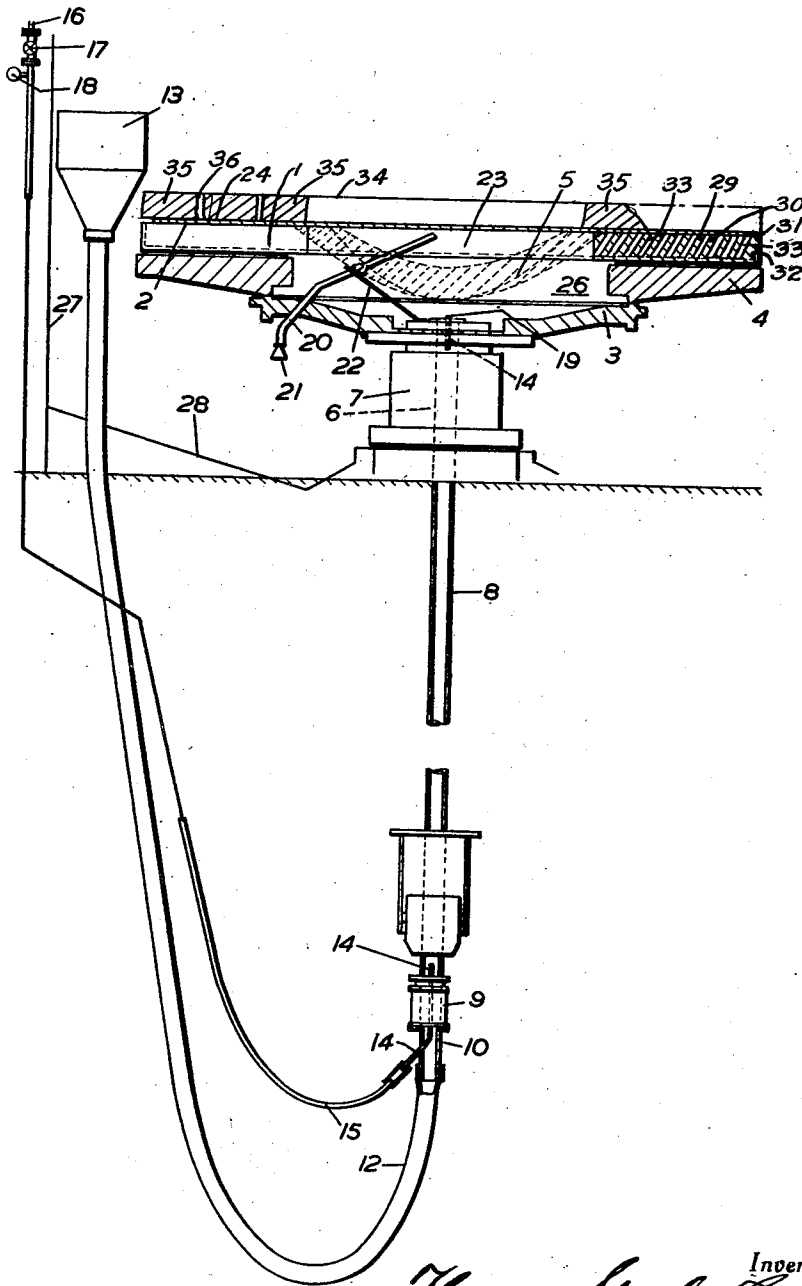


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APPARATUS FOR GRINDING FLAT GLASS
ON BOTH FACES SIMULTANEOUSLY
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APPARATUS FOR GRINDING FLAT GLASS ON
BOTH FACES SIMULTANEOUSLY

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3 Claims. (Cl. 51—263)

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This invention relates to methods of and apparatus for grinding a moving horizontal ribbon of flat glass on both faces simultaneously and especially to methods and apparatus for continuously grinding the underface of horizontally disposed flat glass in ribbon form simultaneously with the grinding of the upper face.

In the specification of Patent No. 2,577,889 is described a method of operation of grinder discs employed in the grinding of glass in horizontal ribbon form and the construction of the discs comprising annular grinding surfaces constituted by several concentric rings of rectangular nogs to which a liquid carrying abrasive particles is fed from the central aperture. The said specification is concerned with a method and means for preventing the suction effect, which may develop in certain circumstances in the central cavity of lower grinding discs, the method and means comprising provision for continuously venting the cavity to atmosphere.

The method and means described therein have been found satisfactory where grinding discs of up to 103 inches are concerned. Larger grinding discs, for example of 123 inches in diameter have been found to require central cavities increased in proportion to the diameter of the disc in order to avoid a tendency of the lower disc to wear convex and venting of the large central cavities is not always adequate to deal with the problem of the suction effect in the void formed above the central depression of the surface of the abrasive-carrying liquid which results from the action of centrifugal force.

According to the present invention in the case of such large cavities in grinding discs of grinding tools for glass, air under pressure is fed into the cavity to prevent the pressure from falling below atmospheric.

Accordingly the present invention comprises a method of grinding the under face of a moving horizontal ribbon of glass by means of an annular grinding disc having a central cavity to which liquid carrying abrasive particles is fed and which is vented to atmosphere characterised by feeding air, or other gas of low solubility in water, under pressure into the cavity to prevent the pressure therein from falling below that of the atmosphere. A small positive air pressure is preferably maintained in the cavity.

Apparatus for continuously grinding the under face of horizontally disposed flat glass in ribbon form comprises a grinding disc having an annular grinding surface, means to feed liquid carrying abrasive particles to the cavity bounded by a grinding surface, a vent to atmosphere from

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the cavity and means to feed air (or other gas of low solubility in water) under pressure to cavity to maintain therein atmospheric pressure or a small positive pressure.

The means for feeding air into the cavity may comprise a conduit extending upwardly through a central bore in the spindle of the grinding disc.

The vent to atmosphere is preferably provided with a choke to control discharge of air from the cavity, and the choking means may be such as to produce a small back pressure for example less than $\frac{1}{2}$ inch of water.

The air injection into the cavity in the lower disc may conveniently be made by way of a conduit passing through the bore of the vertical spindle of the grinding tool, through which more liquid carrying the abrasive is fed to the disc. The air conduit may extend up to the level of the flange support of the lower grinding disc or end at a position in the bore of the spindle, the air pressure being adjusted to from $\frac{1}{2}$ to 1 lb. per square inch greater than the hydrostatic head in the liquid carrying the abrasive at the point of injection.

In order that the present invention may be more clearly understood, a preferred embodiment thereof will now be described by way of example with reference to the accompanying diagrammatic drawing which shows in sectional elevation a lower grinding disc associated with means for maintaining a plenum near the underface of the ribbon of glass resting on the tool.

Referring to the drawing, a lower grinding disc is indicated at 1, substantially 123 inches in diameter and having an annular grinding surface indicated at 2 constructed in accordance with the invention described in the specification of United States Letters Patent No. 2,577,937 and hereafter more particularly referred to.

A lower grinding disc 1 substantially 123 inches in diameter, and having an annular grinding surface indicated at 2, hereafter more particularly referred to substantially 27 $\frac{1}{2}$ inches in radial width is mounted on the flange 3 of a tool by means of an annular casting 4, usually referred to as an "adapter plate," which with the tool and disc forms a central cavity 26 to which, liquid 5 carrying abrasive is fed upwardly through a central bore 6 in the driving shaft 7 of the tool actuated in well known manner. The bore 6 receives a downwardly extending conduit 8 which ends in a gland 9. To a short length of pipe 10 extending downwardly from the gland is attached a hose 12 connected to a funnel 13 supported in known manner above the level of the grinding surface 2 of the disc 1. To the funnel 13 liquid

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containing the usual abrasive is fed, the liquid level therein being maintained at substantially 18 inches above the grinding surface 2 on which rests the ribbon of glass 24.

A pipe 14 of from $\frac{1}{8}$ to $\frac{1}{4}$ inch bore is arranged axially in the conduit 8 extending through the spindle 7 and the gland 9 and passes in fluid tight manner through the wall of the short length of pipe 10 below the gland. The lower end of the pipe is attached to a hose 15 which is connected to a supply of compressed air 16 by way of a control valve 17. A pressure gauge 18 is preferably included in the air line to indicate the pressure of air supplied to the conduit. The upper end 19 of the pipe 14 just enters the central cavity 26.

Through the tool flange 3 passes a vent pipe 20 ending in the upper part of the central cavity near the underface of the glass ribbon 24 and opening to the atmosphere below the flange 3, the pipe being supported in the cavity by strut 22, the pipe extending downwardly as well as outwardly for the whole of its length and the arrangement being as described in the specification of Patent No. 2,577,889. The external end of the vent pipe may be bell mouthed as shown at 21 and be provided with a choke (not shown) so that a small back pressure of about $\frac{1}{2}$ inch of water may be maintained in the upper part of the central cavity 26. Liquid ejected from the edges of the grinding disc 1 is caught by wall 27 and runs down to trough 28 from which it is drained.

The pipe 14 may end at any desired position in the conduit 8, the air pressure in the pipe being then suitably increased by an amount corresponding to the hydrostatic head above the terminating point so that the desired air pressure of approximately $\frac{1}{2}$ inch of water may be maintained in the upper part 23 of the central cavity.

In operating the glass grinding tool, liquid carrying abrasive, for example sand, is fed to the central cavity of the grinding disc 2 by way of conduit 8 and a corresponding upper grinding disc (not shown) is similarly supplied as well-known in the art and both are caused to rotate. Air is admitted to the pipe 14 of the lower tool and the choke on vent pipe 20 is adjusted to maintain the pressure of $\frac{1}{2}$ inch of water in the upper part 23 of the central cavity 26. The ribbon of glass 24 is thus uniformly and resiliently supported over the central cavity by the air pressure.

Thus by means of the invention a ribbon of glass being ground with large grinding tools may be uniformly supported over the whole of the central cavity area on a fluid support and the size of the central cavity in the lower grinding tools may be increased to a diameter greater than that of the central depression of the surface of the abrasive carrying liquid under varying runner speed conditions, the size of the said cavity being in fact determinable solely by the requirements of optimum grinding efficiency and of flatness in the wearing of the discs. The reduction of the width of the grinding annulus that is rendered possible by the invention will ordinarily result in the nog plates retaining their flatness for longer periods of operation.

The annular grinding surface 2 of the lower disc 1 is constituted by curved bars 29, 30 of spiral form which are continuously curved outwardly and forwardly as fully described in the specification of United States Patent No. 2,577,937, and referred to in the specification of United

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States Patent No. 2,577,889, alternate bars 29 merging with a narrow rim 31 on the tool, the intermediate bars 30 being spaced therefrom by circumferential channels indicated at 32, the bars 29, 30 being separated by similarly formed channels 33 which extend from the central aperture 26 of the tool to the circumferential channels 32 and thus intersect the grinding surface 2.

The coaxial associated upper grinding disc is indicated at 34 and comprises rectangular grinding nogs 35 separated as islands by concentric channels 36 intersected by radial channels not shown as such construction is well known in the art and described, for example in the specifications of United States Patent Nos. 2,041,642 and 1,729,498.

I claim:

1. A method of protecting horizontally disposed flat glass as it is continuously advanced between coaxial pairs of grinding discs, the axes of the pairs being normal to the glass, and each disc having a central aperture surrounded by a grinding surface intersected by channels to which apertures abrasive liquid is admitted and distributed by the channels to the faces of the grinding discs, the axes of which are normal to the plane of the glass, and which discs operate on both faces of the glass simultaneously, consisting in continually admitting a gas of low solubility in water into the central cavity of each lower tool operating on the underface of the glass and connecting the cavity in the vicinity of the underface with atmospheric air, to regulate the pressure in the upper part of the cavity throughout variations in the level of the liquid in the cavity.

2. A method of protecting a moving horizontally disposed flat glass according to claim 1 wherein air under pressure is fed to the central cavity to maintain a small positive pressure of the order of half an inch of water whereby the glass over the cavity is resiliently supported.

3. A grinding disc for use in grinding the underface of a horizontally disposed moving ribbon of flat glass including an annular grinding surface disposed in a plane to which the axis is a normal, the grinding surface being intersected by channels, said grinding surface surrounding a central cavity in the disc with which said channels communicate, the disc being carried on a driving shaft having an axial bore opening into the central aperture, a conduit for abrasive liquid connected to said bore, a pipe entering the conduit, a source of gas of low solubility in water under pressure, regulating means connecting the said source with said pipe and a vent pipe leading from the upper part of the central cavity at a point distant from the axis of the disc, said vent pipe extending away from the glass and outwardly from the said axis at all points along its length.

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