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ART OF UNITING GLASS AND CELLULOID

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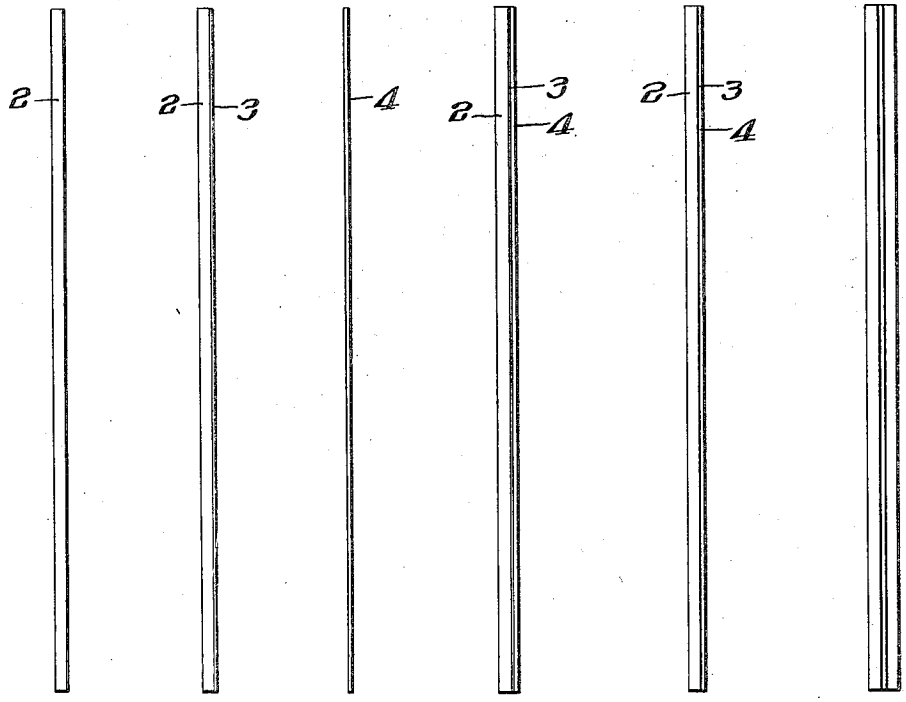
Fig.1. Fig.2. Fig.3. Fig.4. Fig.5. Fig.6.



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ART OF UNITING GLASS AND CELLULOID.

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To all whom it may concern:

Be it known that I, HARRY ROSENTHAL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Art of Uniting Glass and Celluloid, of which the following is a specification.

My invention relates to improvements in the art of uniting glass and celluloid or its equivalent for any desired purpose.

The invention is particularly adapted for use in the manufacture of safety or non-scatterable glass wherein much difficulty has been experienced in producing in an economical manner and without danger of breaking the glass a joint or union, between a sheet of celluloid and a sheet of glass, of sufficient strength and durability to prevent the separation of pieces or particles of glass from the celluloid should the glass be broken through accident or otherwise, and much difficulty has also been experienced in obtaining a product which is perfectly transparent or optically clear.

The object of the invention is to overcome the said difficulties; and with this and related objects in view, the invention consists in the art or process of forming a joint or union between the glass and the celluloid, as will be hereinafter described and claimed.

In the accompanying drawings, illustrating the manner in which the invention is carried into effect,

Figure 1 is an edge view of a sheet of glass.

Figure 2 is an edge view of a sheet of glass provided with a glue coating.

Figure 3 is an edge view of a sheet of celluloid.

Figure 4 is a view showing the sheet of celluloid applied to the glue coating.

Figure 5 is an edge view of a two ply product wherein a sheet of glass and the sheet of celluloid are united.

Figure 6 is an edge view of a three ply product wherein two sheets of glass and an interposed sheet of celluloid are united.

In performing my improved art or process, I take a sheet of chemically clean glass, as shown at 2 in edge view in Fig. 1, and coat it with a suitable glue, as shown at 3, in Fig. 2, in any suitable manner, and allow the glue coating 3 to dry.

After the glue coating 3 has dried, I soften the exposed surface thereof with a microscopical film of glue solvent, such as water, which is not a solvent of celluloid, and which I spread upon said surface so thin that it will not penetrate the glue coating to the glass, thereby preserving the weld or union between the glue coating and the glass. I then soften one surface of a sheet of celluloid, as shown at 4, in Fig. 3, by any suitable means and place the softened surface of the celluloid against the softened surface of the glue 3, press the glass 2 and celluloid 4 together by any suitable means, and permit the glue coating to dry.

To ensure a perfect union between the softened surface of the glue coating and the celluloid, I soften the surface of the celluloid by the employment with the glue solvent of a liquid which is not a solvent for either the glue of the celluloid, but which is potentially capable under the conditions of my improved art or process of bringing about an intimate commingling and interlocking of the molecules of the glue and the celluloid at the surface of contact, resulting in a perfectly welded union and producing the desired result. Such a liquid is methylic denatured alcohol, which is combined with the glue solvent by forming a solution which is 90% alcohol and 10% water or glue solvent.

It is the function of the alcohol to act as a vehicle for carrying the water which has a superficial softening action on the glue while the alcohol has a superficial softening action on the celluloid, thus rendering the two substances capable of being welded together at their points of contact by the aid of pressure preferably combined with heat.

I shall now describe in detail a satisfactory method which I have found to produce good results in carrying my invention into effect.

The sheet of glass 2 is thoroughly cleaned, dried and polished, by any ordinary means, and, subsequently, care is taken to prevent dirt from getting on to the surfaces, especially finger-marks or anything of a greasy nature. One surface of the sheet glass is then coated with a glue which is preferably a solution of gelatine and formic acid, 44 grams of gelatine to one quart of formic acid, specific gravity 1.06. This solution is carefully spread over the surface by being sprayed or poured thereon, preferably the latter. After spreading the solution over the whole surface of the sheet of glass it is

tilted at an angle of about 75 degrees and the excess solution drained off from one corner until the drops fall at the rate of about one per second. The excess which accumulates at the bottom edge, due to surface tension, is tipped off with absorbent paper, and the sheet of glass is brought back to a horizontal position. It is then put into a suitable drier, and dried in still air for about three hours at 210 degrees to 220 degrees F. or for about fifteen hours at 150 degrees to 160 degrees F. This renders the glue or gelatine "bone" dry, a condition necessary for making a perfect product. The sheet of glass is then removed from the drier and allowed to cool down to room temperature. This cooling may be hastened by placing the glass on a heavy iron plate which quickly conducts the heat therefrom.

The sheet of glass 2 with the dried glue coating 3 thereon is then dipped into a solution of 90% completely denatured alcohol, such as U. S. Government formula No. 1, and 10% water by volume. The said formula is: "To every 100 parts by volume of ethyl alcohol of not less than 180 degrees proof there shall be added 10 parts by volume of approved wood alcohol and one-half of one part by volume of approved benzine." The glass is allowed to remain in the solution for a period of about three seconds, whereupon it is removed and drained from one corner until the solution fails to run in a steady stream, but just begins to drop. The sheet of glass is then put upon a clean flat surface, gelatine side up. The sheet of celluloid 4 cut the same size and shape as the glass 2 is dipped in the same solution and drained in the same manner and placed upon the coated glass plate already dipped, care being taken to insure that its edges are in exact registry with the edges of the glass. The alcohol and water solution is maintained at a temperature of 55 degrees to 60 degrees C. by suitable means such as hot water surrounding the tank containing it. This is done to lessen the evaporation from the wet surfaces because a rapid evaporation of alcohol leaves behind an excess of water.

The assemblage of glass and celluloid is now laid upon a piece of linoleum about one-eighth of an inch thick and the same size as the assemblage, and a like piece of linoleum is put upon the top of the assemblage. On top of the upper piece of linoleum is put a series of papers, newspaper quality. The first paper next to the linoleum is much smaller than the assemblage in area and is put upon the central portion thereof. The succeeding papers of the series increase in area by about one-half inch increments until the entire assemblage is covered. Finally, there is put upon the series of papers a piece of fine cork or relatively softer linoleum the same size as the glass and celluloid, and the assemblage thus completed is placed in a suitable hydraulic press and a pressure of 50 pounds to 250 pounds per square inch is applied to the assemblage therein, the pressure being governed by the size, quality and thickness of the glass. The series of papers as above described are included in the assemblage placed in the press to insure that the first pressure will be applied to the central portion thereof and that the pressure will then be gradually extended to the edge portions thereof to force out the alcohol solution and air bubbles as the pressure increases.

During the application of the pressure, the pressure plates of the press are maintained at a temperature of about 140 degrees F. by water circulating within them, or other suitable means; and the pressure is maintained for a period of about twenty minutes, whereupon the pressure is released, the entire assemblage is removed from the press and the united glass and celluloid composite removed from between the linoleum pads. The pressure temperature may be varied from that set forth only within certain limits, because a much lower temperature fails to remove the alcohol sufficiently, and a much higher temperature causes the celluloid to lose its resiliency.

Denatured alcohol, as herein set forth, is not a solvent of gelatine or celluloid. The alcohol acts primarily as a carrier for the water which has a softening action upon the gelatine and it acts secondarily as a softening agent for celluloid. Under the temperature and pressure conditions of my improved art or process there is a natural selection by the gelatine of the water of the solution, and by the celluloid of the alcohol of the solution to the end that there is a superficial softening of the two substances which permits an intermingling and interlocking of the molecules resulting in the desired adhesion between the parts.

Poor adhesion is likely to result if the pressure is applied at room temperature, because the gelatine and celluloid are not softened sufficiently to admit of a thorough interlocking of their molecules.

Pressure is necessary to bring about the interlocking of the molecules not only, but also to remove from between the glass and celluloid the air bubbles and the excess alcohol.

The relative proportions of alcohol and water in the solution thereof may be varied within limits to suit the requirements of different grades of celluloid.

The process hereinfore described for uniting a single sheet of glass and a single sheet of celluloid is adaptable for uniting two sheets of glass to a sheet of celluloid interposed between them, resulting in a three ply

product, as shown in Fig. 6; and it is also adaptable for uniting any desired number of sheets of glass having a sheet of celluloid interposed between each two adjacent sheets of glass.

In order to prevent the action of moisture or other agents which might tend to attack the gelatine or celluloid, or both, and cause the glass to separate from the celluloid, I seal the edges of the product by the application thereto of a coating of a material which is normally less soluble than the glue or gelatine, such, for example, as paraffine; and I accomplish this by dipping each edge of the two or more ply composite product for about three seconds in paraffine maintained at a temperature of about 200 degrees F. At this temperature and during this period of time, enough heat is transmitted to expel from the edge traces of alcohol which might not have been eliminated by the heat and pressure in the hydraulic press. This treatment forms an edge seal which offers perfect resistance to water and any other liquid which this type of product would be subjected to in ordinary practice.

With the completion of the edge sealing, we have the finished product, reinforced glass ready to be cleaned and put in stock.

While I have described in detail herein the preferred method of carrying my invention into effect, I desire it to be understood that the same may be greatly modified without departing from the actual scope of my invention.

I claim:—

1. The art of uniting glass and celluloid which consists in coating a surface of a piece of glass with glue, permitting the glue coating to dry, softening the exposed surface of the coating with a glue solvent, softening a surface of a piece of celluloid by coating it with a liquid which is not a solvent for the glue or the celluloid but which will effect a softening of the latter, and pressing the softened surfaces of the glass and celluloid together by a pressure which is applied first at the central portion of the parts and thereafter extended to the edge portions thereof.

2. The art of uniting glass and celluloid which consists in coating a surface of a piece of glass with glue, permitting the glue coating to dry, softening the exposed surface of a coating with a glue solvent, softening a surface of a piece of celluloid with alcohol, and pressing the softened surfaces of the glass and celluloid together by a pressure which is applied first at the central portion of the parts and thereafter extended to the edge portions thereof.

3. The art of uniting glass and celluloid which consists in applying glue to opposing faces of a piece of glass and a piece of celluloid, pressing the said faces and interposed glue together, and sealing the edges of the assembled parts by dipping them in hot paraffine.

4. The art of uniting glass and celluloid which consists in coating a surface of a piece of glass with glue, permitting the glue coating to dry, softening the exposed surface of the coating with a glue solvent, softening a surface of a piece of celluloid by coating it with a liquid which is not a solvent for the glue or the celluloid but which will effect a softening of the latter, pressing the softened surfaces of the glass and celluloid together, and sealing the edges of the assembled parts by dipping them in hot paraffine.

5. The art of uniting glass and celluloid which consists in coating a surface of a piece of glass with glue, permitting the glue coating to dry, softening the exposed surface of the coating with a glue solvent, softening a surface of a piece of celluloid with alcohol, pressing the softened surfaces of the glass and celluloid together, and sealing the edges of the assembled parts by dipping them in hot paraffine.

In testimony whereof I affix my signature hereto.

HARRY ROSENTHAL.