Oct. 17, 1939. F. B. WALDRON ET AL 2,176,481

APPARATUS FOR PRODUCING GROUND AND POLISHED GLASS STRIP

Original Filed March 4, 1938 2 Sheets-Sheet 1

FIG. 1.

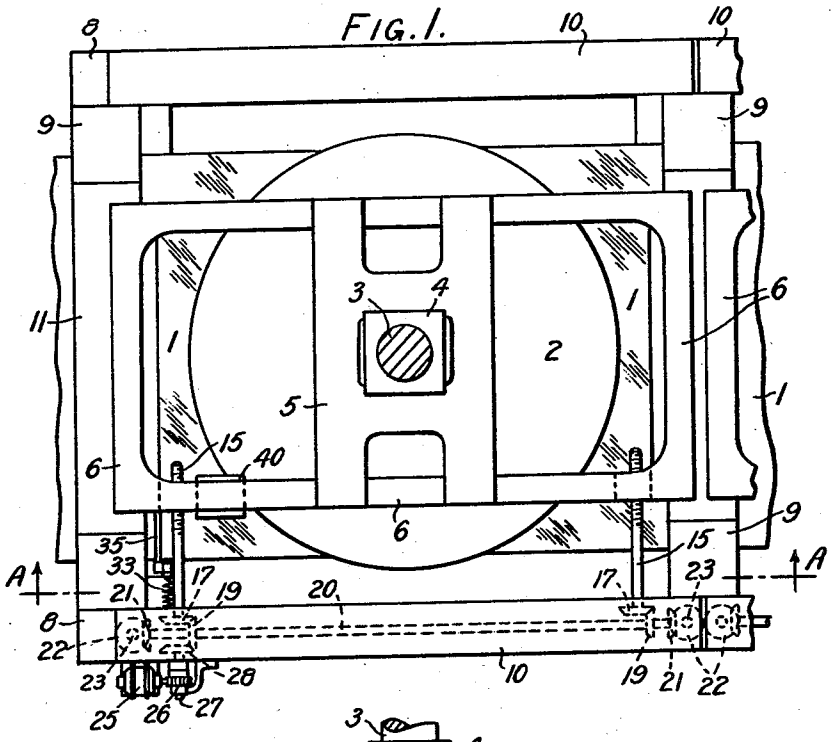
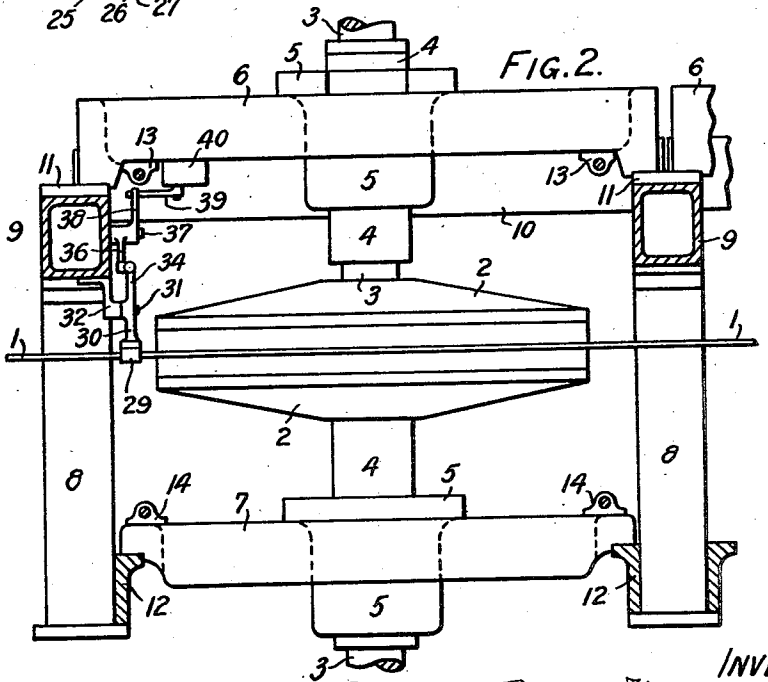


FIG. 2.



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FIG. 3.

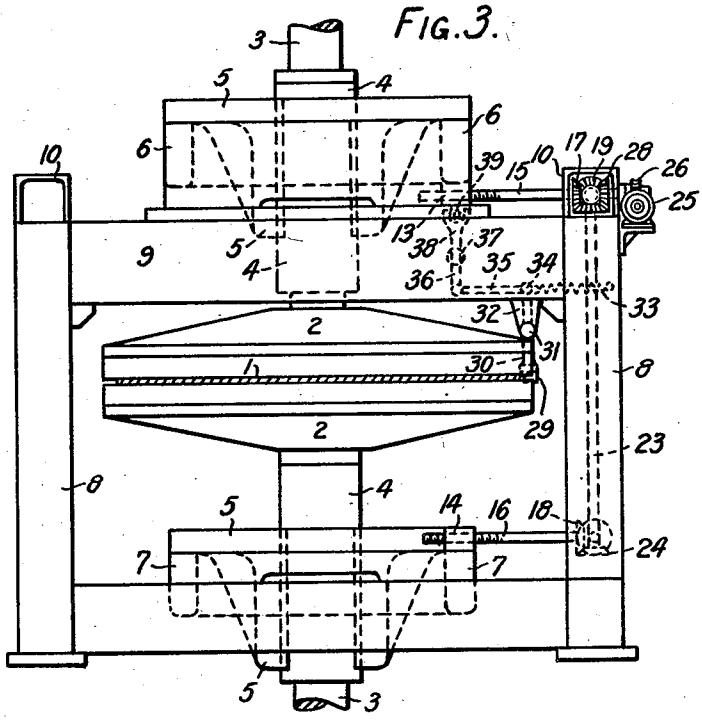
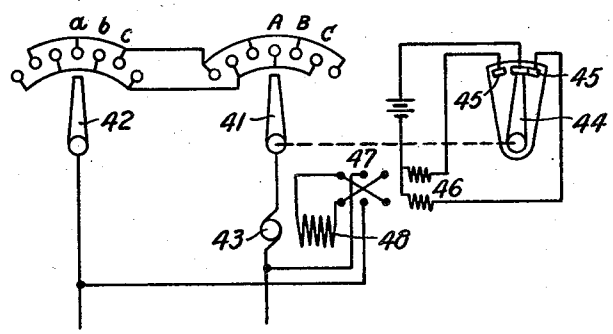


FIG. 4.



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APPARATUS FOR PRODUCING GROUND AND POLISHED GLASS STRIP

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Application March 4, 1938, Serial No. 193,908 Renewed August 10, 1939. In Great Britain March 10, 1937

4 Claims. (Cl. 51—112)

This invention relates to the simultaneous grinding and polishing of both sides of a continuous strip of glass, and has for its object an improved method and apparatus for maintaining the grinding and polishing tools central relatively to the strip.

In the type of apparatus to which the invention relates, the rotary grinding tools are provided with grooves through which the abrasive passes from the centre towards the periphery, but the periphery is formed with a continuous ring which is in contact throughout with the glass; this peripheral ring prevents the rapid escape of the abrasive under the action of centrifugal force.

Now it has been found impracticable to produce a continuous strip of glass so straight laterally, that, while driven through the grinding and polishing apparatus (constituted by a large number of grinding and polishing tools operating on the upper and under surfaces of the strip), it remains central relatively to the tools. If the strip, at any point, deviates from the central position by more than a certain amount, the above-mentioned peripheral ring reaches beyond the edge of the strip on one side, and there is then nothing to prevent the abrasive in the grooves from being thrown outwardly from them. The result is that the tool is insufficiently provided with abrasive and ceases to operate effectively.

In the case of polishing tools, which consist usually of felt covered discs rotatably mounted at a plurality of points on a rotating frame, the outermost discs have to overlap the edges of the strip in order that effective polishing may be obtained. If, however, the overlap exceeds a certain amount the surfaces of the discs become injured by the edges of the glass and are no longer in the condition in which they produce effective polishing.

If, therefore, the strip deviates from its central position by more than a certain amount, the discs overlap the edges insufficiently at one side and too much at the other, and are in consequence injured.

In our co-pending application for Letters Patent of even date herewith we have described a device whereby, when the strip deviates from its central position, force is applied to it to bring it back to its central position. This device has been found effective so long as the deviations of the strip are small, but, in practice, the deviations are such that, if sufficient force is applied to the strip to bring it central, it is liable to break.

According to the invention, the tools are carried on frames which are adapted to slide transversely of the strip, and means are provided for slidably moving the said frames, so that the two tools of a pair of tools are moved simultaneously and equally, transversely of the strip. Preferably, the frames are moved by a motor and a switch is operated directly or indirectly by a transverse movement of the strip, and a hunting gear is provided to operate the motor to move the said frames in the same direction as the movement of the strip and by approximately the same amount.

In the accompanying drawings:

Figure 1 is a plan view of one grinding tool of a grinding apparatus, with its accompanying framework;

Figure 2 is a vertical section thereof along the line A—A of Figure 1;

Figure 3 is a view from the left hand side of Figure 1; and

Figure 4 is a diagrammatic view of a step by step switch circuit.

The strip of glass 1 is driven through the apparatus by pairs of rollers not shown. It is ground between pairs of grinding tools 2, of which there are fifteen to twenty, and these are followed by a larger number of polishing tools, when the strip is polished in the same apparatus. The shafts 3 of the tools are rotated (by means not shown) in bearing blocks 4, which are adapted to slide in frames 5. Means, not shown, are provided for raising and lowering the tools in the frames 5. The frames 5 rest on rectangular frames 6, and the lower frames 5 on rectangular frames 7.

The supporting framework of the apparatus consists of vertical box columns 8 which support transverse box girders 9 and longitudinal box girders 10. The girders 10 which continue to the left of Figure 1 are omitted. The transverse girders 9 carry slides 11 on which the rectangular frames 6 rest and can slide, and slides 12 are fixed to the lower ends of the column 8 on which the rectangular frames 7 rest and can slide. The tools 2 can therefore be moved transversely of the strip of glass 1 by the sliding of the frames 6 and 7 on the slides 11 and 12.

The means for moving the tools transversely are as follows: Two nuts 13 are fixed to the frame 6, one near each end, and two nuts 14 to the frame 7. Screws 15 and 16 engage the nuts 13 and 14 respectively and carry bevel wheels 17 and 18 respectively. The two bevel wheels 17 are connected together by bevel wheels 19 on a shaft 20 in the longitudinal girder 10. The shaft 20 also carries bevel wheels 21 which engage bevel

wheels 22 on two vertical shafts 23 in the columns 8. The vertical shafts 23 carry at their lower ends bevel wheels 24 which drive the bevel wheels 18 on the screws 16 through bevel wheels and a shaft similar to the bevel wheels 21 and 19 and shaft 20. By the above-described gearing, the four screws 15 and 16 are turned simultaneously on turning the shaft 20, and thereby the frames 6 and 7, carrying the tools 2, are moved transversely together, and always remain coaxial.

The screws may be turned by a hand wheel geared to the shaft 20, but preferably they are turned by a motor connected to an automatic device. The motor 25 turns a worm wheel 26 on a shaft 27 which carries a bevel wheel 28 engaging the bevel wheel 19. When the edges of the strip are cut before the strip enters the grinding apparatus, the location of the strip is conveniently ascertained by one edge of it, and Figures 1 to 3 show a device whereby the motor 25 is turned in one direction or the other so as to maintain the axis of the tools 2 always at a fixed distance from one edge of the strip. Thereby, when the strip is cut to constant width, the axis of the tools may be maintained over the centre line of the strip whatever may be the position of the strip in a transverse direction.

A roller 29 (Figures 2 and 3) on the arm 30 of a lever pivoted at 31 to a bracket 32, is pressed against the edge of the strips 1 by a spring 33 attached to the other arm 34 of the lever. The arm 34 is connected by a link 35 to the arm 36 of a lever pivoted at 37. The other arm 38 of this lever is forked to engage the arm 39 of a relay reversing switch 40 so connected to the motor 25 that a movement of the arm 39 in one or the other direction causes the motor 25 to turn in one or the other direction.

In operation, if the strip 1 moves to the right (as seen in Figure 3) pressing the roller 29 to the right, the forked arm 38 moves to the right; this moves the arm 39 of the switch 40 to the right, closing the motor circuit to turn the motor so that the screws 15 and 16 turn right-handedly. Thereby, the frames 6 and 7 are moved to the right, and, since the frame 6 carries the switch 40, this also moves to the right until the arm 39 breaks the motor circuit. In this way, the tools 2 carried by the frames 6 and 7 are caused to follow the transverse movement of the strip. The arm 39 is conveniently given play in the fork of the arm 38, so that small unimportant movements of the strip can occur without causing movement of the tools. The above is one form of the device commonly termed a hunting gear, in which one member is caused to follow any movement of another member. Another form is shown diagrammatically in Figure 4, in which 41 and 42 are switch arms turned by movement of the strip and of the tool frame respectively. Each switch arm has a series of contacts, such as *a*, *b*, *c*, A, B, C, connected as shown, and the two arms are connected to the mains through the armature 43 of the motor 25. In the position shown, the circuit is open; if the strip moves to turn the arm 41 to contact B, the circuit is closed, and the motor turns to move the tool frame, and the arm 42 to contact *b*, when the circuit is broken.

Similarly, a further movement of arm 41 to contact C closes the circuit which is opened again when arm 42 is moved to contact *c*. The arm 42 follows the arm 41 also in the other direction, provided that the motor is reversed. This is effected as follows: a second arm 44 is mounted friction-tight on the spindle of the arm 41 and is adapted to make contact with one of the two contacts 45 which are connected as shown to the relay coils 46 of a reversing switch 47, adapted to reverse the current through the shunt 48 of the motor. From the position shown, a movement to the left of the switch arm 41 carries with it the arm 44, to make contact with the left hand contact 45, to reverse the motor shunt field. The arm 44 remains in this position during any subsequent movement of the arm 41 in the same direction, but reverses the motor field on a reverse movement of the arm 41.

In our above-mentioned co-pending application for Letters Patent, devices are described which are adapted to ascertain the location of the strip with reference to its centre line, when the edges of the strip are not cut, and cannot, therefore, be used to determine the location of the strip. Any such device, which moves correspondingly to the centre line of the strip, may be used to move the switch arm 41, or the appropriate part of any other hunting gear, instead of the roller 29 bearing against the edge of the strip.

Having described our invention, we declare that what we claim and desire to secure by Letters Patent is:

1. Apparatus for operating on a continuous strip of glass which is passed longitudinally through the apparatus, comprising a plurality of pairs of tools operating simultaneously on the upper and lower surfaces of the strip, with the two tools of each pair opposite one another, frames adapted to carry the tools and supports above the strip for the frames of the tools operating on the upper surface and supports below the strip for the frames of the tools operating on the lower surface, slideways on the supports transversely of the apparatus on which the frames are adapted to slide, means for holding the frames on the slideways in a predetermined operative transverse position relatively to the supports and to the strip, and means, operable when the strip moves transversely, for moving the frames to an operative position which is different relatively to the supports but substantially the same relatively to the strip.

2. Apparatus for operating on a continuous strip of glass which is passed longitudinally through the apparatus, comprising a plurality of pairs of tools operating simultaneously on the upper and lower surfaces of the strip, with the two tools of each pair opposite one another, frames adapted to carry the tools and supports above the strip for the frames of the tools operating on the upper surface and supports below the strip for the frames of the tools operating on the lower surface, slideways on the supports transversely of the apparatus on which the frames are adapted to slide, means for holding the frames on the slideways in a predetermined operative transverse position relatively to the supports and to the strip, and means, set into operation by a lateral movement of the strip, for moving the frames to an operative position which is different relatively to the supports but substantially the same relatively to the strip.

3. Apparatus for operating on a continuous strip of glass comprising a plurality of pairs of tools operating simultaneously on the upper and lower surfaces of the strip, with the two tools of each pair opposite one another, frames adapted to carry the tools and supports above the strip for the frames of the tools operating on the

upper surface and supports below the strip for the frames of the tools operating on the lower surface, slideways on the supports transversely of the strip on which the frames are adapted to slide, a motor connected by gearing with the two frames carrying the tools of a pair, a switch operated when the strip makes a transverse movement and a hunting gear comprising the said switch adapted to operate the motor to move the said frames in the same direction as the movement of the strip and by approximately the same amount.

4. In a glass grinding apparatus including a plurality of grinding tools arranged to operate simultaneously on both surfaces of a continuous strip of glass passing through the apparatus, the combination of means for shifting the grinding tools laterally, relatively to the strip to maintain the strip and grinding tools in centralized relation during the grinding period, and automatic means for controlling the operation of said shifting means to correct for any deviation from said centralized relation.

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