

March 22, 1960

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2,929,176

METHOD AND APPARATUS FOR SURFACING GLASS SHEETS

Filed April 11, 1958

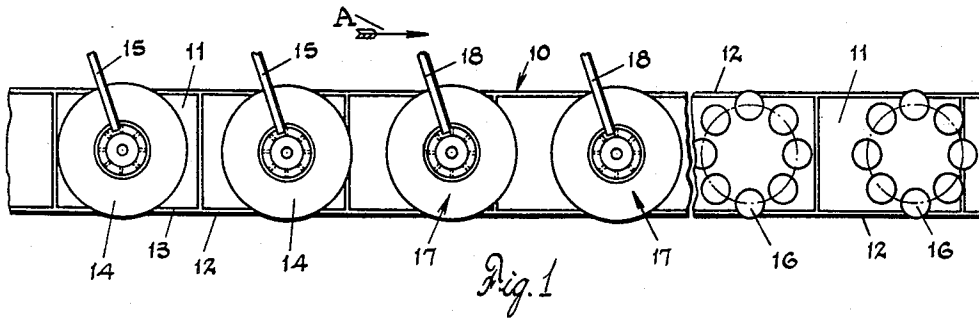
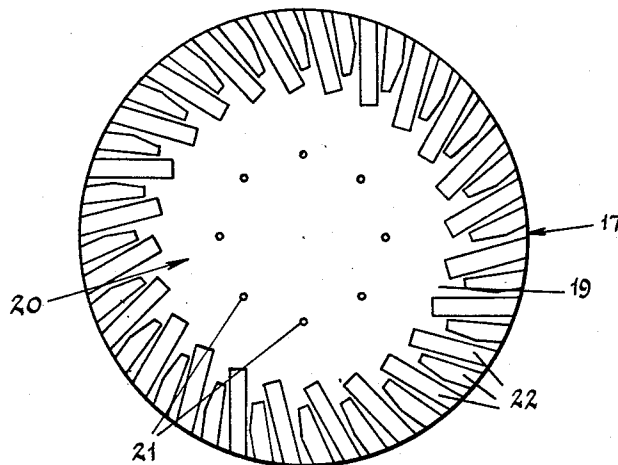
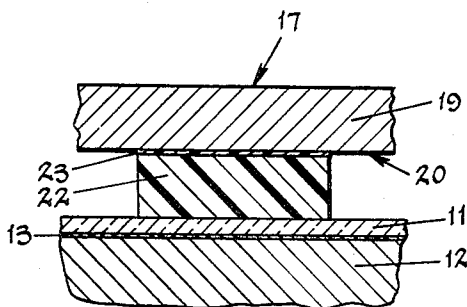
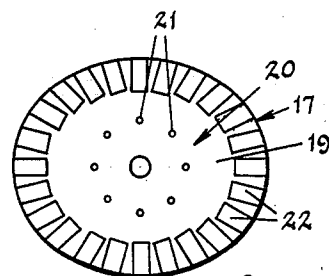


Fig. 3

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METHOD AND APPARATUS FOR SURFACING GLASS SHEETS

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Application April 11, 1958, Serial No. 728,017

5 Claims. (Cl. 51—195)

The present invention relates broadly to the surfacing of glass sheets or plates, and more particularly to an improved smoothing treatment between the customary grinding and polishing operations.

This application is a continuation-in-part of the co-pending application of James W. McAuley and Everett L. Karlene, Serial No. 473,136, filed December 6, 1954, now abandoned.

In preparation for the customary grinding and polishing, plate glass blanks are usually imbedded horizontally by means of a layer of plaster of Paris or the like upon a series of work tables which are arranged end to end and supported by trucks on rails which have been leveled with extreme care. The glass is then conveyed under a series of grinding and polishing machines to produce a smooth, flat, highly polished surface thereon. After one side of the sheets is thus finished the glass is inverted, reset on the tables, and again passed under the grinding and polishing machines to produce a finished sheet of plate glass.

According to one method of grinding and polishing now in general use, the glass sheets are first subjected to the action of a series of grinding heads, having cast iron runners, and a slurry of coarse sand and water fed between the glass sheet and the iron runners, and by rotating the runners while moving the glass sheets beneath them. After the sheet has been ground with coarse sand and water it passes under similar grinding heads having cast iron runners which are used with progressively finer grades of sand until at the end of the grinding operation very fine sand is used. At this point, the smoothness of the grinding is limited by the fineness of grinding sand available. Also, the grinding runners sometimes produce scratches in the glass which are deeper than the pits and cuts produced by the fine abrasive sand. Consequently, the glass surface is not ground as smooth as may be desired and if it is passed immediately to the polishing machines excessive polishing is required before a satisfactorily polished surface is obtained. Various methods have been proposed for smoothing the ground glass surface before polishing but none of these methods have proved entirely satisfactory, and in the present conventional process the glass is ordinarily passed directly from the iron grinding runners using the fine abrasive sand to the polishing operation which is accomplished by a series of felt polishing pads in cooperation with fine emery or rouge which has been wetted by water.

It is a primary object of this invention to provide an improved surfacing method and apparatus which produced a smoother ground surface that may be polished with less polishing action than heretofore required.

Another object of this invention is to provide an improved surfacing tool or runner that may be used with relatively fine grinding sand to produce a smoother ground glass surface and yet has a practical useful life.

A further object of this invention is to provide a method for producing plate glass wherein an improved smoothing tool is employed which allows for the reduc-

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tion in the amount of polishing required to produce the desired polished surface.

According to the invention, these and other objects are accomplished by employing plastic surfacing runners with an abrasive having a specific particle size which is determined by the hardness of the plastic material used. The softer the plastic material the coarser the abrasive material may be and yet produce the same degree of smoothness on the glass surface. The softer plastic is indented to a greater degree by the abrasive material than is the harder plastic so that the effective size of the particles of abrasive is only a fraction of the actual particle size. It is believed that the abrasive particles become partially imbedded in the plastic material, while leaving portions thereof exposed which perform the surfacing or smoothing action. The plastic material, however, must be sufficiently hard to avoid complete imbedding of the abrasive particles therein such as would render them ineffective in smoothing the glass surface. Also, it has been found that relatively soft plastic materials do not wear away as fast as the hard plastic materials. This is exactly opposite from what would be expected from experience with metal grinding runners where the harder metal runners are found to last longer than the softer runners in actual use. The soft plastic runners also have the advantage of allowing the use of coarser abrasives than are now required for fine grinding with metal runners. This is of advantage as the coarser abrasives are more readily obtainable and more easily classified.

Broadly speaking, therefore, this invention provides a method and apparatus employing grinding runners which are soft enough to be indented by the abrasive material being used so that abrasive materials become partially imbedded therein during the grinding or smoothing process. Other objects and advantages of the invention will become more apparent during the course of the following description when taken in connection with the accompanying drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a fragmentary diagrammatic plan view of portions of a grinding and polishing line embodying the smoothing apparatus of this invention;

Fig. 2 is a bottom view of one form of smoothing tool provided by the invention;

Fig. 3 is a fragmentary sectional view illustrating the smoothing tool of this invention while smoothing a sheet of glass; and

Fig. 4 is a view similar to Fig. 2, showing a modified type of smoothing tool.

Referring now to the drawings, there has been illustrated in Fig. 1 a well-known type of continuous grinding and polishing line indicated generally by the numeral 10. Glass blanks 11 may be bedded upon tables 12 in a layer of plaster of Paris or the like 13. The tables 12 are continuously moved in the direction of the arrow A to carry the blanks first beneath iron grinding runners 14, beneath which sand of progressively increasing fineness is fed through tubes 15, and then beneath polishing heads 16 which are supplied with rouge in any well known manner.

In carrying out the invention, there is interposed between the grinding runners 14 and the polishing heads 16, at least one smoothing tool 17, which are fed with classified abrasives through tubes 18.

Each smoothing tool 17 comprises a disc shaped grinding head 19, preferably of metal and having a smooth bottom face 20 and holes 21 through which abrasive slurry is fed. Attached directly to the bottom face 20 of the grinding head 19 are a plurality of plastic runner bars 22 which are preferably secured thereto by a coating 23 of a suitable adhesive such as epoxy resin. In prac-

tice, the grinding head 19 is rotated and the tables 13 moved continuously therebeneath so that the surface of the glass is kept in relative motion with respect to the smoothing tools 22.

As shown in Fig. 2, the runner bars are arranged substantially radially with respect to the axis of rotation of the disc shaped grinding head and extend from the outer edge of the head inwardly and terminate at a point outwardly of the openings 21. In Fig. 4 there is illustrated a modified type of smoothing tool which is of an elliptical shape, with the runner bars 22 being similarly shaped and arranged along the other edge of the runner head and extending radially inwardly from the edge to a point outwardly of the openings 21.

In general, the runner bars 22 may be of any material which allows the abrasive sand to imbed therein and which is tough enough to wear reasonably well. Excellent results are obtained by the use of runner bars constructed of any of a number of different plasticized thermoplastics. For example, plasticized polyvinyl and copolymeric vinyl resins, such as plasticized polyvinyl chloride resin and plasticized polyvinyl chloride acetate resin, are found to be particularly valuable in the practice of this invention.

Any of the usual plasticizers may be used and the amount should be within 50 to 70 parts by weight of plasticizer per 100 parts of resin. Especially good results are obtained when the plasticizer is dioctyl phthalate but other plasticizers such as dicapryl phthalate, dioctyl sebacate, dioctyl adipate and triethylene glycol dioctoate may be employed.

It may also be desired to use a small amount of stabilizer in the composition. Preferably, 2 to 3 parts of stabilizer are used per 100 parts of resin. Any of the conventional stabilizers which render the compositions more stable to light and heat are employed in the manufacture of plasticized vinyl resins. A multitude of such exist and all perform equally well in the present invention.

Examples of compositions that have been found to be particularly successful are set forth in Table I as follows:

Table I

Composition.....	A	B
Polyvinyl Chloride.....	100	100
Dioctyl Phthalate.....	70	50
Stabilizer.....	3	3

These compositions are soft enough to allow the abrasive particles to become partially imbedded therein but not so soft as to become completely imbedded. This partial imbedding results in the effective size of the abrasive particles being considerably smaller than the actual size of the particles. For example, at the end of the customary grinding operation the abrasive particles used with the cast iron runners are of the order of 6 to 8 microns whereas somewhat larger particles may be used with the plastic runners of this invention to produce an even finer ground surface on the glass sheets. The preferred ranges of the abrasive particle size that may be used with the plastic runners are set forth in following Table II along with the pressure of the grinding runners on the glass and the rate of rotation of the grinding runners. The compositions A and B in Table II are those similarly designated in Table I.

Table II

Composition.....	A	B
Size of Abrasive Sand in Microns.....	20-55	10-25
Pressure of Grinding Runners, p.s.i.....	2-2.5	2-2.5
R.p.m. Grinding, Runners.....	50-75	50-75

In addition to the thermoplastic materials discussed above certain resins such as the acrylic resins which of themselves are tough enough to wear reasonably well and are soft enough to allow abrasive particles to imbed therein have also been found to give satisfactory results. Methyl methacrylate, for example, is a material which has been found to provide a good smoothing action when used with abrasive sand in the range of 5 to 15 microns in diameter.

It has been found that when smoothing apparatus of the invention incorporating runners composed of the above mentioned plastics is used in conjunction with abrasive sand of appropriate diameter determined as disclosed hereinabove, that a finer smooth is produced on the surface of the glass before polishing than is to be obtained by the use of any of the prior customary methods. Of course, initiating the polishing procedure with a surface which has been brought to a finer surface condition permits the polishing to be accomplished with considerably less expenditure of work than was needed heretofore. Accordingly, this results in a saving in wear and tear on the polishing equipment and a reduction in the amount of power consumed in the polishing operation. Additionally, the smoothing action may be performed with a coarser sand than is needed when conventional metal grinding runners are used. The coarser sand is not only more readily available, but it is also less expensive than the finer sands, and therefore more desirable to use from an economic standpoint.

While certain examples of runner bar arrangements have been described for the sake of illustration, other shapes and arrangements of runner bars may be employed.

It is to be understood that the form of the invention disclosed herein is to be taken as the preferred embodiment thereof, and that various changes in the shape, size and arrangement of parts as well as various procedural changes may be resorted to without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. A method of finishing a glass sheet, comprising moving the sheet relative to a rotating smoothing runner composed of a plasticized thermoplastic material containing from 50 to 70 parts of plasticizer per 100 parts of thermoplastic material and having a flat working face disposed substantially parallel to the surface of a glass sheet, introducing abrasive particles of sand having a size of between 5 to 55 microns between the surface of the glass sheets and the working face of the smoothing runner, and applying pressure to the abrasive particles by means of said working face to cause the abrasive particles to become partially imbedded in and fixedly connected to the thermoplastic material of said working face during the smoothing operation.

2. A method of finishing a glass sheet as defined in claim 1, wherein the thermoplastic material is polyvinyl chloride.

3. A method of finishing a glass sheet as defined in claim 1, wherein a pressure of about 2 to 2.5 p.s.i. is applied by the working face of the smoothing runner to the sand.

4. A method of finishing a glass sheet as defined in claim 1, wherein the thermoplastic material is an acrylic resin.

5. A method of finishing a glass sheet as defined in claim 4, wherein said acrylic resin is methyl methacrylate.

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