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APPARATUS FOR SIMULTANEOUSLY POLISHING BOTH FACES OF A TRAVELLING STRIP OF GLASS

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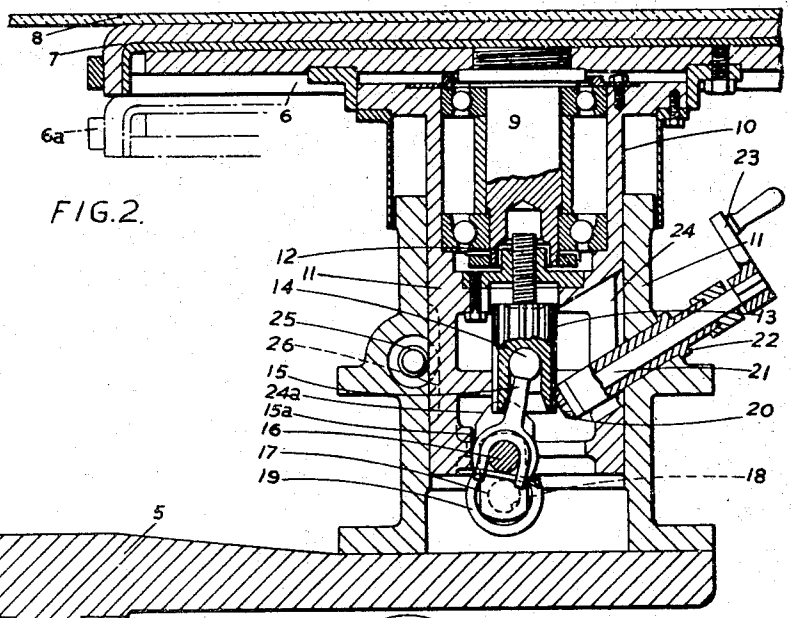


FIG. 2.

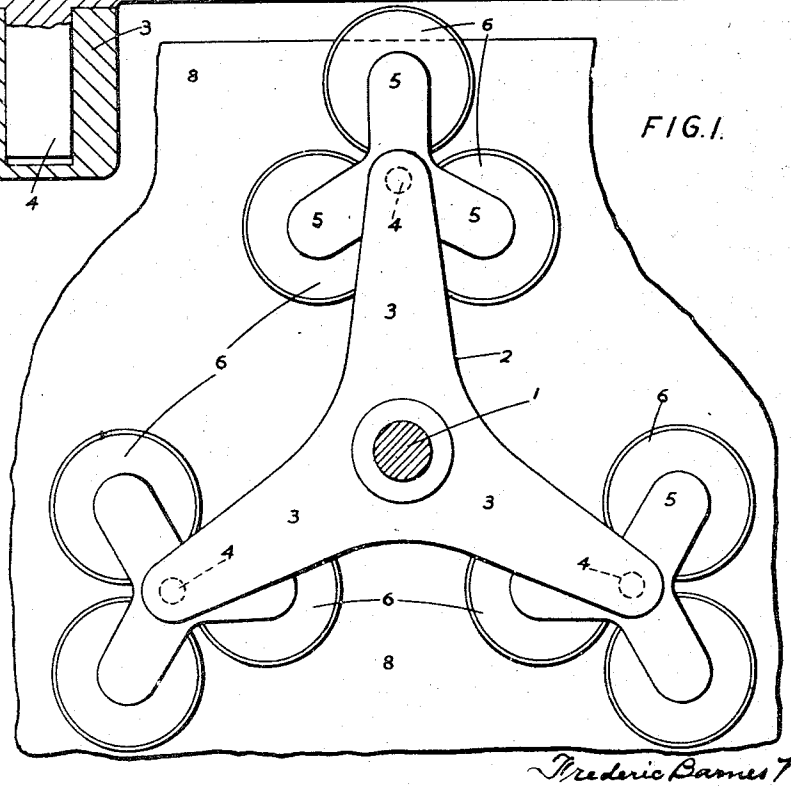


FIG. 1.

Inventor
Frederic Barnes Waldron
By
Harrison, Kennedy & Campbell,
Attorneys

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APPARATUS FOR SIMULTANEOUSLY POLISHING BOTH FACES OF A TRAVELLING STRIP OF GLASS

Frederic Barnes Waldron, Prescot, England, assignor to Pilkington Brothers Limited, Liverpool, England, a British company

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3 Claims. (Cl. 51—195)

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This invention relates to apparatus for simultaneously polishing both faces of a travelling strip of glass.

Such form of apparatus commonly comprises polishing tools adapted to operate on the underface of the glass strip, whilst at the same time they serve to support the strip, each such tool including a plurality of polishing pads each adapted to turn on a substantially vertical axis, the tool being mounted on a frame which is adapted to rotate so as to bring each pad to an edge of the glass.

The tool may either be supported on a single frame with central driven shaft or may be supported on a plurality of sub-frames in turn supported on a main frame with central driven shaft, each sub-frame (if used) being free to rotate on its support on the main frame. Each tool is provided with means of vertical adjustment, whereby the strip of glass supported by the plurality of tools can be kept free of bends in passing through the apparatus.

Polishing is effected by the rubbing of the pads over the glass, while rouge and water is supplied either to the pads or to the glass. After a certain time of operation, rouge becomes caked on the pads to form a hard layer, in which foreign matter such as glass splinters may be embedded, and the polishing action is then impaired. The pads then have to be cleaned by removing the hard layer and, to effect this, access must be obtained to the operative surface of the pads. Further, the pad coverings gradually wear and may become damaged and then the covering must be removed and replaced.

If a polishing tool operating on the undersurface of a strip of glass be lowered so as to give access to the surfaces of the pads, there is considerable risk of the travelling glass, which is then left unsupported over the tool, binding and then breaking. Also, when one or some of the pads have their covering replaced, the pads with new coverings are not accurately in the same plane as the remaining pads with partially worn coverings. This has the result of imposing bending stresses on the glass which may be sufficient to break the glass.

The main objects of the invention are to provide mechanism in apparatus for simultaneously polishing both faces of a travelling strip of glass

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by which each individual pad can be dropped sufficiently away from the glass so that the felt can be readily changed and scraped when necessary, and can then be returned to operative position without disturbing the pristine adjustment of the pad while the remaining pads remain in operative position supporting the glass and by which each pad can be individually and accurately adjusted in height so that all the pads of the tool can be brought into one plane and mutually support the glass whether they are new or worn.

In accordance with the present invention apparatus for polishing the undersurface of a horizontal travelling strip of glass comprising a polishing tool in which a plurality of polishing pads, each adapted to turn on a vertical axis, is supported on a frame adapted to rotate on a vertical axis, is characterized by two independent means for moving each pad vertically, one adapted to drop the pad vertically sufficiently far from the glass to give ready access to its operative surface and to return it to its previous position without disturbing the adjustment, while the other pads remain in operative position supporting the glass, and the other adapted to give final adjustment of the pad accurately into the plane in which the other pads support the glass.

In a preferred construction according to the invention each pad is rotatably supported in a sleeve, which sleeve is vertically slidable in a tubular member carried by the tool, a horizontal shaft mounted on the tool and passing through said tubular member, means mounted on the shaft for raising the sleeve to an upper position or permitting it to be dropped vertically to a lower position, an extensible connection between said raising means and said sleeve disposed axially of the sleeve and in threaded engagement therewith and means for actuating the extensible connection to achieve fine adjustment of the pad in raised position comprising vertical teeth on said extensible connection, a pinion engaging said teeth and means for rotating said pinion, said vertical teeth being long enough to retain engagement with the pinion during vertical movement of the sleeve.

The sleeve raising means may comprise a crank shaft journalled in the tubular member attached to the tool, with a block on a rod connected to a crank-pin of the crank shaft supporting the extensible member.

extends from the hub. The position of the free end of the bi-metal 40 can be adjusted by rotating a cam 43, as the lever 41 is continually urged against the periphery of the cam by a spring 44. An electric heating element 46 is carried on the end of the bi-metal strip and is insulated from the strip. The heater element is a low voltage type and is energized by a step-down transformer 47. The primary winding 48 of the transformer is connected to the usual 110 volt household power lines 49 and 50 by wires 51 and 52. The secondary winding 53 of the transformer is connected to the heating element by wires 54 and 55. The heating element 46 is arranged to be moved by deflection of the bi-metal 40 intermediate junctions 58 and 59 of a thermocouple indicated generally at 60, so that these junctions are heated above atmospheric temperatures preferably by radiant heat. The thermocouple 60 comprises a U shaped constantan wire 61 having the ends thereof joined with copper wires 62 and 63 at 58 and 59. The wire 61 is preferably shielded from the heat of the heater 46 except at the junctions 58 and 59. The circuit for the thermocouple 60 includes a galvanometer 67 and a thermopile 68, which latter comprises the device 36. The wire 62 is connected to the thermopile 68 at a junction 70 and the wire 63 is connected with a terminal 66 of the galvanometer. The lever 41 is adjusted by the cam so that when the temperature of the bi-metal 40 is 72° F., for example, the heater element 46 is mid-way between the junctions 58 and 59 and each junction is subjected to the same intensity of radiant heat, and therefore, the temperatures of these junctions will be substantially the same. It is to be understood, however, that the lever 41 could be adjusted by the cam so that the heater element would be midway between the junctions of the thermocouple at other temperatures than 72° F. As the temperature of the bimetal decreases, the heater element 46 is moved toward the junction 59 for increasing the intensity of the radiant heat at that junction while causing a decrease in the intensity of the heat at the junction 58. This increases and decreases the temperatures of the junctions 59 and 58, respectively. When the temperature of the bimetal is raised above 72° F., the heater element is moved nearer to the junction 58 and that junction becomes warmer than the junction 59. Thus, on a decrease in temperature of the bimetal below 72° F. an electric potential will be established tending to cause a flow of current through the thermocouple circuit from wire 61 to wire 63, and on an increase in temperature above 72° F., the flow of current or potential will be established in the opposite direction. When the heater element is exactly intermediate the junctions, both junctions are heated equally and no current will be generated.

The junction 70 of thermopile 68 is connected with a constantan wire 71. The opposite end of the wire 71 is joined with one end of a copper wire 72 at junction 73 and the opposite end of the wire 72 is connected to a constantan wire 74 at junction 75. The opposite end of the wire 74 is connected to a copper wire 76 at junction 77. The junctions 70 and 75 are each in close heat exchange relation with a mass of heat absorbing material 79, such as copper, so that the temperatures of the wires at these junctions will lag with respect to changes in ambient temperature. The junctions 73 and 77 are each in close heat exchange relation with masses smaller than those of junctions 70 and 75 or they may be exposed directly to changes in temperature so that when the thermopile is subjected to changes in temperature, there will be a differential in temperature between the junctions 70 and 73, and 75 and 77, respectively. The thermopile 68 is subjected to the air in the bonnet of the furnace.

The wire 76 is connected to a terminal 78 of the galvanometer 67, and the coil 80 of the galvanometer is connected in series with the thermocouples 60 and 68 through the terminals 66 and 78.

It will be apparent that when the temperature of the air in the bonnet increases, the temperatures of the junctions 73 and 77 of the thermopile will increase more rapidly than the temperatures of the junctions 70 and 75 and, therefore, an electric current will be established in wire 76 tending to flow toward the coil 80. When the temperature of the air in the bonnet decreases, the thermopile 68 will establish an electric current tending to flow in the opposite direction since the junctions 73 and 77 will be cooler than junctions 70 and 75. When the temperature of the air in the bonnet of the furnace is constant or substantially constant, the junctions of the thermopile 68 will be at the same temperatures, and therefore, no potential will be established by it. Thus, the thermopile establishes an electric potential proportional to the rate of change in temperature, and the direction of flow of current is dependent on whether the temperature is increasing or decreasing.

It will be noted that the thermocouple 60 and thermopile 68 establish currents of the same polarity, or augment one another, whenever the temperature of the bimetal 40 is above or below 72° F., and the air in the furnace bonnet is increasing or decreasing, respectively, and that potentials are established counter to one another whenever the temperature of the bimetal 40 is above or below 72° F., while the temperature of the air in the furnace bonnet is decreasing or increasing, respectively.

The galvanometer 67, a top plan view of which is shown diagrammatically in Fig. 2, is constructed so that when the potential at the terminal 66 of the galvanometer 67 is greater than the potential at the terminal 78, the coil 80 will be deflected in a counter-clockwise direction, for example, and when the potential at 78 is greater than at 66, the coil will be deflected in a clockwise direction. When the potentials are exactly the same or zero, the coil will be in the position shown in Fig. 2. It is apparent that the galvanometer is responsive to the algebraic sum of the potentials established by the thermopile and thermocouple.

An armature 81, which is mounted on a vertical pivot 82, is oscillated by movement of the coil 80, and this armature carries an iron armature 83 and a contact bar 84.

Two suitable electromagnets, shown diagrammatically at 85 and 86, are arranged on opposite sides of the armature 83 and are equally distant from the armature when the coil 80 is in the position shown in Fig. 2. The magnets 85 and 86 include coils 87 and 88, respectively, and these coils are connected in series. The coil 88 is connected to the line 50 by a wire 89 and to the coil 85 by wire 90. Coil 87 is connected to the line 49 by a circuit including a wire 91, time switch 92 and wire 93.

The time switch 92 includes a contact bar 94

3. Apparatus according to claim 1 characterized by each pad being rotatably supported in a sleeve, which sleeve is vertically slidable in a tubular member carried by the frame, a horizontal shaft mounted on the tubular member and passing through said tubular member, means mounted on the shaft for raising the sleeve to an upper position or permitting it to be dropped vertically to a lower position, an extensible connection between said raising means and said sleeve disposed axially of the sleeve and in threaded engagement therewith and means for actuating the extensible connection to achieve

fine adjustment of the pad in raised position comprising vertical teeth on said extensible connection, a pinion engaging said teeth and means for rotating said pinion, said vertical teeth being long enough to retain engagement with the pinion during vertical movement of the sleeve, said sleeve raising means comprising a crank shaft journalled in the tubular member attached to the arm, with a block on a rod connected to a crank-pin of the crank shaft supporting the extensible connection.

FREDERIC BARNES WALDRON.