includes an outwardly open-

ing socket 81 opening in a direction remote from end surface 77 and which includes a conical inner end 83 joined to the main cylindrical portion 85 of the socket. Rod 79 is pointed at the end thereof, as at 87. During this operation rod 79 is inserted in socket 81 in the manner shown in FIG. 5 so that the pointed end 87 engages the apex 89 of conical portion 83 and the cylindrical body 91 of rod 79 engages the main cylindrical portion 85 adjacent the outer end of the socket. During this operation, rod 79 is held stationary at an angle and the tool 75 rotates by virtue of the rotation of lens A, as heretofore described, and the pad 80 which conforms to the shape of end surface 77 and is therefore in the shape of a portion of a sphere engages the secondary and/or tertiary curves for the polishing thereof. This method produces a better blended transition zone than the customary methods heretofore in use.

The next and final operation of machine 11 is the polishing of the edges of lens A and the bevel on the convex surface thereof. This operation takes place in the portion of the machine shown to the left in FIG. 1. For this operation, the arbor 13 is removed from chuck 33 and placed in a holder 93. Holder 93 is spool-like in construction and provided with a longitudinal central bore 95 through which reduced end portion 17 of arbor 13 extends. Holder 93 is provided with a pair of slots 97 on opposite sides thereof which are cut through to bore 95 and into which extend the respective legs 99 of a spring 101 which engages the opposite sides of reduced end portion 17 to hold the arbor fixed at the desired and proper place. Thus, it will be seen that this arrangement of the reduced portion 17 engaged by spring 101 permits longitudinal adjustment of arbor 13 in holder 93. Holder 93 is rotatably held by a suitable ball bearing 103 having a rotatable annular inner portion 105 through which holder 93 extends and is fixedly attached thereto, and the bearing includes an outer portion 107 of usual construction which is held stationary relative to inner portion 105. Holder 93 is rotatably driven as by a continuous belt 109 that is looped around holder 93 and chuck 33, which causes arbor 13 to rotate about its longitudinal axis.

Bearing 103 is pivotally mounted for pivot about a horizontal axis, as by pins 111 attached to outer portion 107 and laterally extending therefrom pivotally through apertures in a pair of laterally spaced rocker arms 113, which arms in turn are respectively rockably mounted for rocking movement about a horizontal axis, as by pivot pin 117 extending through apertures in the rocker arms and through apertures in a portion 119 of the supporting base 43.

A spring 121 or the like connected between one of rocker arms 113 and base 43 urges the rocker arms to pivot counterclockwise, as viewed in FIG. 1, and another spring 123, coupled between bearing 103 and one of rocker arms 113, urges the bearing and thereby the holder 93 and arbor 13 to pivot counterclockwise, as viewed in FIG. 1. The actual coupling of spring 123 to one of the rocker arms 113 is by any suitable means, as by engagement of the end of spring 123 with an arm 124 fixedly attached to said one of rocker arms 113.

A horizontally disposed wheel 125 is mounted for rotation about a substantially vertical axis by means of a hub 127 fixedly attached to the lower face of the wheel adjacent the central portion thereof and which hub is provided with a downwardly opening central socket 129 which receives a vertically disposed axle 131, which is fixedly attached to the hub by means of a set screw 133 and extends downwardly from the hub to its rotatable mounting, not shown. A circular rim 135 concentric with wheel 125 is preferably integrally formed with the wheel and is upstanding from the circular upper face 137 of the wheel adjacent the peripheral edge 139 of the wheel but spaced therefrom. A circular polishing cloth 141 covers wheel 125 and the edges of the cloth extend

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downwardly over rim 135 and peripheral edge 139 where the cloth is attached to the peripheral edge by means of a continuous circular spring 142 or the like extending over the edge of the cloth adjacent peripheral edge 139, which spring urges the edge of the cloth into an annular groove 143 provided in peripheral edge 139 so that the cloth is removably mounted on the wheel. The cloth 141 is loosely mounted in the portion thereof as at 145 which is between rim 135 and peripheral edge 139 so that the lens A engages cloth 141 in loose portion 145 and so that the lens edges are enveloped by the cloth, thus allowing the concurrent polishing of the inside and outside edges of the lens as well as the bevel on the convex side of the lens. The loose portion 145 of polishing cloth 141 does not extend further than the bevel on the convex side, so that any scratching of the convex optical surface is prevented.

It should be noted that springs 121, 123 have a double acting effect on arbor 13 and therefore on lens A against polishing cloth 141. In other words, spring 121 urges arbor 13 and lens A inwardly, and spring 123 urges the arbor and lens downwardly, which causes an efficient polishing action, so that after this operation the lens is now completely finished for use.

Also, it should be noted at this point that axle 131 is preferably driven by means, not shown, in a direction preferably opposite to the rotation of arbor 13.

It will be understood from the foregoing description that a machine 11 is provided that starts with lenses which already have optical surfaces on both sides and finishes each individual lens by cutting it down to the size or diameter desired, trimming the edges of the lens, grinding the inside curves, polishing the inside curves, and finally polishing the edges and the bevel on the convex surface. It will also be apparent that the machine 11 of the present invention performs the finishing operation in a fast and efficient manner without requiring a highly skilled operator to operate the machine.

Although the invention has been described and illustrated with respect to a preferred embodiment thereof, it

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is to be understood that it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of this invention as hereinafter claimed.

I claim:

1. In a machine for finishing contact lenses, a rotatable wheel having a peripheral edge and a circular upper face, a circular rim upstanding from said face at a place adjacent and spaced from said peripheral edge, a polishing cloth mounted on said wheel, means holding said cloth on said wheel adjacent said peripheral edge thereof with said cloth being loosely mounted between said rim and said peripheral edge to establish a loose portion of said cloth, an arbor, means attached to said arbor for holding thereon a lens to be finished, a pivotally mounted holder removably receiving said arbor, means coupled to said holder for the rotation of said holder and said arbor, means for urging said holder inwardly and downwardly relative to said peripheral edge of said wheel to carry the lens inwardly and downwardly against said loose portion of said cloth for the polishing of the lens.

2. In a machine for finishing contact lenses, a rotatable wheel having a peripheral edge and a circular upper face, a circular rim upstanding from said face at a place adjacent and spaced from said peripheral edge, a polishing cloth mounted on said wheel, means holding said cloth on said wheel adjacent the periphery thereof with said cloth being loosely mounted between said rim and said peripheral edge to establish a loose portion of said cloth, and means for rotatably supporting a lens to be finished against said loose portion of said cloth for the polishing of the lens.

References Cited in the file of this patent

UNITED STATES PATENTS

1,491,332	Brown	Apr. 22, 1924
2,151,233	Rowe	Mar. 21, 1939