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METHOD OF CLEANING GLASSWORKING TOOLS

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This invention relates to a novel method of cleaning the glass-contacting surface of a glass-working tool attached to a blowing, pressing, rolling or other glass-forming machine while such machine is in operation.

Plungers, molds, shaping rolls and the like, which are utilized in the automatic forming of glassware, periodically accumulate on their glass-contacting surfaces a condensation or residue of glass-fumes and other material emanating from the hot plastic glass and comprising principally the more volatile constituents of the glass, such as, compounds of alkali-metals, boron, arsenic, lead and the halogens. As such a deposit accumulates on the working tool, a corresponding haze pattern is impressed on the ware being produced. While this is not particularly objectionable on some types of ware, it is a major source of rejection where surface quality is of paramount importance as in the case of pressed face plates for television picture tubes and certain types of rolled sheet glass.

Also, in bulb-forming machines of the type described in Patent No. 1,790,397 to William J. Woods and David E. Gray, on which bulb blanks are blown at successive intervals from a continuous plastic glass strip, the accumulation of such deposits on the pocket roll which initiates the bulb formation necessitates frequent adjustment of the machine in order to avoid subsequent misalignment of the blanks and the blow molds.

This objectionable residue can usually be removed without much difficulty by removing or segregating the tool and either soaking it in a chemical bath or scouring or otherwise similarly abrading it. The loss of production, however, which occurs while the tool is being removed or segregated and replaced is a serious problem. Brushing devices for cleaning the tool surface without stopping the machine have not been satisfactory.

I have now discovered that such difficulties can be overcome and the objectionable residue can readily be removed from such a tool while at working temperature with little or no interruption of normal operation or interference with production by directing against such residue a blast of dry particles of a solid ammonia derivative which will completely dissociate into gaseous products on contact with the hot surface.

To be suitable for such use, such derivatives should on decomposition leave no inorganic or organic residue to contaminate the glass during its working. They should therefore be completely decomposable into gaseous products at or below the temperature of the glass-working tool to which they are applied. They should, however, not be so readily decomposable or hygroscopic as to preclude their being sprayed with an air jet.

Suitable solid ammonia derivatives include ammonium salts of inorganic acids, such as, for example, the bicarbonate, sulfate, nitrate, and chloride; ammonium salts of organic acids, such as, the acetate, oxalate, succinate and tartrate; and amino compounds, such as, urea, biuret, glycine and glycolamide. Compounds which produce acid fumes, such as ammonium chloride, should not be used in the vicinity of tools and structural members composed of iron or steel or other easily corroded metals without adequate protection thereof. Although their cleaning action may be adequate, compounds such as

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cyanamide, which may produce poisonous fumes, should be avoided.

Ammonium bicarbonate is particularly suitable because it is crystalline, non-hygroscopic, and stable at room temperature yet decomposable below 100° C., does not produce noxious or objectionable fumes, and is cheap and easily available.

Urea has similar properties except that it decomposes at a somewhat higher temperature and is equally suitable.

In carrying out the invention, the dry ammonia derivative in sufficiently finely divided form is sprayed with an air jet from a gun similar in operation to the well-known sand-blast gun. For rapid cleaning, an air pressure of about 100 pounds per square inch is desirable. If desired, the gun may be held and guided by hand. It is advantageous, however, to attach it to the glass-working machine, or to a structure adjacent thereto, so that it can periodically be moved into operating position for directing a blast of the ammonia derivative particles against the part to be cleaned without stopping the machine and when not in use can be moved aside out of the way.

While the abrasive action of the impinging particles of the ammonia derivative before they decompose doubtless is instrumental in removing the objectionable residue, the sudden explosive evolution of gas at the surface of the residue as the ammonia derivative decomposes on contact therewith also plays a part. Moreover in some instances it may be that a chemical reaction occurs between components of the residue and gases such as ammonia formed by the decomposition of the ammonia derivative which contributes to the removal of the residue. The method is effective with all such residues and with glass-working tools of any type on which such residues accumulate, providing a sufficiently high air pressure is used.

Among the various advantages and benefits resulting from the use of the above-described method is the substantial saving in time or increase in production which is obtained by cleaning a glass-working tool while in operation at working temperature. For example, during the normal operation of the automatic bulb-blowing machine described in the above-mentioned Patent No. 1,790,397, the pocket roll, which together with a plain roll feeds a ribbon of plastic glass to the machine, gradually accumulates a deposit of glass-fumes which not only necessitates frequent readjustment of the position of the machine with respect to the rolls, as is pointed out above, but ultimately requires the removal of the machine to give access to the rolls and to permit hand cleaning of the pocket roll. The frequency of such cleaning averages twice during a run of 60 hours, each cleaning requiring up to 30 minutes and causing the loss of 15,000 to 30,000 bulbs depending upon the size of bulb and the speed with which the machine is being operated. By directing a blast of ammonium bicarbonate particles with an air pressure of 100 pounds per square inch against the objectionable deposit for about 3 to 5 minutes about once in every 3 hours, the hand cleaning of the pocket roll is rendered unnecessary during a 60 hour run and the position of the machine rarely needs adjustment. The production of good bulbs is thereby increased by an average of 3 to 5%.

I claim:

1. The method of removing from the surface of a glass-working tool while at working temperature the condensation products and residue resulting from working contact with hot plastic glass, which comprises directing against such residue a blast of dry particles of a solid ammonia derivative which will completely dissociate into gaseous products on contact with the hot surface.

2. The method of claim 1 in which the ammonia derivative comprises ammonium bicarbonate.

3. The method of claim 1 in which the ammonia derivative comprises urea.

No references cited.