

12

EUROPEAN PATENT APPLICATION

21 Application number: 80300382.1

51 Int. Cl.³: **B 24 B 9/14**

22 Date of filing: 11.02.80

30 Priority: 15.02.79 GB 7905308

43 Date of publication of application:
01.10.80 Bulletin 80/20

84 Designated Contracting States:
AT BE CH DE FR IT LU NL SE

71 Applicant: **RODWAY OPTICAL INDUSTRIES LIMITED**
Albion Street
Driffield North Humberside YO25 7QB(GB)

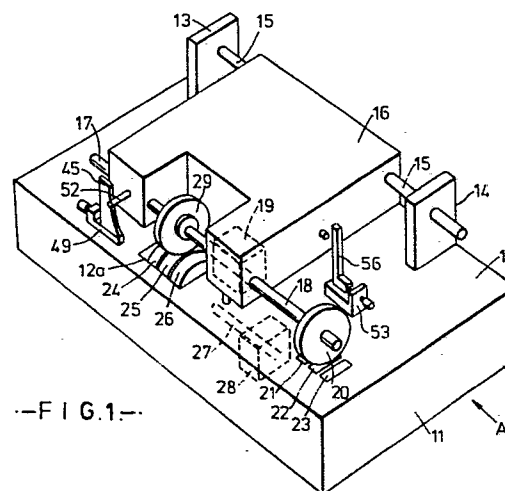
72 Inventor: **Moody, Bryan Malcolm**
The Saddlers
Kilham North Humberside(GB)

72 Inventor: **Bennett, Brian**
24, Long Lane
Driffield North Humberside(GB)

74 Representative: **Oulton, Richard John et al,**
H.L. Cottrell & Co. 22, Whitefriargate
Hull. N. Humberside. HU1 2EX.(GB)

54 Improvements in or relating to lens edge grinding machines.

57 In a multi-wheel lens edge grinding machine of a type defined there is a difficulty in providing positive drive to displace the frame (16) between the different grinding positions whilst allowing the frame to "float" during the grinding operation. This difficulty is resolved by driving the frame via a cam plate engaged by the frame and which plate affords positive transverse engagement with the frame whilst the frame is elevated and a less restricting engagement with the frame when the frame is lowered to a grinding position.



—FIG. 1—

- 1 -

IMPROVEMENTS IN OR RELATING TO LENS EDGE
GRINDING MACHINES.

This invention relates to lens edge grinding machines and more particularly to so-called "multi-wheel" lens edge grinding machines for grinding the edges of spectacle and the like lenses.

5 Multi-wheel lens edge grinding machines are well known in the art and conventionally comprise a base housing, a frame mounted atop the base and pivotable about a horizontal axis, a driven shaft supporting a plurality of grinding wheels within the base to present
10 the upper regions of the grinding wheels through an opening in an upper surface of the base housing, and co-axially aligned lens supports presented by the frame and intended to engage the major faces of a lens therebetween. The pivotal axis of the frame, the axis
15 of said driven shaft, and the common axis of the lens supports are all parallel, the frame is arranged for displacement in the direction of its pivotal axis to allow a supported lens to be engaged selectively with any one of said grinding wheels, and means are provided
20 for rotating the lens supports in accordance with a predetermined programme.

In all conventional lens edge grinding machines the first grinding wheel is a plain cylindrical wheel intended to rough grind the lens to a desired
25 peripheral configuration and the second grinding

wheel is intended to impart the desired peripheral cross-section on the lens. As different lenses often require different peripheral cross-sections it is convenient to mount at least two different "second" grinding wheels on the shaft and whereby the operator may select the desired "second" grinding wheel to be used for each lens.

To obtain the desired peripheral configuration for the lens, one of the lens edge supports conveniently carries a cam, engageable with an anvil individually set to each of the grinding wheels, and the cam is rotated with the lens thus to angularly adjust the frame relative to the base during grinding so that the desired peripheral configuration is imparted to the lens.

With many lenses the periphery of the lens does not lie in one plane and whilst with the first grinding, and in fact with many second grindings, the frame is advantageously allowed to "float" transversely to permit that part of the lens edge in contact with the grinding wheel to "self locate" with respect to the wheel, other "second" grinding operations require a more positive guide to effect displacement of the frame relative to the base.

Thus, it is often required to grind a "V" rib, with a base smaller than the thickness of the edge of the lens to follow a particular path about the periphery of the lens. This "V" rib is normally ground finished on a "second" grinding wheel and, to obtain the desired path for the "V" rib, a peg on the front of the frame is arranged to engage a cam surface, frequently formed on one edge of a metal member, mounted on the base and whereby the frame is transversely displaced, as said frame is angularly displaced about its pivotal axis during grinding, to cause the lens to displace relative to the grinding wheel as said lens rotates. Such

- 3 -

a cam is, hereinafter, referred to as the "lens cam".

Conventional multi-wheel lens edge grinding machines of the type defined above suffer from a number of inherent defects, one of which is in correctly and accurately displacing the frame to its different positions relative to the base. With some machines the lens supporting part of the frame is elevated and lowered by pneumatically or hydraulically operated piston and cylinder arrangements but the transverse displacement is effected by the frame sliding under gravity along inclined guide ways until it abuts pre-fixed stops, by electrical magnet means, such as solenoids or the like devices which act directly on the shaft upon which the frame is mounted, or by extremely complicated programming devices. With at least the first two such arrangements, the frame, at least in its end locations, is continuously biased against a stop and the third arrangement is extremely expensive to manufacture and maintain.

Further, when electrical holding means are provided for retaining the frame in a desired location, there is always a chance that a fault in the electrical circuit of the machine, or a mains fault, can render the electrical locating means ineffective and the lens may thereby be ruined.

A further danger in utilizing a stop means which creates permanent forces between the frame and the base is that, with time, wear on the stop members can so displace the frame relative to the grinding wheels that the machine becomes defective and, in a continuous production process, a large number of lenses can be ruined before the defect is observed.

The present invention as claimed is intended to avoid the inherent defects in prior art machines.

According to the present invention there is provided a multi-wheel lens edge grinding machine

- 4 -

comprising a base housing, a plurality of grinding wheels on a common shaft supported by said housing a motor for rotating said grinding wheels in unison and a lens support frame pivotally attached to the base housing via a pivot shaft parallel to the common shaft of said grinding wheels to permit the frame to displace between a low position, in which a lens supported by said frame is engageable by one or other of said grinding wheels and a high position, in which a lens supported by said frame is elevated to a position clear of all said grinding wheels, said frame further being displaceable in the direction of its pivot shaft to permit a lens supported by said frame to be selectively engageable with each of said grinding wheels, characterised by a cam plate within said base housing adapted to positively engage an element of said frame when said frame is in an elevated position, and a drive arrangement for positively displacing said cam plate in the general direction of the said pivot shaft.

Thus, with such a cam plate, the frame is positively engaged for mutual transverse displacement with the cam plate when the frame is elevated from the grinding position.

Preferably the cam plate includes a cam opening therethrough and said frame element always projects into said opening.

The opening preferably includes a slot-like part into which the frame element projects when the frame is elevated, a part wider than said slot-like part and into which the frame element projects when the frame is lowered, and guide surfaces for guiding the frame element from said wider part of said opening into said slot as the frame is elevating.

In one embodiment of the invention said cam plate is displaced by an electric motor, actuatable only when the frame is in an elevated position with respect to

- 5 -

the base housing, and conveniently said electric motor drives the cam plate via a worm arrangement.

5 Preferably a circuit for said motor includes a micro switch adapted to be actuated to close the motor circuit only when the frame is in its elevated position. Preferably also a circuit for said motor includes two micro switches, actuation of either one of which opens the motor circuit, one said micro switch being adapted to be actuated when the frame displaces to one desired
10 extreme transverse position and the other said micro switch being adapted to be actuated when the frame displaces to its other desired extreme transverse position.

15 In a preferred embodiment the machine includes a spring-loaded pivoted lever arranged to be angularly displaced against its spring loading by an element of the frame to define one extreme position for the frame in one direction of the axis of the pivot shaft, said lever when so displaced serving to actuate one of said
20 micro switches to open the motor circuit thus to terminate displacement of the cam plate and frame.

Preferably the spring acting on said spring loaded lever has such rating that said spring returns said lever to displace said frame from its said extreme
25 position to a desired position, as said frame lowers and said frame element loses its positive engagement with said cam plate.

30 With the frame element in the wider part of the opening when the frame is in its grinding position, a degree of "float" is afforded to the frame during grinding.

Preferably both micro switches are actuated by spring loaded pivoted levers and said levers limit the displacement of the frame in the directions of the axis of the pivot shaft for the frame. Conveniently

- 6 -

the spring loading for each lever comprises the return spring of the actuating member of the micro switch associated with that lever.

5 In a preferred embodiment one of said spring loaded pivoted levers comprises a cam lever adapted, when engaged by the pin element presented by the frame, to effect a controlled displacement of the frame in the direction of the pivotal axis of the frame in dependence upon change in the angular position of the frame
10 relative to the base housing.

In a further embodiment the machine includes a permanent magnet for retaining the frame against a stop substantially fixed with respect to the base housing and preferably the permanent magnet is
15 mounted on the frame and is co-operable with a ferromagnetic stop member attached to the base housing.

The invention will now be described further by way of example with reference to the accompanying drawings in which:-

20 Fig. 1 shows a multi-wheel lens edge grinding machine in accordance with the invention,

Fig. 2 shows, in perspective view, the arrangement for positively driving the frame in the direction of the pivotal axis of the frame,

25 Fig. 3 shows, in perspective view, the lens cam arrangement for the machine and,

Fig. 4 shows, in side view, the frame stop arrangement for the frame location most remote from engagement by the lens cam.

30 The multi-wheel lens edge grinding machine illustrated in Fig. 1 comprises a housing 11 presenting a substantially flat upper surface 12 with two parallel brackets 13 and 14 upstanding from the rear edge region thereof. A shaft 15, rotatably
35 and axially displaceable in bearings presented by brackets 13 and 14, has a frame 16 secured thereto

- 7 -

and frame 16 co-axially supports rotatable lens supports 17 and 18 parallel to the axis of shaft 15.

5 The lens support 18 is rotatable by a motor 19 within frame 16 and support 18 extends outwardly of the frame 16 to support a disc cam 20, the periphery of which is selectively engageable with three anvils 21, 22 or 23.

10 The housing 11 has a rectangular opening 12a in surface 12 and the upper regions of three grinding wheels 24, 25 and 26, in side by side relationship, are exposed through opening 12a. The grinding wheels 24, 25 and 26 are mounted on a shaft 27, rotatably supported within housing 11 and driven by a motor 28
15 within housing 11.

The device described thus far conforms with conventional multi-wheel lens edge grinding machines and operates as follows:-

20 With the frame 16 elevated (rotated clockwise when viewed in the direction of the arrow "A" in Fig. 1) the lens supports 17 and 18 are separated to permit a lens 29 to be introduced therebetween and the lens supports 17 and 18 are then closed on the major faces of the lens 29 to support lens 29 firmly therebetween.
25 A cam 20, conforming to the desired peripheral shape for the lens 29, is secured on the lens support 18, the motor 28 is started to rotate shaft 27 and grinding wheels 24, 25 and 26 and, when the grinding wheels 24, 25 and 26 are rotating at operational speed and with
30 the frame 16 transversely located so that the periphery of lens 29 lies in the plane of grinding wheel 26 (the first grinding wheel) frame 16 is lowered, by anti-clockwise rotation when viewed in the direction of the arrow "A" to initiate the first grinding
35 operation.

As the lens 29 will have an initial peripheral

- 8 -

configuration greater than that required, and greater than the peripheral configuration of the cam 20, the grinding wheel 26 will be effective upon the engaged peripheral edge of lens 29 as and until the cam 20 engages the first anvil 23, which is set to the periphery of grinding wheel 26. At this stage the motor 19 is started so that lens support 18, with cam 20 thereon, lens 29 and lens support 17 are rotated, at slow speed, and conveniently with a stepping motion so that the grinding wheel 26 generally reduces the periphery of lens 29 to conform with the periphery of cam 20 in a single revolution of lens 29. When the first revolution of lens 29 is completed the motor 19 continues to rotate lens 29 to perform a second rotation which, in effect, rough finishes lens 29.

After the second revolution of lens 29 the frame 16 is again elevated (rotated clockwise when viewed in the direction of arrow "A"), the frame 16 is transversely displaced (shaft 15 axially sliding in bearings 13 and 14) to locate the lens 29 in the plane of grinding wheel 25 or grinding wheel 24. The grinding wheels 24 and 25 will have differently shaped peripheral edges and, at this stage, it is left to the operator to select which periphery is to be ground on the lens. Once the selection of the grinding wheel has been determined, and the lens 29 is located in the plane of that grinding wheel, the frame 16 is again lowered (rotated anti-clockwise as viewed in the direction of arrow "A") until the periphery of lens 29 engages the grinding wheel and grinding is initiated, again the cam 20 will be aligned with an anvil 21 (if grinding wheel 24 is operational) or anvil 22 (if grinding wheel 25 is operational) and again motor 19 will rotate lens 29 through two complete revolutions to impart on the periphery of

- 9 -

lens 29 the peripheral cross-section determined by the peripheral groove in the grinding wheel 24 or 25 operational on the lens. When the second revolution has been completed the frame 16 is again elevated to permit the lens supports 17 and 18 to be separated to allow the lens 29 to be removed therefrom.

The arrangement proposed by the present invention for transversely displacing frame 16 will now be described with reference to the embodiment shows in Fig. 2.

A cam plate 30 with an integral guide flange 31, is supported on a runway 32 within housing 11, the flange 31 locates in a substantially vertical slot 33 in runway 32 so that plate 30 always lies substantially horizontal. A drive shaft 34, secured to cam plate 30, has a worm 35 formed thereon and worm 35 passes through an electric motor 36 adapted, when actuated, to act on worm 35 to axially displace shaft 34, in a direction depending upon the direction of rotation of motor 36.

The cam plate 30 includes a cam opening 37 there-through defined by an edge 38, generally at right angles to the shaft 34, an edge 39 remote from the shaft 34 and generally parallel thereto, said edge 39 joining edge 38 with an edge 40 parallel to edge 38 but of shorter length than edge 38, an edge 41 extending from edge 40 towards edge 38 and at an angle in the region of 45° to both edges 40 and 39, an edge 42 extending from edge 41 towards shaft 34 and parallel to edge 38, and an edge 43 joining edge 42 with edge 38 at that part of opening 37 closest to shaft 34.

The shaft 15 presents a radial pin 44 which has a diameter slightly less than the distance between edges 38 and 42 and, when the frame 16 is displaced to elevate the lens supporting part away

- 10 -

from the grinding wheels 24, 25 and 26, the pin 44 enters snugly into the slot defined by edges 38, 42 and 43. The pin 44 has such length that when the frame is lowered to a grinding position the pin 44 locates in the wider part of the opening 37 defined between edge 38 and edges 40 and 41.

The arrangement operates as follows:

When a lens is being mounted between lens supports 17 and 18 the frame is elevated, the cam plate 30 will be in one extreme end position, and the pin 44 will be located in the slot defined by edges 38, 42 and 43 so that frame 16 is positively located in the transverse direction with the newly mounted lens 29 in the plane of the first grinding wheel 26.

As now to start a grinding operation the frame 16 is lowered to engage the lens 29 with grinding wheel 26 the pin 44 slides along edge 38 and out of the slot defined by edges 38, 42 and 40. Thus, during the first grinding operation, the edge 38 prevents transverse displacement of frame 16 towards the left, as viewed in Fig. 2, but the cam offers no restriction to displacement of pin 44 away from edge 38 towards edge 40, whereby a degree of transverse "float" of the frame 16 is permitted by the cam 30.

When the first grinding operation has been completed and elevation of the frame 16 is initiated, the pin 44 may be in any location between edges 38 and 40 but, if the pin 44 is displaced from edge 38, the progressing elevation of frame 16 causes pin 44 to engage the inclined guide edge 41 and further elevation of frame 16 is accompanied by transverse displacement of frame 16 as pin 44 slides along edge 41 until pin 44 is located to engage in the slot defined by edges 38, 42 and 43 when the elevation of the frame 16 can be completed.

With the frame 16 fully elevated motor 36 is

- 11 -

actuated to act through worm 35 and axially displace shaft 34, shaft 34 displaces cam plate 37 and, with pin 44 within the slot defined by edges 38, 42 and 43 the frame 16 is positively displaced.

5 The motor 36 will be deactivated when the lens 29 lies in the plane of the desired second grinding wheel 24 or 25 and, as the frame 16 is then lowered to the grinding position, the pin 44 again rides out of the slot defined by edges 38, 42 and 43.

10 It will thus be seen that with this arrangement a positive drive of the frame in the direction of the axis of shaft 15 is always obtained, irrespective of the position of the frame during grinding the frame is always accurately located with respect to the cam plate when the frame is elevated, and the cam plate affords a degree of "float" in the direction of the axis of shaft 15 when each grinding operation is in progress.

15 It will be appreciated that the cut-off for motor 36 must be effected to accurately locate the plane of a lens 29 in the desired plane of a grinding wheel and one mechanism for performing the cut-out of motor 36 to locate the frame 16 relative to a grinding wheel 24 or 25 is shown in Figs. 1 and 3.

20 In Fig. 3 a lens cam 45, with a cam surface 46, is pivotally attached by a pin 47 to a slide member 48, slidably disposed in a guide member 49 secured to surface 12. A screw member 50 passes through part of guide member 49 and through a bore in slide member 48 and screw member 50 is rotatable, but held against axial displacement, with respect to slide member 48 and is in threaded engagement with slide member 49 so that, by rotating the wheel 50a on screw 50, the slide member 48 is slidably displaced with respect to guide member 49 and, as will be seen from Fig. 1, the direction of displacement of member 48 in

- 12 -

member 49 is parallel to the axis of shaft 15.

5 A micro switch 51 is located between lens cam 45 and slide member 48, the actuator spring (not shown) of the switch 51 urges clockwise rotation of lens cam 45 about pin 47 (as viewed in Fig. 3) and an extension 48a of slide member 48 engages in a recess 45a in lens cam 45 to limit the angular displacement of lens cam 45.

10 The micro switch 51 constitutes, when actuated, a cut-off for breaking the power circuit to motor 36.

15 In operation, the operator will, after selecting which of the grinding wheels 24 or 25 is to be used to finish a lens, set the adjustment of slide member 48 to a predetermined mark identified with the selected grinding wheel. The return spring on the micro switch 51 will maintain the lens cam in its most clockwise location (as viewed in Fig. 3) with the extension 48a engaged with the lowermost surface of recess 45a and, with the micro switch 51 so arranged, 20 the power circuit to motor 36 is completed, when the first grinding operation is completed, to displace cam plate 30 and frame 16 towards the second grinding position.

25 As the cam plate 30 and frame 16 displace towards the left (as viewed in Fig.1) a frame guide pin 52 projecting from the front of frame 16 and intended to co-operate with lens cam surface 46 during the second grinding operation, approaches lens cam 45 and eventually engages surface 46. Further displacement 30 towards the left, under motor 36, causes lens cam 45 to be rotated anti-clockwise (as viewed in Fig. 3) about pin 47, such rotation causes micro switch 51 to be actuated and said switch actuation breaks the drive circuit to motor 36 to cause the transverse displacement to terminate. 35

It will be observed from Fig. 3 that the upper

- 13 -

part of the cam surface 46 is substantially vertical so that, when the frame guide pin 52 first engages cam surface 46 and displaces the lens cam 45 to actuate micro switch 51, the frame 16 can still be
5 downwardly displaced, pin 52 sliding down cam surface 46, until the pin 44 is displaced out of the slot defined by edges 38, 42 and 43 and the frame 16 can move towards the right (pin 44 displacing away from edge 38). Once pin 44 is displaced from its
10 captive slot the return spring of micro switch 51 becomes effective to return lens cam 45 to its most clockwise rotation, this causes a small displacement of frame 16 towards the right (as viewed in Fig. 1) and, thereafter, the frame 16 is correctly located,
15 with its guide pin 52 in engagement with cam surface 46, for the second grinding operation.

Thus, as the grinding proceeds and the lens 29 and cam 20 cause frame 16 to oscillate about the axis of shaft 15, the pin 52 rides up and down cam
20 face 46 to effect the desired transverse displacement of frame 16 to maintain the lens 29 in desired relationship to the grinding wheel.

In prior art multi-wheel lens edge grinding machines of the type defined difficulties are often
25 experienced in maintaining the frame guide pin 52 in contact with the cam surface 46. One common method is to utilize a solenoid mounted on shaft 15 but this leads to uneven loading between the pin 52 and surface 46 as the frame displaces transversely.

30 The present invention overcomes this difficulty by providing a permanent magnet 52a as part of the frame guide pin 52, the magnet 52a has one end tapped to receive a screw 52b presented by a non-ferrous stub pin 52c secured to the frame 16, and as the lens
35 cam 45 is made from a ferrous material the magnet 52a in direct engagement with surface 46 provides a

- 14 -

uniform retaining force for all positions of pin 52 along surface 46.

5 It is also advantageous to provide a stop for motor 36 when the frame 16 is being displaced from the second grinding position back to the first grinding position and a mechanism suitable for this purpose is illustrated in Fig. 1 and, in more detail, in Fig. 4.

10 A base member 53, secured on surface 12, slidably retains a member 54 and, a screw 55, in threaded engagement with slideable member 54 and rotatable, but non-axially displaceable, with respect to base member 53, serves to adjust the position of slideable member 54 in the direction of the axis of shaft 15.

15 An upright member 56 is pivotally attached to slideable member 54 and presents a limb 56a, engageable with the actuating member of a micro switch 57 and captive beneath an extension 54a of slideable member 54. When the device is not stressed by
20 external forces, the return spring (not shown) retains limb 56a against the undersurface of extension 54a and the micro switch, which is effective on the power circuit of motor 36 when operated, is closed.

25 A frame pin 58 is aligned to engage the face of member 56 adjacent the frame and, as will be seen from Fig. 4, the said face, when the device is not affected by pin 58, is inclined to the vertical.

In operation, and when motor 36 is operating to displace cam plate 30 and frame 16 towards the right
30 (as viewed in Fig. 1), the switch 57 is closed until, as frame 16 approaches its extreme right hand position, frame pin 58 engages upright member 56 and causes clockwise displacement of said member 56 (as viewed in Fig. 4) relative to slideable member 54 when switch
35 57 operates to open the circuit of motor 36 and stop the drive therefrom.

- 15 -

With the motor 36 stopped the frame is accurately located in the transverse direction by the pin 44 in engagement with the slot of opening 37, the engagement of pin 53 with upright 56 will have displaced the face of upright 56 engaged by pin 55 towards, but not to, the vertical and thus, as the frame 16 lowers the pin 58 rides down the inclined face of member 56 to afford some "float" for frame 16, and to release micro switch 57 from its actuated condition.

If desired the frame 16 may be given an enforced transverse displacement, as it oscillates, during the first grinding operation by providing a magnetic attraction between pin 58 and upright 56 and in the illustrated example, the pin 58 comprises a non-ferrous part 58a secured to frame 16 and a permanent magnet 58b supported on part 58a and said member 56 is made from a ferrous material.

It will be appreciated that, with the embodiment described above, the transverse displacement of the frame 16 between its pre-set stops is automatically controlled by the micro switches 51 and 57 and it will be appreciated that the circuit for motor 36 will include means which prevent the motor circuit from closing to re-activate motor 36 when a micro switch 51 or 57 returns to its inoperative condition. Such a means may comprise a simple relay in the motor circuit.

Further, as the motor 36 must not be activated when frame 16 is displaced from its elevated position, the circuit for motor 36 preferably includes a micro-switch 59, engageable with pin 44, and activated only when the frame is elevated to permit the circuit of motor 36 to be completed.

Further, the machine includes a hydraulic piston and cylinder arrangement 60 for raising and lowering

- 16 -

the frame 16, said arrangement being controlled by a counter associated with shaft 18 to elevate frame 16 each time shaft 18 completes its two revolutions. The piston and cylinder arrangement 60 may also be arranged to lower frame 16 upon actuating of a "start" switch by the operator and by actuation of the micro-switch 51 and, thereby, a fully automatic operation may be obtained.

Thus, in such an automatic operation, with the assemblies 41 to 51 and 53 to 57 set to the desired limits and with the shaft 27 rotating the grinding wheels 24, 25 and 26 at operational speeds, the operator has only to insert a lens to be ground and press a "start" button to cause the hydraulic piston and the cylinder arrangement to contract, to lower the frame 16 and thereby engage the lens with grinding wheel 26. Thereafter, the first grinding is effected, motor 19 rotating lens support 18 until lens support has completed two revolutions when the piston and cylinder arrangement 60 is actuated by the counter to elevate the frame 16 terminating the first grinding operation.

With frame 16 elevated the "safety" micro switch 59 is activated, the circuit to motor 36 is completed, and the motor 36 is effective on shaft 34 to displace cam plate 40 and frame 16 to the second grinding position. The drive to motor 36 is terminated when the micro switch 51 is operated and, as switch 51 operates, the arrangement 60 contracts to lower frame 16 to permit the second grinding operation to be initiated.

When lens support 18 has again completed its two revolutions the arrangement 60 expands to elevate the frame 16, the switch 59 is again actuated as the frame reaches its elevated position and the motor 36 is operated, in reverse direction, to drive the cam

- 17 -

plate 30 and the frame 16 back to the start position when, the micro switch 51 is operated, the "start" circuit is broken, and the ground lens can be removed.

5 It will be appreciated that with the above described "automatic" operation the motor 19 is required to start, to rotate lens support 18 through two revolutions, each time the frame 16 is lowered and such a start for motor 19 may be initiated by the
10 micro switch 59 opening the circuit for motor 36 as the frame 16 lowers but preferably motor 19 is started when the grinding operations have started and the cam 20 makes contact with the relevant anvil 21, 22 or 23.

15 Although the present invention has been described by way of example with reference to a specific embodiment the invention is not limited thereto and many modifications and variations will be apparent to persons skilled in the art.

- 1 -

CLAIMS.

1. A multi-wheel lens edge grinding machine comprising a base housing (11) a plurality of grinding wheels (24, 25, 26) on a common shaft (27) supported by said housing (11), a motor (28) for rotating said grinding wheels (24, 25, 26) in unison, and a lens support frame (16) pivotally attached to the base housing (11) via a pivot shaft (15) parallel to the common shaft (27) of said grinding wheels (24, 25, 26) to permit frame (16) to displace between a low position, in which a lens (29) supported by said frame (16) is engageable by one or other of said grinding wheels (24, 25, 26), and a high position, in which a lens (29) supported by said frame (16) is elevated to a position clear of all said grinding wheels (24, 25, 26), said frame (16) further being displaceable in the direction of its pivot shaft (15) to permit a lens (29) supported by said frame (16) to be selectively engageable with each of said grinding wheels (24, 25, 26), characterised by a cam plate (30) within said base housing (11) adapted to positively engage an element (44) of said frame (16) when said frame (16) is in an elevated position, and a drive arrangement (35, 36) for positively displacing said cam plate (30) in the general direction of the said pivot shaft (15).
2. A multi-wheel lens edge grinding machine as claimed in claim 1 in which the cam plate (30) includes a cam opening (37) therethrough and said frame element (44) always projects into said opening (37).
3. A multi-wheel lens edge grinding machine as claimed in claim 2 in which the opening (37) includes a slot-like part (38, 42, 43) into which the frame element (44) projects when the frame (16) is elevated, a part (38, 39, 40, 41) wider than said slot-like part (38, 42, 43) and into which the frame element (44) projects when the frame (16) is lowered, and guide surfaces (38, 41) for guiding the frame element (44) from said wider part (38, 39, 40,

- 2 -

41) of said opening (37) into said slot (38, 42, 43) as the frame (16) is elevating.

4. A multi-wheel lens edge grinding machine as claimed in claim 1, 2 or 3 in which said cam plate (30) is displaced by an electric motor (36) actuatable only when the frame (16) is in an elevated position with respect to the base housing (11).

5. A multi-wheel lens edge grinding machine as claimed in claim 4 in which said electric motor (36) drives the cam plate (30) via a worm (35) arrangement.

6. A multi-wheel lens edge grinding machine as claimed in claim 4 or 5 in which a circuit for said motor (36) includes a micro switch (59) adapted to be actuated to close the motor circuit only when the frame (16) is in its elevated position.

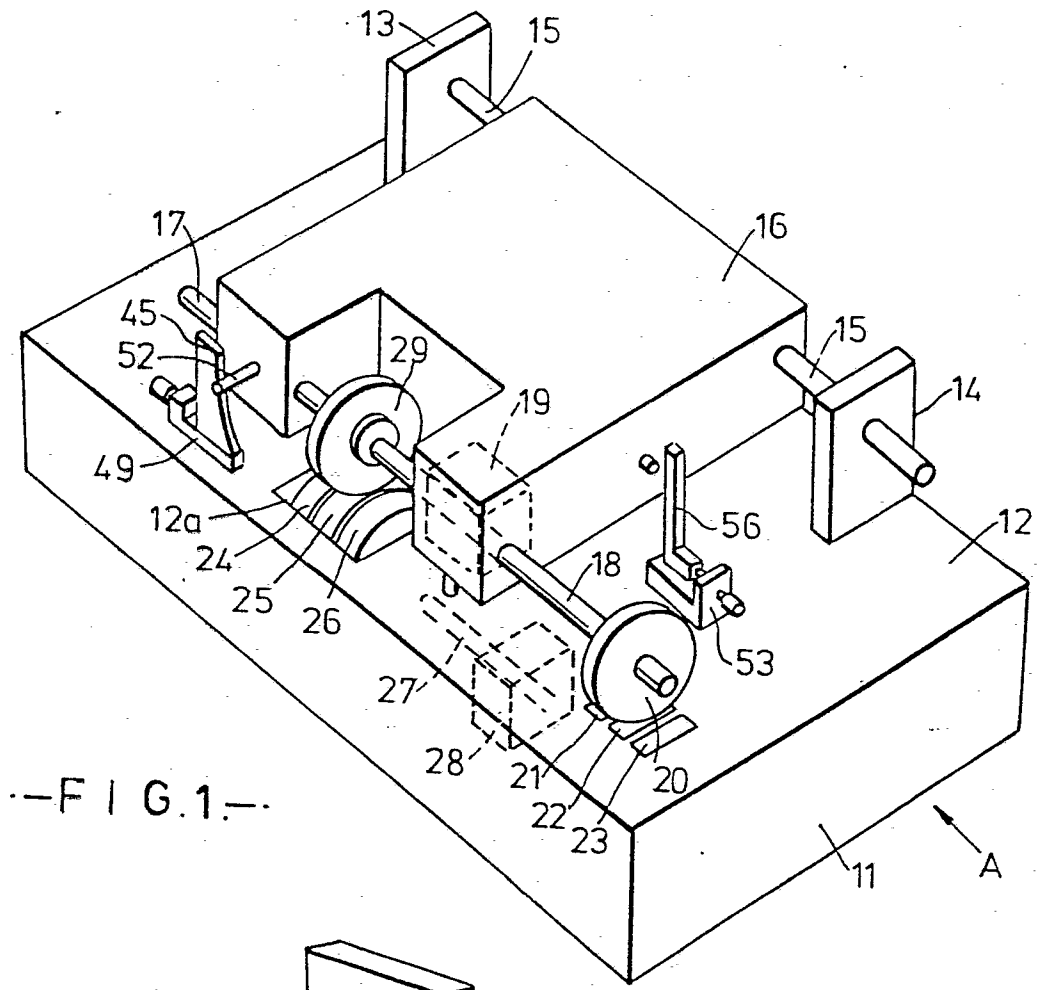
7. A multi-wheel lens edge grinding machine as claimed in claim 4, 5 or 6 in which a circuit for said motor (36) includes two micro switches (51, 57), actuation of either one of which opens the motor circuit, one said micro switch (51) being adapted to be actuated when the frame (16) displaces to one desired extreme transverse position and the other said micro switch (57) being adapted to be actuated when the frame (16) displaces to its other desired extreme transverse position.

8. A multi-wheel lens edge grinding machine as claimed in claim 7 including a spring-loaded pivoted lever (45 or 56) arranged to be angularly displaced against its spring loading by an element (52 or 58) of the frame (16) to define one extreme position for the frame (16) in one direction of the axis of the pivot shaft (15), said lever (45 or 56) when so displaced serving to actuate one of said micro switches (51 or 57) to open the motor circuit thus to terminate displacement of the cam plate (30) and frame (16).

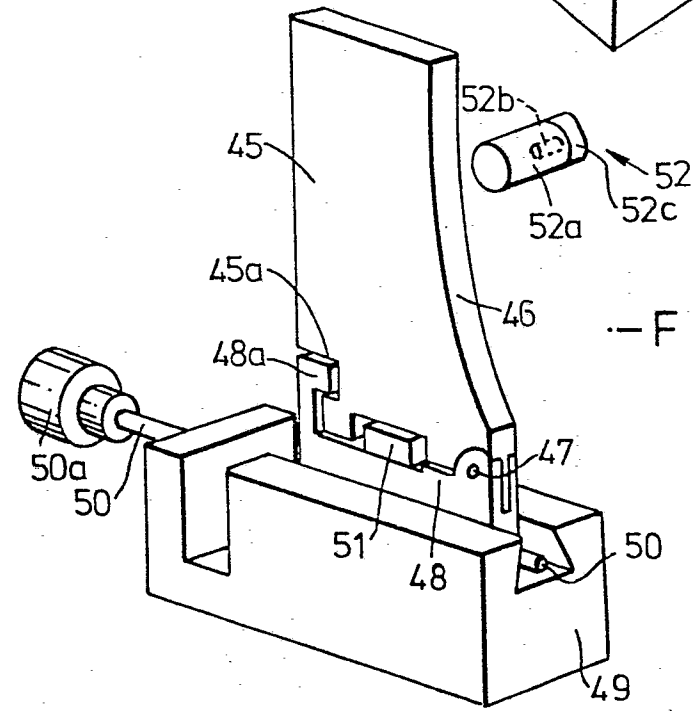
9. A multi-wheel lens edge grinding machine as claimed in claim 8 in which the spring acting on said spring loaded lever (45 or 56) has such rating that said spring returns said lever (45 or 56), to displace said frame (16) from its said extreme position to a desired position, as said frame (16) lowers and said frame element (44) loses its positive engagement with said cam plate (30).
10. A multi-wheel lens edge grinding machine as claimed in claim 8 in which both micro switches (51 and 57) are actuated by spring loaded pivoted levers (45 and 56) and said levers (45 and 56) limit the displacement of the frame (16) in the directions of the axis of the pivot shaft (15) for the frame (16).
11. A multi-wheel lens edge grinding machine as claimed in claim 10 in which the spring loading for each lever (45, 56) comprises the return spring of the actuating member of the micro switch (51, 57) associated with that lever (45, 56).
12. A multi-wheel lens edge grinding machine as claimed in claim 10 in which one of said spring loaded pivoted levers (45) comprises a cam lever adapted, when engaged by the pin element (52) presented by the frame (16), to effect a controlled displacement of the frame (16), in the direction of the pivotal axis of the frame (16) in dependence upon change in the angular position of the frame (16) relative to the base housing (11).
13. A multi-wheel lens edge grinding machine as claimed in claim 1 including a permanent magnet (52a or 58b) for retaining the frame (16) against a stop (45 or 56) substantially fixed with respect to the base housing (11).
14. A multi-wheel lens edge grinding machine as claimed in claim 13 in which the permanent magnet (52a or 58b)

- 4 -

is mounted on the frame (16) and is co-operable with a ferro-magnetic stop member (45 or 56) attached to the base housing (11).



—FIG. 1.—



—FIG. 3.—

