GRINDING AND POLISHING APPARATUS

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

INVENTOR.
HENRI JULES CHAUMONT

BY
Bauer and Seymour
ATTORNEYS
Sept. 10, 1968

H. J. CHAUMONT

3,400,501

GRINDING AND POLISHING APPARATUS

Filed June 10, 1965

4 Sheets-Sheet 4

INVENTOR.

HENRI JULES CHAUMONT

BY

Bauer and Seymour

ATTORNEYS
ABSTRACT OF THE DISCLOSURE

A rubbing block intended principally for machines for grinding and polishing sheet glass, and quick-releasable clamping means for connecting the block to a heavy base member permanently attached to the machine. The block is formed in two like and essentially coplanar panels joined for limited pivotal movement about a line in their meeting edges. The clamping means cooperates with these panels to hold them together and to urge them into contact with the base member by which they are moved in an orbital grinding or polishing movement. Due to the quick-detachable feature and light weight of the block, it may be readily removed for replacement of its felt rubbing facing.

The present invention relates to apparatus for grinding and polishing plates of material such as glass. In particular, the invention relates to an improved grinding and polishing unit for use in such apparatus.

In the type of polishing and grinding apparatus under consideration, a polishing unit comprising a heavy block with a pad of felt or similar material secured to its rubbing surface is moved back and forth, usually in an elliptical path, on the plate being ground and polished. At the same time, a suitable liquid, usually a suspension of an abrasive such as rouge, is fed to the pad at the rubbing surface of the unit. The grinding and polishing is accomplished by the rubbing of the abrasive over the surface of the sheet or plate in a reciprocatory motion under the weight of the block. In the course of this operation the pad wears out and must be replaced periodically. In conventional apparatus the entire polishing unit must be removed to replace the pad. This requires the skill of a mechanic to disconnect and connect the driving connections, such as gears and levers, to the motive power for the apparatus in order to remove the unit and then replace it after a new pad has been put on. This disconnection and connection takes time and in addition the units are normally sufficiently heavy to require the use of a chain hoist or other lifting device to remove the heavy unit from the apparatus.

It is a principal object of the present invention to eliminate the above difficulties involved in replacing worn pads of grinding and polishing units.

In accordance with the invention the grinding and polishing unit comprises generally a heavy base plate or member having a comparatively light rubbing element removable secured thereto. A pad of felt or other material is attached to the rubbing surface of the rubbing element in a conventional manner, as by adhesive. When the pad needs to be replaced, the rubbing element is released from the base member by releasing a simple clamp means and is easily slipped out of the apparatus for repair or replacement. The base member remains connected to the motive power. The rubbing element is light and easily handled by unskilled labor without having to employ lifting devices, and the simplicity of the operation saves time.

The grinding and polishing unit is preferably quite heavy in order to press the pad against the surface being ground and polished. For the purpose of the present invention, it is desired to have the rubbing element light for easy removal and to have the necessary weight concentrated in the base member. But it is a problem to provide a suitable connection between the light and heavy parts which is easily releasable but which holds the two securely together despite the stresses and vibrations to which the unit is subjected during operation.

A further object of the present invention is to provide a simple clamp means which removably connects the rubbing element to the base member and holds it securely in place. Another object is to provide means for holding the rubbing element in place on the base member under resilient pressure.

In accordance with one feature of the invention, the clamping pressure which holds the rubbing element to the base member is resilient and the clamping pressure is applied to opposite edges of the rubbing element in a direction which presses the rubbing element firmly against the base member.

In accordance with another feature of the invention resilient clamping pressure is applied by spring means connected to urge the clamp means into its clamping position.

In accordance with another feature of the invention the rubbing element is made up of at least two panels in edge-to-edge relation with a cylindrical element supported between and holding apart the adjacent edges, the cylindrical element being placed so as to cooperate with the clamp means to create components of force which press the rubbing element, and particularly the portions of the rubbing element at adjacent edges of the panels, tightly to the base member.

In accordance with still another feature, the cylindrical element between the panels is resilient as a means of holding the rubbing element held in place under resilient pressure.

The above and further objects and novel features of the present invention will more fully appear from the following detailed description when read in conjunction with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims.

In the drawings, wherein like reference characters refer to like parts throughout the several views:

FIGURE 1 is a horizontal section through one form of rubbing element in accordance with the present invention along the line 1—1 of FIGURE 2;

FIGURE 2 is an end view of a vertical section along the line 2—2 of FIGURE 1 showing the base member and the rubbing element of FIGURE 1;

FIGURE 3 is a schematic representation of an end elevation of one embodiment of a grinding and polishing unit in accordance with the invention in which the rubbing element is made up of two adjacent panels;

FIGURE 4 is a view similar to FIGURE 3 but showing an embodiment in which the rubbing element is a single unit;

FIGURE 5 is a horizontal section through another form of rubbing element in accordance with the invention;

FIGURE 6 is a vertical section along the line 6—6 of FIGURE 5 showing the rubbing element of FIGURE 5;

FIGURE 7 is a vertical section along the line 7—7 of FIGURE 5 showing the base member and the rubbing element of FIGURE 5;

FIGURE 8 is an end elevation of another form of a grinding and polishing unit in accordance with the invention and showing an alternative form of the clamp means;
FIGURE 9 is a view similar to FIGURE 8 but showing the clamp means in unclamped position; FIGURE 10 is a vertical section through the axis of the pivotal connection for the pivoted arm of the clamp means shown in FIGURES 8 and 9; FIGURE 11 is an end elevation of the arm and pivot shown in FIGURE 10; and FIGURE 12 is a schematic representation of the end elevation of the grinding and polishing unit shown in FIGURE 8.

Referring now to the drawings, and particularly to FIGURES 1–4, a grinding and polishing unit in accordance with the present invention comprises generally a base member 10 against which a rubbing element 11 is removably secured by clamp means 12 mounted on the base member 10. Rubbing element 11 is constructed to be lightweight but strong being made of any suitable metal or alloy and, as shown in FIGURES 1, 2, 5 and 7, the interior of the rubbing element may be made cellular as a means of reducing the weight of element 11. The lower rubbing surface of rubbing element 11 is provided by a pad 13 of felt or other suitable material cemented or otherwise adhered to the lower surfaces of the element 11. Rubbing element 11 may be a single panel as illustrated in FIGURE 4 or a plurality of panels, such as panels 11a and 11b in FIGURES 2 and 3 in adjacent edge-to-edge relation with a cylindrical element 40 between the adjacent edges.

The clamp means 12 comprises a pair of arms 14 and 15 attached to opposite edges respectively of base member 10, arm 15 being pivoted on base member 10 at 16. As shown in FIGURE 2, the sides of rubbing element 11 have beveled edges 17 and the lower ends of arms 14 and 15 are provided with end portions 20 and 21 slanted or bevelled to match and shut the beveled edges 17 when clamp means 12 is in clamping position.

Looking at FIGURES 3 and 4, arm 14 is secured to the right edge of the base member 10. It extends above the base member and is attached to a cross beam 22 by a triangular plate 23 secured in the angle between the arm 14 and cross beam 22. Arm 15 which is pivoted to the left edge of the base member 10 at 16 is connected at its upper end to a rod 24 by a pivot 25. A cylinder 26 is fixed on rod 24 and a cylinder 27 is attached to cross beam 22. Cylinder 27 has a plate 28 attached across its right end and secured to cross beam 22. The other end of cylinder 27 is telescopically slidable in cylinder 26 and has a plug 29 fixed in its end within cylinder 26. Rod 24 extends through and is attached to a plate 30 which is secured across the left end of cylinder 26. Rod 24 extends slidable through a suitable packaging gland in plug 29, and is connected to a piston 31 slidable in the bore of cylinder 27. A coil spring 32 around the cylinders is compressed between flanges 28a and 30a, which are at the ends of the respective cylinders, and urges the cylinders apart.

Cylinder 27 is fixed in position so that cylinder 26 is thus urged to the left and thereby pivots arm 15 around the pivot point 16 into clamping position in which end portions 20 and 21 of the arm 14 and 15 are against the beveled edges 17 of rubbing element 11. To release the clamp means, fluid such as air under pressure is forced into the cylinder 27 between plug 29 and piston 31 so as to push piston 31 to the right against the pressure of the coil spring 32 and draw the upper end of the arm 15 to the right so that the ends 21 of the arms 14 and 15 are against the beveled edges 17 of rubbing element 11. The fluid under pressure to release clamp means 12 may be conducted into cylinder 27 between plug 29 and piston 31 through a conduit 33 opening inside the cylinder 27 and extending out through the plate 28 where it is connected through a valve 33a to supply (not shown) of fluid under pressure.

The plates 28 and 30 at the outer ends of the respective cylinders 27 and 26, have openings therein for escape of air to permit the cylinders to move as described when pressure fluid is introduced into cylinder 27. The clamp means is subsequently returned to clamping position by releasing the pressure of fluid in the cylinder 27 as by opening a valve 33b to relieve the pressure, whereupon coil spring 32 pivots the upper portion of arm 15 to the left again.

When clamp means 12 is in clamping position the pressure of the portions 20 and 21 of arms 14 and 15 against the beveled edges 17 at the opposite sides of the rubbing element produce resultant forces which, as illustrated by the arrows R in FIGURES 3, 4 and 12, press the rubbing element 11 to the base member 10. Thus, the rubbing element is firmly pressed against base member 10 so as not to be displaced by the generally reciprocatory movement of the unit during grinding and polishing. Moreover, the clamping pressure applied to hold the rubbing element in position is resilient and absorbs lateral shocks and vibrations applying to the rubbing element. In the embodiments illustrated in FIGURES 3 and 4, this resiliency is provided by the structure of the clamp means 12 wherein the clamping pressure is applied by the coil spring 32. In the embodiments of FIGURES 5–12 in which the rubbing element 11 is made up of two or more adjacent edge-to-edge panels the resiliency is provided by having the cylindrical element 40 between adjacent panels diametrically resilient, as subsequently described in detail.

For grinding and polishing operations a liquid suspension of an abrasive, such as rouge, is continuously fed through a plurality of conduits 36 in the rubbing element to the pad 13 which forms the rubbing surface of the rubbing element. As seen in FIGURE 3, each conduit 36 opens through the bottom of the rubbing element into a channel 37 in the pad 13. The channels 37 extend obliquely across the pad 13. The upper end of the conduit opens through to the upper support surface of rubbing element 11 adjacent a groove 38 in the base member 10. Groove 38 extends longitudinally of the base member and abrasive fluid is fed into it under pressure from a source not shown. Gaskets 38a are recessed into the edges of the groove 38 and make a leak-tight seal with the upper surface of the rubbing element 11 when the rubbing element is clamped in position so that the liquid abrasive flowing from the groove 38 through the conduits 36 to the pad 13 is kept from working its way into the interface between the abutting support surfaces of the rubbing element and base member.

In the embodiment shown in FIGURES 1, 2 and 3, the rubbing element 11 is made up of two panels 11a and 11b in adjacent edge-to-edge relation with a cylindrical element 40 supported between the adjacent edges. The cylindrical element 40 is attached in a groove 45 in the edge of panel 11a and is received in a groove 46 in the adjacent edge of the panel 11b. The panels are put into position to be clamped to base member 10 by placing panel 11b with its beveled edge 17 against end portion 20 of arm 14 and then moving the panel 11a in the direction indicated by arrow f. FIGURE 5, until the cylindrical element 40 is seated in groove 45. End portion 21 of arm 15 is then pivoted into position against beveled edge 17 of panel 11a and clamped. To remove the panels the clamp means 12 is released and the panels 11a and 11b are withdrawn in the direction indicated by arrow f', FIGURE 3. As illustrated with reference to comparable panels 11a and 11b in FIGURE 5, each of the panels 11a and 11b have U-shaped extensions 43 at their end edges and the upper arms of the U's ride in brackets 44, on the base member 10 to guide the panels into position and support them until they are clamped by the clamp means 12. As shown in FIGURE 1, the end edges 18 of each panel 11a and 11b are advantageously made with a counter-C of the panel to make it easier to slide the panel into position without jamming.

In the embodiment of FIGURES 1–3 the cylindrical ele-
ment 40 is generally elliptical in cross section with arcuate surfaces about centers C and C' at opposite sides. The arcuate surface about the center C is received and secured in matching arcuate groove 45 in the edge of the panel 11a while the arcuate surface about the center C' is loosely received in the matching arcuate groove 46 in the adjacent edge of panel 11b. The cylindrical element 40 is thus a key-like element which holds the panels 11a and 11b in alignment and acts as a joint about which the respective panels may rotate. As shown, the center of the resilient element 40 is above the center line between the support surface at the top of the rubbing element 11 and the rubbing surface at the bottom of the element 11 so that pressure of the clamp means 12 on the beveled edges 17 of the rubbing element is in such relation to the resilient element 40 that the portion of the rubbing element at the adjacent edges of the panels 11a and 11b are pressed up against the base member.

FIGURES 5, 6 and 7 show another embodiment of the invention in which the resilience of the clamping is provided by a resilient cylindrical element 50 between adjacent edge to edge panels 51a and 51b, of the rubbing element 51. In this embodiment the cylindrical element is made of resilient material such as rubber and is tubular, having a pair of axially aligned cylindrical chambers 52 formed within it. It is elliptical in cross section to provide arcuate surfaces at opposite sides which match and are received in arcuate grooves 53 and 54 in the adjacent edges of the panels 51a and 51b respectively. It is attached in the groove 53 of the panel 51a by bolts 55 which are embedded in the ends of the element and project at right angles thereto into holes 56 in the panel 51a in which the ends of the bolts are secured by snap rings 57. The chambers 52 are connected to a T connection 58 which is connected through a conduit 59 in the panel 51a to a connection 60. The connection 60 is held in place in the panel 51a by a snap ring 61 and a source of fluid (not shown) under pressure is connected to the connection 60 to inflate the chambers 52 sufficiently to maintain the elliptical cross section of the cylindrical element.

When the panels 51a and 51b are clamped together the cylindrical element 50, being attached in arcuate groove 53 and received loosely in arcuate groove 54, provides a pivot point between the two panels. Like the cylindrical element 40 of FIGURES 1-3, the center of the cylindrical element 50 is above the longitudinal center line between the rubbing surfaces and suppur support surfaces of the panels 51a and 51b so that the clamping pressure of the end portions 20 and 21 of arm 15 is applied against the outer beveled edges 17 of the panels urges the adjacent edges of the panels to buckle up toward the support surface of base member 10 to supplement the effect of the clamping pressure which presses the rubbing element to the support surface of base member 10.

FIGURES 8 and 9 show an embodiment of clamp means which may suitably be used when the resiliency of the clamping is provided by a resilient cylinder element 50 between panels 51a and 51b. The arm 14 having the beveled end portion 20 thereon is pivoted at 19 and is extended up from the right end of base member 10. The upper end of the arm 14 is rigidly secured to a cross beam 65 by a triangular plate 66 affixed on the right end of the cross beam 65 and secured to arm 14. At the other edge of base member 10 arm 15 is pivotally supported on a bracket 67 by a pin 68 carried by the bracket and passing loosely through a hole in arm 15. The end of arm 15 is forked as shown upon FIGURES 10, 11 to engage a tongue portion 65a at the left end of the cross beam 65 when the arm is pivoted to its vertical clamping position and is held in clamping position by a bolt 69 which is inserted through holes in the forked upper portion 70 and through a matching hole in the upper portion 65b of cross beam 65. Arm 15 is further held firmly in clamping position by a bolt 70 inserted through a hole in the bracket 67 and passing through a matching hole in the lower portion of the arm 15 below pin 68. To release clamp means 12 bolts 69 and 70 are withdrawn and the arm 15 is pivoted to the position shown in FIGURE 9.

The bracket 67 is formed of two pairs of spaced apart plates 71 and 72 secured at right angles to a back plate 73 which is attached by screws 74 to the left edge of the base member 10. The pairs of plates 71 and 72 are spaced apart to receive the arm 15 between them while the plates of each pair are spaced apart to receive a plate 75 between them at each side of the arm 15. Plates 75 are attached to arm 15 so as to move therewith by the pivot pin 68, which passes through the top of each plate 75 and by lugs 76 projecting from opposite sides of the arm 15 and engaging the lower ends of the plates 75. As indicated at 34, FIGURE 9, the lower portions of plates 71 and 72 are cut away to provide clearance for lugs 76 when arm 15 is pivoted to clamping position.

In operation clamp means 12 illustrated by the embodiment of FIGURES 3-4 and 8-12 are simple to operate to clamp rubbing element 11 in position or release it for removal. Yet, when in clamping position the clamp means in accordance with the invention holds the rubbing element securely fixed against the base member 10.

Rubbing element 11, whether it is a single panel or two or more panels as described, is quickly and simply removed from base member 10 by releasing the clamp means and drawing the panel or panels out from one side of the unit. As mentioned the panel or panels comprising the rubbing element are made as light as possible to be handled easily, but strong enough to remain rigid when the clamping pressure is applied. For this purpose, rubbing element 11 is cellular and the upper and lower walls of the element are made only as thick as required to preserve the rigidity of the element. In operation, as seen in FIGURES 2 and 7, the bottom of the rubbing element which is under more pressure than the clamp means than the top wall, is thicker than the top wall.

As many apparently widely different embodiments of the present invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments.

What is claimed is:
1. In a machine for grinding and polishing flat sheet glass, a heavy base having a first planar face, a rigid rubbing element having a second planar face for surface-to-surface contact with said first planar face, said element also having opposite side edges beveled upwardly and outwardly, and clamping means carried by said base and engaging said beveled side edges of said element, said means exerting compressive forces on said element, having components urging said faces together.
2. The machine of claim 1, and a layer of flexible rubbing material detachably secured to the surface of said element opposite said second planar face.
3. A grinding and polishing unit comprising a base member having a support surface, a rubbing element adapted to be removable secured to the base member by clamp means, said rubbing element having a support surface at one side and a rubbing surface at the opposite side, said clamp means being movable into clamping position against the rubbing element in a direction to press the support surface of the rubbing element against the support surface of the base member, resilient means cooperating with the clamp means when it is in clamping position to press the rubbing element resiliently against the base member, said clamp means and when in clamping position, bearing against opposite side edges of the rubbing element secured to the base member thereby, said clamp means and the rubbing element comprising a pair of panels adapted edge-to-edge relation, and a cylindrical element supported longitudinally between and holding apart the adjacent
edges of the panels, said cylindrical element having an arcuate surface corresponding to and adapted to be received in an arcuate groove in one of said edges whereby the panels are movably supported relative to each other about the center of said arcuate surface.

4. In a machine for grinding and polishing flat sheet glass, a heavy base member having a first planar face, a relatively lightweight, rigid rubbing element having a second planar face and a face opposite said second planar face, to which a flexible rubbing pad may be detachably affixed, said element also having opposed side edges sloping upwardly and outwardly, first and second arms carried by said base member adjacent respective opposite sides thereof, first means pivoting said first arm between its ends to said base member for angular movement about an axis normal to said first arm and parallel with said first planar face, the distal end of each said arm being adapted to engage a respective sloping edge of said rubbing element, and second means urging apart the other ends of said first and second arms, to thereby urge said distal ends thereof into engagement with the sloping edges of said rubbing element and create component forces holding said base member and said rubbing element together with said planar faces thereof in contact.

5. A grinding and polishing unit comprising a base member having a flat support surface, a rubbing element having a flat support surface, clamp means comprising a pair of arms mounted on the base member at opposite edges thereof respectively, at least one of said arms being pivotally mounted on the base member, said arms having end portions adapted to engage opposite edges respectively of the rubbing element when the rubbing element is in position with its support surface against the support surface of the base member, means to press said end portions of the arms against the edges of the rubbing element which is in said position, the engagement of the end portions of the arms and said edges of the rubbing element being such that the resultant forces of the pressure of the arms against said edges press the central portion of the rubbing element to the base plate, resilient means cooperating with the clamp means when it is in clamping position to press the rubbing element resiliently against the base member, the rubbing element comprising a pair of panels in adjacent edge-to-edge relation and said resilient means includes a resilient element supported between and holding apart the adjacent edges of the panels.

6. The machine of claim 1, said rubbing element comprising first and second essentially coplanar portions with contiguous edges, and an elongated resilient element supported between and holding said edges in spaced relation.

7. The machine of claim 6, said resilient element being tubular, and conduit means communicating with the interior of said resilient element and adapted for connection with a source of pressure fluid, to inflate and expand said resilient element.

8. The machine of claim 1, a first conduit for fluid passing through said rubbing element and opening through the outer face thereof, a second conduit for fluid in said base member opening through said first planar face, said openings being in fluid-tight registration when said first and second planar faces are clamped in abutting relation by said clamping means.

9. The grinding and polishing unit of claim 3 in which said cylindrical element is diametrically resilient.

10. The grinding and polishing unit of claim 3 in which the center of said arcuate surface is above the mid-point between the support and rubbing surfaces of the rubbing element.

11. The grinding and polishing unit of claim 9 in which the pressure of the clamp means against each of the outside edges of the rubbing element is directed at an acute angle with respect to the support surface of the rubbing element.

12. The machine of claim 4 in which said second means comprises a spring connected to and urging said other ends of the arms apart.

13. The grinding and polishing unit of claim 5 in which said resilient element is generally tubular and arranged longitudinally between said adjacent edges.

14. The grinding and polishing unit of claim 13 in which said resilient element is substantially elliptical in cross section and supported in a pair of opposed semi-circular grooves in said adjacent edges respectively, said grooves extending longitudinally of said edges and said resilient element being arranged with its longest diameter extending between the grooves.

15. The grinding and polishing unit of claim 13 in which the resilient element has at least one inflatable chamber therein.

References Cited

UNITED STATES PATENTS

672,408 4/1901 McAfee
1,045,894 12/1912 Schimmel
1,183,444 5/1916 Fisk
1,385,902 7/1921 Bussler
1,410,096 9/1922 Wolthieter
1,735,644 11/1929 Hill
2,326,879 8/1943 Neuhausen
2,499,933 5/1950 Smul

LESTER M. SWINGLE, Primary Examiner.