

April 16, 1946.

W. J. DYKOSKI ET AL

2,398,628

POLISHING PRECISION SURFACES

Filed Feb. 14, 1944

2 Sheets-Sheet 1

FIG. 1

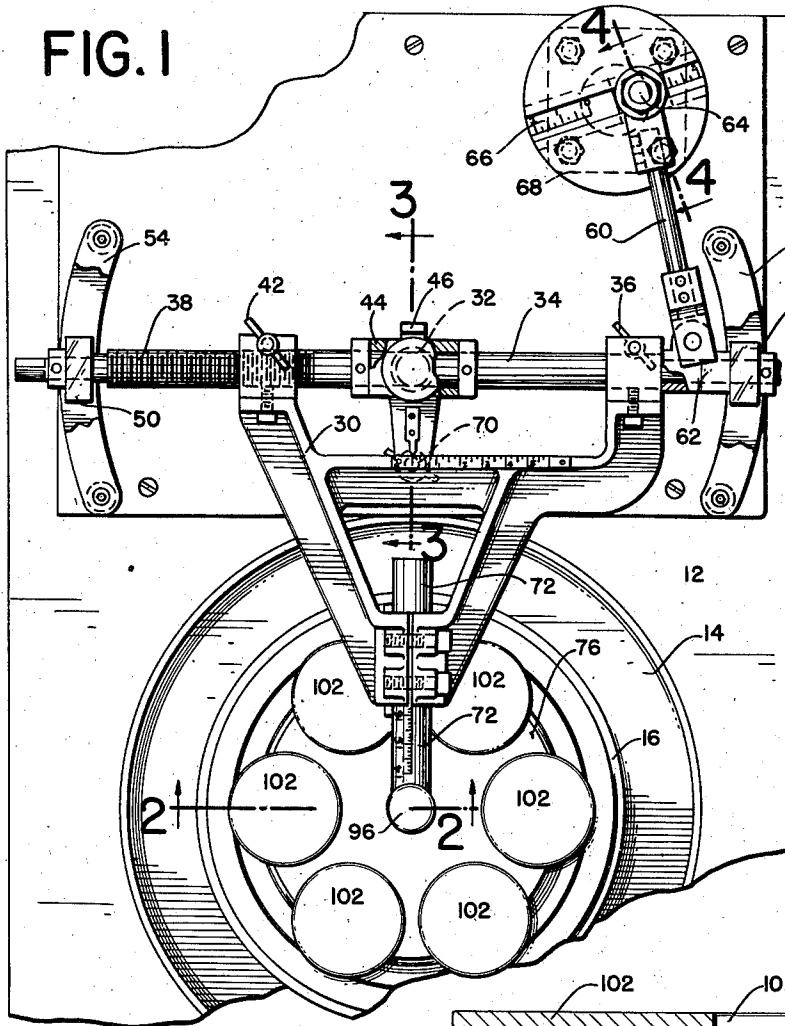


FIG. 4

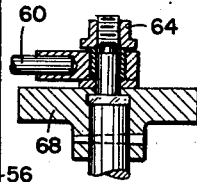


FIG. 2

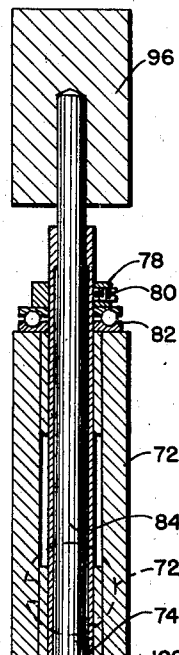
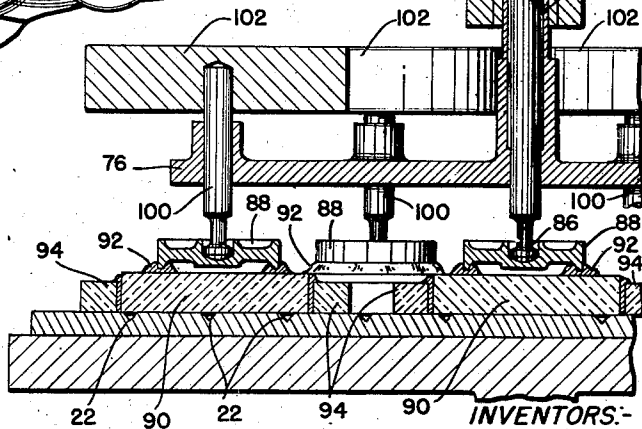
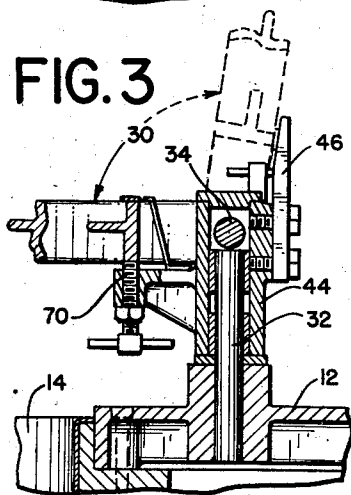


FIG. 3



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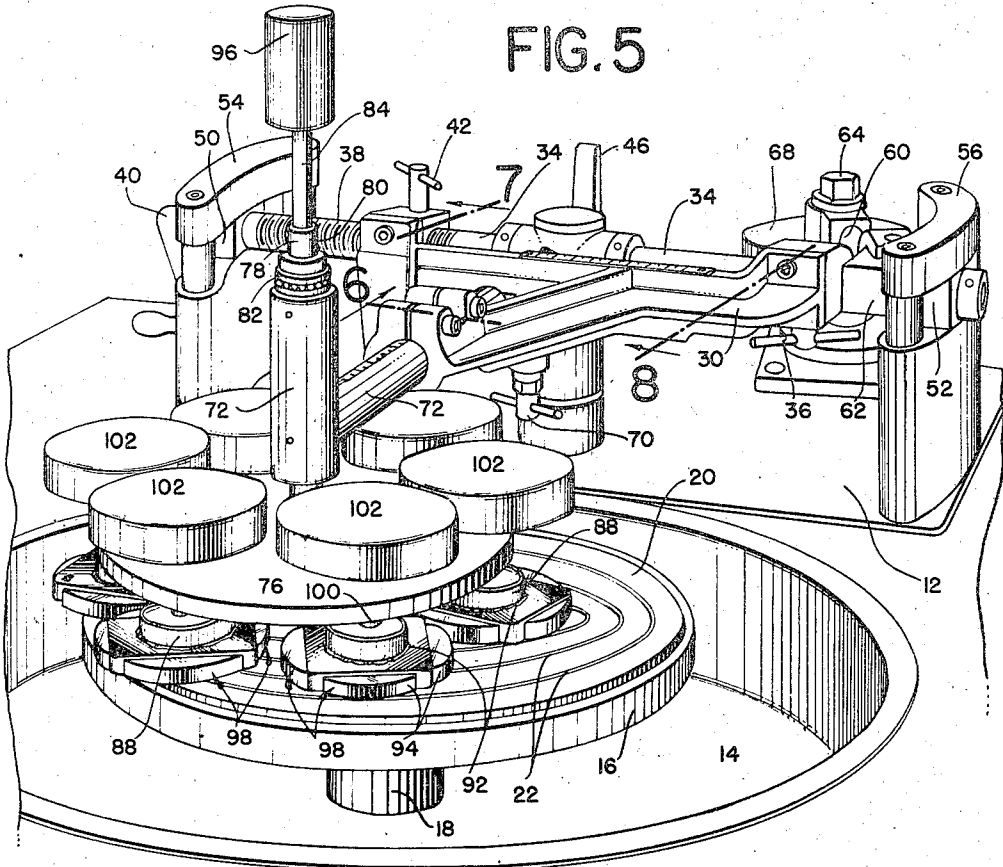


FIG. 6

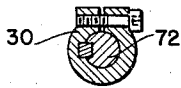


FIG. 7

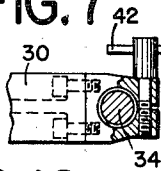


FIG. 8

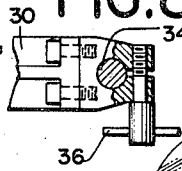


FIG. 11

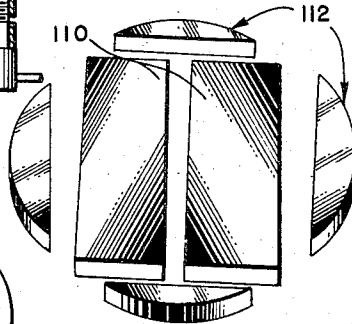


FIG. 10

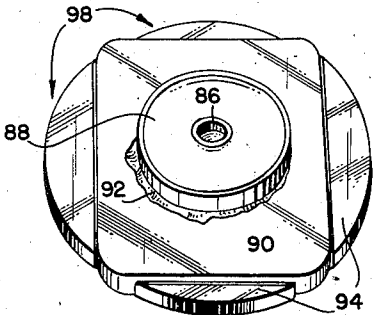
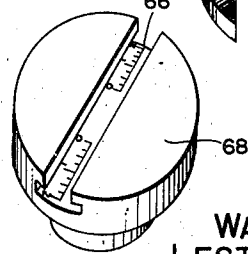


FIG. 9



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POLISHING PRECISION SURFACES

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Application February 14, 1944, Serial No. 522,348

4 Claims. (Cl. 51-124)

This invention relates to grinding and polishing precision surfaces, particularly those of blanks for forming optical flats which when finished must be guaranteed accurate as to flatness to one-twentieth of a wave length of helium light.

An object of this invention is to provide a method of and means for simultaneously grinding or polishing the surfaces of a number of such optical flats or the like.

Another object is the provision of a generally improved method of and means for grinding and polishing such optical flats.

These and other objects, as will hereinafter appear, are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings in which

Figure 1 is a partial top plan view of a machine embodying the invention;

Fig. 2 is a partial enlarged vertical section on the line 2-2 of Fig. 1;

Figs. 3 and 4 are partial vertical sections on the lines 3-3 and 4-4 of Fig. 1;

Fig. 5 is a partial perspective view of the machine shown in Fig. 1;

Figs. 6, 7 and 8 are sections on the lines 6, 7 and 8 of Fig. 1;

Fig. 9 is a perspective view of the rotating driving head;

Fig. 10 is an enlarged perspective of the assembly of an optical flat blank with its surrounds ready for grinding or polishing; and

Fig. 11 is a similar view showing toolmakers' bar flats and the surrounds for rendering an assembly of the same substantially circular.

The embodiment illustrated comprises a machine having a frame 12 in which is located a well 14 in which is rotatably mounted a metal disk or plate 16 on a shaft 18 driven by any suitable means, not shown. The surface of the top of the disk for polishing is covered with a pitch lap surface 20 which is substantially flat and provided with a series of circular scorings or cross hatchings 22, the better to maintain a flat polishing surface. This surface is soft and tends to pile up as the blanks are rubbed over it. These are stopped by the scorings.

An arm 30 is mounted to oscillate about a vertical axle 32 and for this purpose is adjustably mounted upon a horizontal rod 34. The arm 30 is bifurcated, one end being secured by means of a clamp 36 on the rod 34, while the other end is screw-threaded and screwed upon the threaded end 38 of the rod 34. The arm 30 may be adjusted to the left to the position shown in Fig. 1 by turning the rod 34 by means of a crank 40. The

arm is then secured in any adjusted position by means of the clamps 36 and 42. The rod 34 is secured at its center in a casting 44 to which is secured a stop 46 (Fig. 3) for holding the arm 30 when swung back to raised position.

The outer ends of the rod 34 carry guide blocks 50, 52 which are adapted to slide between circumferential guides 54 and 56. A connecting rod 60 pivotally connects a block 62 on the rod 34 with a wrist pin 64 adjustably mounted in a guide-way 66 in the driving head 68 which is mounted on a vertical shaft, not shown, and driven about its axis by a suitable driving means. By moving the wrist pin 64 toward or from the center of the driving head, the amplitude of swing of the rod 34 and of the arm 30 is varied.

The height of the arm 30 above the disk 16 is varied by means of an adjusting screw 70 (Fig. 3). This arm carries an L-shaped extension 72 which is made adjustable so as to vary the effective length of the arm relative to the center of the table 16. This extension has a vertical leg (Fig. 2) in which is journaled a tube 74 on the lower end of which is carried a multiple head 76. This tube and multiple head are made adjustable for height by means of a set collar 78 which is secured thereon by means of a setscrew 80, the whole resting upon a ballthrust bearing 82, thereby rendering the whole readily rotatable.

Through the center of the tube 74 passes a long pivot pin 84, the lower end of which is reduced and rounded and fits in an opening 86 in a spud 88. This spud, as shown in Fig. 10, is then secured by pitch 92 to the top of a glass blank 94 which is to become an optical reflector or the like 90. The optical reflector shown is of a well known type which is longer than it is wide and has rounded corners. Surrounds 96 of the same material as the blank 90 and having the form of segments of the same circle, are secured to the flat edges of the blank so as to give the whole a substantially circular contour and these sectors are accurately mounted centrally thereon as by means of wax so that their lower surfaces are all in substantially the same plane. These surrounds insure a more uniform polishing of a blank whose form is other than circular. The upper end of the pivot pin 84 is surmounted by a weight 98.

In the embodiment shown six other blank assemblies 98, similar to the assembly shown in Fig. 10, are similarly rotatably mounted on six pivot pins 100 which are slidably and rotatably mounted in the vertical head and spaced about the central pivot pin 84 and each of these is surmounted by a weight 102.

With the parts assembled, as shown in Fig. 5, the disk 16 is set in rotation while the arm 30 oscillates the multiple head 76 and this causes the blank assemblies to be moved across the pitch lap surface 20 as it is rotated. A suitable polishing material as rouge is kept on this surface.

By this arrangement a surprisingly uniform and accurate polishing of the blanks is obtained but it is advisable that the weights 102 shall be considerably greater than the weight 96, in fact about in the proportion of 3 to 1.

In Fig. 11 is shown a modification of the device where metal toolmakers' bar flats 110 are to be similarly assembled with similar metal surrounds 112 upon a spud 88.

Where an opening in the center of the back of the blank 90 is not objectionable, it may be made to receive the lower ends of the pins 84 and 100 with the elimination of the spuds 88. A spring can be used instead of the weights 102 and the spuds can be enlarged to serve this same purpose. In any case the point of contact of the driving pin must be as low as possible to render the assembly in stable equilibrium.

The parts 90 and 94 are assembled by laying them on a flat surface and then the surrounds 94 are caused to adhere to the blank 90 by means of a suitable mixture of resin and wax. Thus the lower surfaces of all these members are fixed substantially in a plane.

The above description applies particularly to polishing on a pitch lap surface but this apparatus can also be used for grinding the blanks in which case coarser and faster cutting abrasives are used directly on the steel plate or disk 16 with the pitch lap surface removed.

Thus it will be seen that we have provided a very simple and efficient means for grinding or polishing optical flats, toolmakers' flats, lenses, or the like.

While we have shown and described but a single embodiment of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made which do not depart from the spirit and scope of our invention as disclosed in the appended claims.

We claim as our invention:

1. In a machine of the class described for grinding blanks, a disk, a flat unbroken grooved pitch lap surface on the disk, means for rotating the disk about its axis, an arm adapted to oscillate above the disk substantially across its axis, a member mounted to rotate freely about an axis in the arm substantially parallel to the axis of the disk, a pivot pin journalled in the axis of the member, a plurality of pivot pins journalled in the member parallel to said axis and uniformly spaced equidistant therefrom, each of said pivot pins being adapted to slide up and down with respect to said member, a weight on the upper ends of each of said pivot pins, and spuds each having a universal movement on the lower end of one of said pivot pins so as to yieldingly press each spud and a blank carried thereby toward the disk and to enable it to accommodate the blank to the rotating surface of the disk so as to maintain the pitch lap top surface substantially flat as the polishing proceeds.

2. In a machine of the class described for

grinding blanks, a disk, a flat unbroken grooved pitch lap surface on the disk, means for rotating the disk about its axis, an arm adapted to oscillate above the disk substantially across its axis, a member mounted to rotate freely about an axis in the arm substantially parallel to the axis of the disk, a pivot pin journalled in the axis of the member, a plurality of pivot pins journalled in the member parallel to said axis and uniformly spaced equidistant therefrom, each of said pivot pins being adapted to slide up and down with respect to said member, a weight on the upper ends of each of said pivot pins, and spuds each having a universal movement on the lower end of one of said pivot pins so as to yieldingly press each spud and a blank carried thereby toward the disk and to enable it to accommodate the blank to the rotating surface of the disk, the weight on the center pivot pin being substantially one-half that on each of the outer pivot pins so as to maintain the pitch lap top surface substantially flat as the polishing proceeds.

3. In a machine of the class described for grinding blanks, a disk, a flat unbroken grooved pitch lap surface on the disk, means for rotating the disk about its axis, an arm adapted to oscillate above the disk substantially across its axis, a member mounted to rotate freely about an axis in the arm substantially parallel to the axis of the disk, a pivot pin journalled in the axis of the member, six uniformly-spaced pivot pins journalled in the member parallel to said axis and uniformly spaced equidistant therefrom, each of said pivot pins being adapted to slide up and down with respect to said member, a weight on the upper ends of each of said pivot pins, and spuds each having a universal movement on the lower end of one of said pivot pins so as to yieldingly press each spud and a blank carried thereby toward the disk and to enable it to accommodate the blank to the rotating surface of the disk so as to maintain the pitch lap top surface substantially flat as the polishing proceeds.

4. In a machine of the class described for grinding blanks, a disk, a flat unbroken grooved pitch lap surface on the disk, means for rotating the disk about its axis, an arm adapted to oscillate above the disk substantially across its axis, a member mounted to rotate freely about an axis in the arm substantially parallel to the axis of the disk, a pivot pin journalled in the axis of the member, six uniformly-spaced pivot pins journalled in the member parallel to said axis and uniformly spaced equidistant therefrom, each of said pivot pins being adapted to slide up and down with respect to said member, a weight on the upper ends of each of said pivot pins, and spuds each having a universal movement on the lower end of one of said pivot pins so as to yieldingly press each spud and a blank carried thereby toward the disk and to enable it to accommodate the blank to the rotating surface of the disk, the weight on the center pivot pin being substantially one-half that on each of the outer pivot pins so as to maintain the pitch lap top surface substantially flat as the polishing proceeds.

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