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Shelestak

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[54] **APPARATUS FOR MARKING FLAT GLASS**

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[73] Assignee: **PPG Industries, Inc.,** Pittsburgh, Pa.

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[52] **U.S. Cl.** **118/7,** 118/77, 118/244, 346/141

[51] **Int. Cl.** **B05c 1/02**

[58] **Field of Search** ... 118/7, 76, 77, 244, 258, 259; 346/140, 141

[56] **References Cited**

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2,582,043	1/1952	Krahulec	346/140
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2,920,605	1/1960	Humphries	118/244
3,644,934	2/1972	Hawkins et al.	346/141

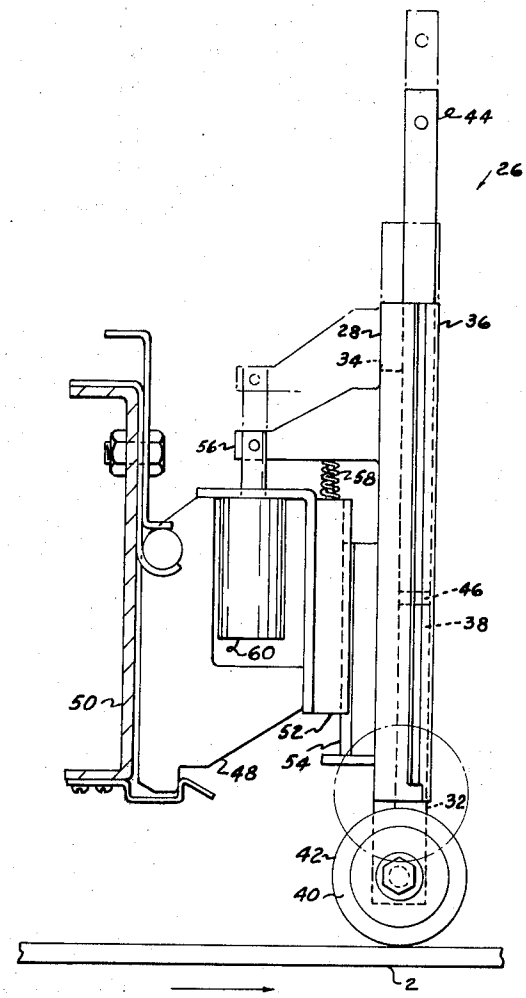
Primary Examiner—Louis K. Rimrodt

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[57] **ABSTRACT**

Disclosed herein are apparatus and methods for marking the location of defects in a moving ribbon or sheets of flat glass and, in particular, apparatus which comprises a marking material holder and transfer wheel assembly which is suitably supported above said ribbon or sheets of glass and arranged to be rapidly actuated into and out of contact with the glass to mark the location of defects therein.

8 Claims, 5 Drawing Figures



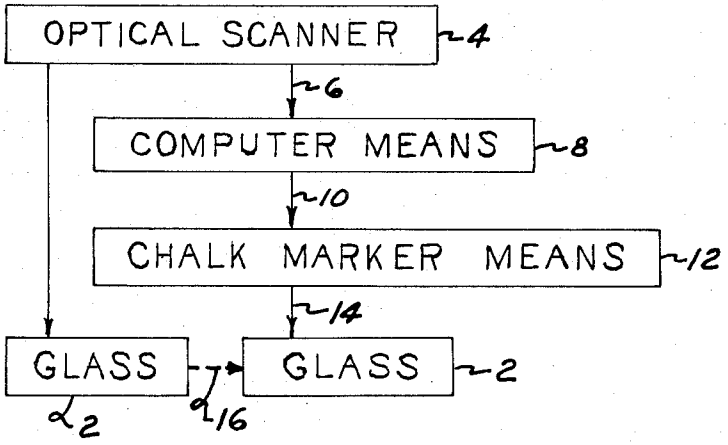


FIG. 1

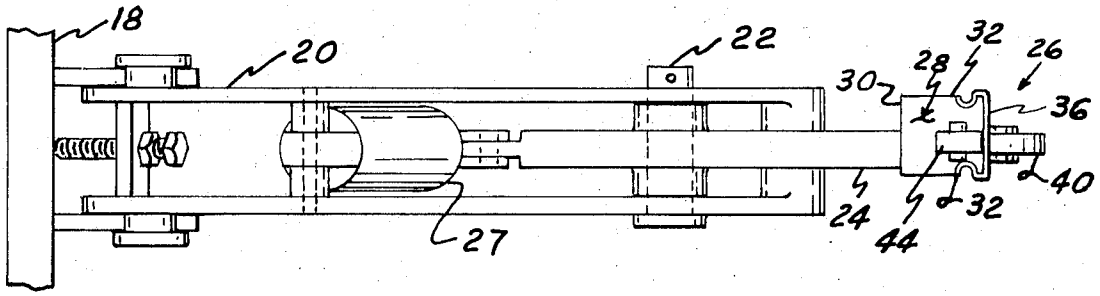


FIG. 3

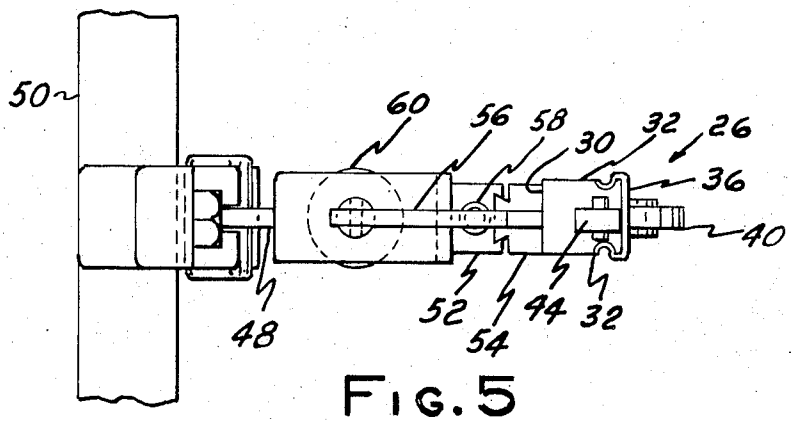


FIG. 5

FIG. 2

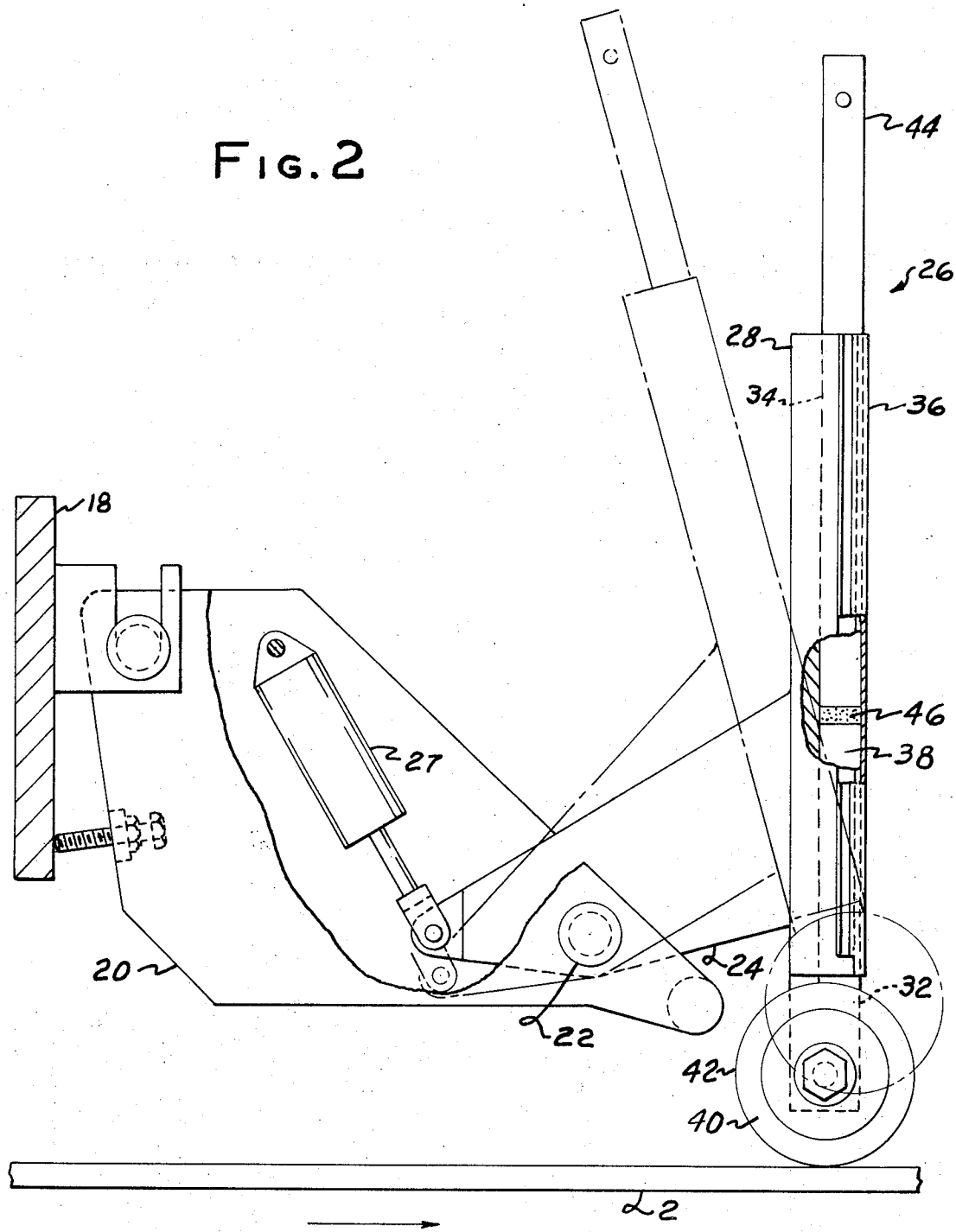
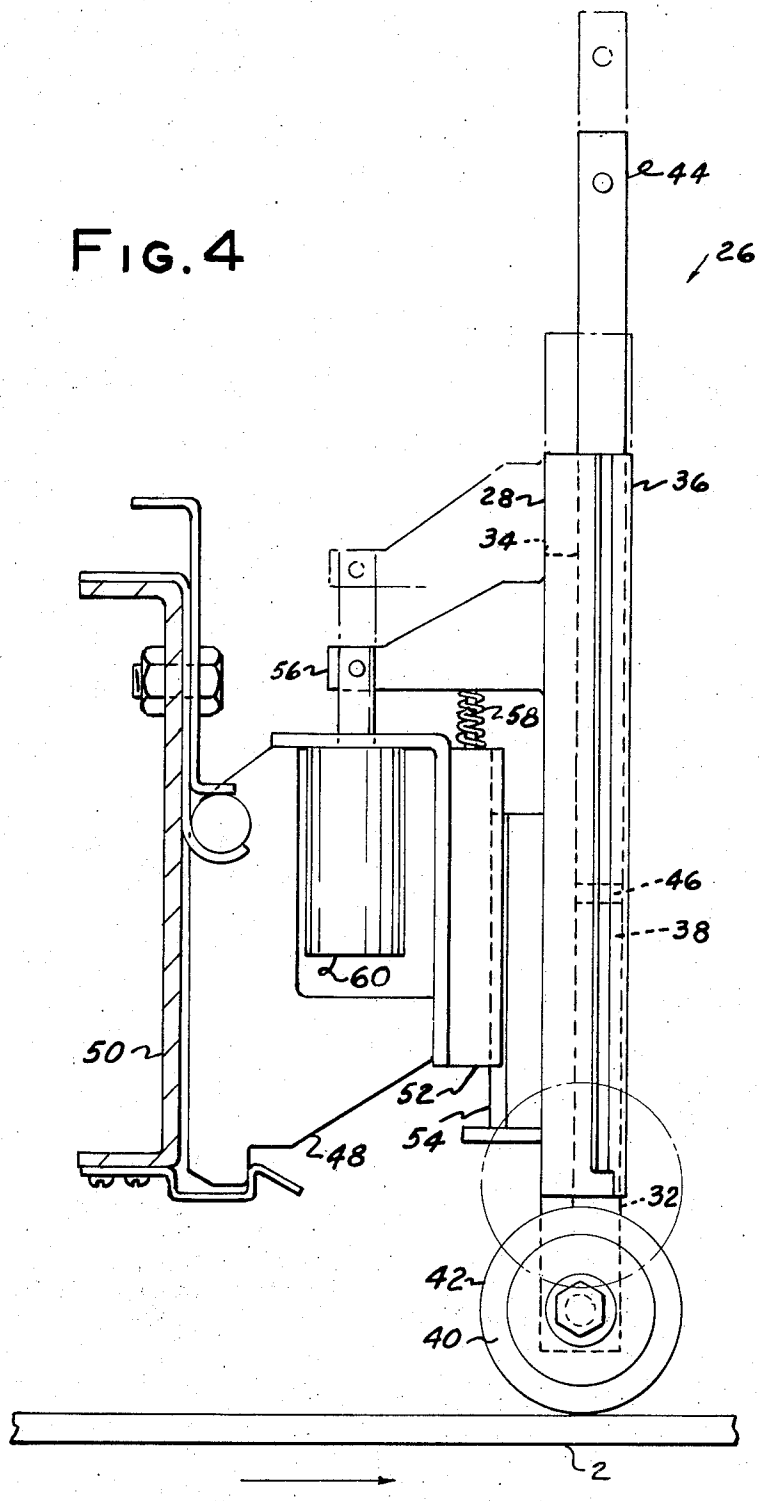


FIG. 4



APPARATUS FOR MARKING FLAT GLASS

BACKGROUND OF THE INVENTION

This invention relates to marking the location of defects in a moving ribbon or sheets of flat glass, and more particularly, to improved, virtually trouble-free apparatus and methods for making such glass while it is traveling in relatively rapid motion with respect to the marking means.

Marking means per se are amply disclosed in the prior art. However, disclosure of automatic, quick-response, defect-marking means for rapidly moving ribbons or sheets of flat glass are infrequently mentioned in the prior art literature because, until recently, the speeds of such ribbons or sheets of flat glass were such that manual inspection and marking was practical. Generally it may be said that marking means have been developed to suit particular materials being marked and the speed at which marking of such materials must be accomplished. Examples of marking devices developed to suit a particular material and/or marking speed, outside the area of rapidly moving ribbons or sheets of flat glass, include U.S. Pat. Nos. 846,919, 2,312,136, 2,701,417, 3,020,640, 3,256,607, 3,328,883 and 3,387,371.

Prior to the instant invention, for the marking of flat glass moving at relatively high speeds, it was proposed to use a marking means comprising a sleeve grasping a piece of chalk, with tooth-like serrations on the exterior of the sleeve. When air cylinder means operated to move the chalk to or from a marking position, a stationary leaf spring member engaged the serrations and caused the chalk to be rotated, insuring against its developing a flattened portion and failing to mark. Spring load means were employed to urge the chalk and its sleeve toward the glass to be marked. The foregoing marking device is fully disclosed in U.S. Pat. No. 3,644,934, assigned to the assignee of the present invention.

The present invention is designed to further insure against failure of marking means to mark glass and to greatly simplify the apparatus and marking procedure described above. It should be appreciated that marking apparatus of the nature herein contemplated is used to mark the locations of defects throughout the transverse and longitudinal extents of flat glass ribbons or sheets 100 to 150 inches wide, passing at a line speed of 500 to 1,200 inches per minute. For this purpose, it is generally desirable to provide a plurality of marking apparatuses or devices, with the devices being spaced at various locations across the transverse extent of the sheets or ribbon being inspected and marked. For example, with a ribbon of about 140 inches in width, it is generally desirable to provide about 140 of such markers, each spaced one inch apart. Accordingly, it is most important that these markers do not fail to mark the glass, that they leave a positive, well-defined mark, that they be virtually maintenance free, that they contain a minimum number of moving parts that may be damaged by handling or otherwise become contaminated from the glass plant environment where they are used, and that do not normally require replenishment of the marking material until it is entirely consumed.

In accordance with the present invention, there is provided a glass marking means which more satisfactorily accomplishes the above-mentioned objectives than

any known prior art marking device. In particular, the present invention encompasses a marking device for flat glass which comprises support means, a holder for a piece of marking material, a marking wheel mounted for rotation on said holder with its perimeter in contact with said marking material, means to bias said marking material toward the perimeter of said wheel, means attaching said holder to said support means so that said holder is movable in the plane perpendicular to a major surface of flat glass moving adjacent thereto, and means to move said holder so that said marking wheel moves into and out of contact with said major surface of said flat glass.

A complete understanding of the invention may be obtained from the foregoing and following description thereof, taken in conjunction with the appended drawings, in which:

FIG. **1** comprises a schematic diagram, indicating a float glass inspection system containing a chalk marker system in accordance with the present invention;

FIG. **2** is an elevation, partly broken away, showing one embodiment of a marking means according to this invention;

FIG. **3** is a top view of the marking means of FIG. **2**;

FIG. **4** is an elevation of a further embodiment of a marking means according to the instant invention; and

FIG. **5** is a top view of the marking means of FIG. **4**.

Referring to FIG. **1**, there is indicated schematically a system whereby flat glass **2** is inspected and marked. The inspection is done with an optical scanner means **4**, which may take the general form of an optical scanner or laser scanner, such as that described in U.S. Pat. No. 3,609,380, issued Sept. 28, 1971, and assigned to the assignee of the present invention. As each defect in the glass is sensed the optical scanner means **4** produces an output signal that may be fed, as indicated by the line **6**, to a computer means **8** or other suitable defect tracking and marker actuating means. The computer **8** takes into account the location of each defect, considering the line speed of the conveyor line through which the glass ribbon or sheet is being passed, the relevant locations of edge portions of the glass, and the scanning speed of the optical scanner means **4**. As indicated by the line **10**, the computer means **8** then delivers to the marker means **12** a suitable signal or signals actuating the means **12**, so that, as indicated by the line **14** and the dashed line **16**, as the glass **2** moves adjacent marker means **12** there are placed on the glass **2**, at appropriate locations, indications of the existence of defects in the glass **2** sensed by the optical scanner means **4**. The present invention concerns particular forms that may be taken by marker means **12**.

With reference to FIGS. **2** and **3**, illustrated therein is one preferred embodiment of the present invention. According to this embodiment, there is provided a support means **18** suitably mounted transverse to the direction of movement of the glass **2**, which direction of movement is shown by the arrow in FIG. **2**. Pivotally mounted on support means **18** is a bracket member **20**. Pivotally mounted, in turn, to bracket member **20** and about a pivot point **22** is a further bracket member **24** to which is attached a marking means **26**. Operatively connected to bracket members **20** and **24** is a double-acting, fluid-actuated, e.g., air-actuated, cylinder **27** so that, as will be understood, the bracket member **24** and attached marking means **26** is rotatable about pivot

point 22 such that marking means 26 can move into and out of contact with the upper disposed major surface of flat glass 2, in a plane perpendicular to said major surface.

With particular reference to marking means 26, there is shown an elongated body member 28 having a web 30 and a pair of laterally spaced flanges 32, defining therebetween an elongated, open slot 34. An elongated cover member 36 is affixed to flanges 32 to enclose slot 34 so as to provide a holder for marking material 38.

The holder for marking material 38 is further provided with suitable means, such as an extension of one flange 32, to which is rotatably mounted a marking wheel 40. Marking wheel 40 is mounted in alignment with and adjacent to the appropriate end of slot 34 such that upon pivotal rotation of bracket member 24 and marking means 26, in the arrangement shown, the marking wheel will move into and out of contact with the upper disposed major surface of flat glass 2, in a plane perpendicular to said major surface.

Additionally, the holder for marking material 38 is provided with a means for biasing the marking material toward the perimeter 42 of marking wheel 40. This means comprises an elongated rod 44 constructed and arranged to be inserted in slot 34 from the end opposite marking wheel 40 and having resilient material 46, such as foam rubber, affixed to the rod end nearest the marking wheel 40. The presence of resilient material 46 is to prevent any movement of rod 44, that may occur during rapid pivotal rotation or reciprocating movement of marking means 26 with respect to glass 2, from tamping marking material 38 so vigorously as to crush and jam the marking material in the slot 34 of the holder for marking material 38.

Advantageously, it has been found that a particularly suitable marking wheel 40 for marking glass has a perimeter in contact with the marking material 38 which is comprised of a felt material or a material, preferably a flexible material, such as rubber, which contains a grit. In actual practice it has been found that a marking wheel having a perimeter comprised of rubber containing a grit is less susceptible to wear than, for example, a marking wheel having a perimeter comprised of a felt material. Notwithstanding, both perimeter materials readily accept suitable marking material, such as crayon or a piece of chalk, and readily transfer such marking materials to glass. A particularly desirable grit for use in a flexible perimeter material, such as rubber, is a finely divided, abrasive, silicon carbide, although other finely divided abrasive materials such as aluminum oxide, silicon dioxide and other natural or artificial finely divided abrasive grit materials are considered satisfactory.

Turning now to FIGS. 4 and 5, illustrated therein is a second preferred embodiment of the present invention. The only substantial difference between the embodiment of FIGS. 2 and 3 and the embodiment of FIGS. 4 and 5 resides in the support and actuating mechanism for marking means 26 and, accordingly, the same reference numerals have been applied to the respective figures of drawing to indicate like parts throughout the same.

With respect to the support and actuating mechanism for the marking means 26 of the embodiment of FIGS. 4 and 5, there is shown a plate member 48 pivotally mounted to a support member 50 which extends transverse to the direction of movement of the glass 2, which direction of travel is shown by the arrow in FIG. 4. Attached to plate member 48 is shown a slideway member, 52, e.g., a member having an elongated dovetailed groove. Attached to the marking material holder of marking means 26 there is shown a slide member 54, e.g., a member having an elongated dovetailed portion, which is cooperatively interengaged with slideway member 52 so that said holder is vertically reciprocable in a plane perpendicular to the upper major surface of flat glass 2 moving adjacent thereto. It will be understood, of course, that the relative position of slideway member 52 and slide member 54 can be reversed without changing the desired reciprocability of marking means 26 with respect to flat glass 2. Also shown is an arm 56 attached to the marking material holder of marking means 26. Disposed between arm 56 and slideway member 52 is a spring 58 to bias the marking wheel 40 upward and out-of-contact with flat glass 2. Also disposed between arm 56 and plate number 48 if an electrically actuated solenoid 60 to move said marking wheel downward and into contact with flat glass 2.

I claim:

1. An apparatus for marking a surface of a piece of flat glass, comprising:
   - a holder for a piece of marking material;
   - a marking wheel;
   - means for rotatably supporting said marking wheel such that the perimeter of said marking wheel is in contact with the marking material;
   - means for biasing the marking material toward the perimeter of said wheel to urge the marking material against the perimeter of the wheel while preventing crushing of the marking material; and
   - means for moving said holder and marking wheel toward and away from the surface of the piece of flat glass to move said marking wheel into and out of contact, respectively, with the surface of the flat glass wherein said wheel rotates relative to the marking material to transfer the marking material on the perimeter of said wheel to the surface when said wheel is in contact with the surface.

2. The apparatus according to claim 1 wherein the perimeter of said marking wheel is comprised of a material that readily accepts the marking material and readily transfers the marking material to the surface of the glass.

3. The apparatus according to claim 2 wherein the perimeter of said marking wheel comprises a grit-containing flexible material.

4. The apparatus according to claim 3 wherein the grit comprises silicon carbide.

5. The apparatus according to claim 1 wherein said holder comprises an elongated body member having a web and a pair of laterally spaced flanges defining an elongated, open slot therebetween to receive the marking material, an elongated cover member affixed to said flanges to enclose the slot and said means for rotatably supporting said wheel mounted between said flanges to support said marking wheel in alignment with and adjacent one end of the slot.

6. The apparatus according to claim 5 wherein said means for biasing the marking material includes an elongated rod constructed and arranged to be inserted into the slot from the end opposite said marking wheel to urge the marking wheel toward said wheel and a resilient material affixed to the rod end nearest said marking wheel and slideably engaging sides of the slot

to prevent movement of said rod during movement of said holder and said wheel toward and away from the surface of the piece of glass to prevent crushing and jamming of the marking material in the slot.

7. The apparatus according to claim **5** wherein said moving means includes:

a support means;

a slide member connected to said support means; and

a slideway member attached to said holder wherein said slide member and said slideway member are cooperatively interengaged so that said holder is vertically reciprocable in a plane perpendicular to the surface of the piece of flat glass.

8. The apparatus according to claim **7** wherein said moving means further includes:

a spring operatively connected to said holder and said support means to bias said marking wheel out of contact with the surface of the flat glass; and

an electrically actuated solenoid operatively connected to said holder and said support means to move said marking wheel into contact with the surface of the flat glass.

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