UNITED STATES PATENT OFFICE.

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ADHESIVE COMPOUND AND PROCESS OF PRODUCING SAME.

SPECIFICATION forming part of Letters Patent No. 604,584, dated May 24, 1898.

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To all whom it may concern:

Be it known that I, CHARLES M. HIGGINS, a citizen of the United States, residing in Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Adhesive Compounds, of which the following is a specification.

My invention relates to that class of compounds consisting of dextrine combined with a boron compound and water, such as shown in my United States Patent No. 466,239, of December 29, 1891.

My present invention consists, mainly, in a special method or process of combining the boron compound with the dextrine solution, whereby certain results or advantages are secured, as hereinafter set forth. In my former patent the boron compound is combined with the dextrine solution, preferably at a high or hot temperature, and an excess of alkali is preferably afterward added. My present process provides a method whereby the boron compound may be combined with the dextrine at a low temperature or cold and good results thereby obtained and without an excess of alkali, enabling the product to be made neutral, or nearly so, with certain characteristic advantages for certain purposes. To this end I first dissolve the dextrine in a dilute solution of caustic alkali, preferably cold, and then add to the alkaline dextrine solution boracic acid sufficient to make an adhesive compound with the dextrine and at the same time neutralize the alkali, or nearly so. My invention therefore consists, mainly, in the feature above outlined, as hereinafter fully set forth and claimed.

My improved process is adapted to produce either a mucilage or paste, according to the proportions of the ingredients and the quality of the dextrine used.

I will first give my preferred practical working formula for a good liquid mucilage on my improved system.

In one gallon of water dissolve sufficient caustic soda or other alkali to make a dilute solution having a decided alkaline reaction—say a density of about $1\frac{1}{2}°$ to 2° Baumé. This will be obtained by adding about three and three-fourths fluid ounces of lye of 40° Baumé to one gallon of pure water. In this dilute alkaline solution dissolve seven to seven and one-half pounds of yellow dextrine. The dextrine will dissolve in this solvent with the aid of stirring or agitation and without the necessity of heat. When all dissolves, add six or seven ounces of boracic acid and mix thoroughly with the alkaline dextrine until the said acid is fully dissolved and combined. The boracic acid will immediately neutralize the alkali, so as to prevent any further darkening action on the dextrine, and it will form an adhesive compound with the dextrine with the effect to greatly increase its adhesiveness, forming a very smooth solution of light color and of limpid consistency, yet great density and without any strong alkalinity or causticity. After the boracic acid has been added and fully dissolved and combined, as described, the mucilage is complete and may be bottled for sale.

The advantage of this system is that the alkali enables the dextrine to be dissolved readily at a low temperature without the application of heat, and while the alkali would tend to make the dextrine solution very dark and limpid if allowed to act long thereon this is prevented by the immediate addition of the boracic acid, which overcomes the thinning and darkening effect of the alkali, and which thus neutralizes or more than neutralizes the alkali, forming a very adhesive and smooth solution which will not be corrosive or caustic to anything on which it may be used, and which will have a permanent light amber color, and which will also have a certain characteristic quality of consistency and adhesiveness specially suited for certain particular purposes.

Of course if it is desired to give the mucilage a decided alkaline reaction more of the caustic alkali may be used relatively to the boracic acid, or if it is desired to give the mucilage an acid reaction less of the alkali or more acid may be used, as will be readily understood; but I generally prefer to so proportion the ingredients that the finished composition will be nearly neutral or slightly beyond neutrality on the alkaline side, but preferably much less alkaline than borax. This is one of the great advantages of my described process or system, for by this de-

scribed means of avoiding an excess of free alkali or strong alkaline reaction the solution is prevented from darkening by age, which always occurs when a dextrine solution is made with free alkaline or even with a decided alkaline reaction, such as occurs even with a solution having the same degree of alkalinity as borax.

Instead of using a dilute caustic alkali—such as soda, ammonia, or potash—a dilute solution of an alkaline salt, preferably carbonate or bicarbonate of soda, may be used, the dextrine being dissolved and the boracic acid afterward added, as described, with substantially the same effect.

The proportions of the several ingredients given may vary considerably, according to the consistency desired, and I do not limit myself to any fixed proportions; but the amount of the borax compound will generally regulate the other ingredients, and it is desirable that this exist in rather a large percentage relatively to the dextrine—that is, from about three to six or seven per cent. of the weight of the dextrine, more or less—the alkali being preferably always about such as will produce nearly a neutral result, and the water varying according to the viscosity or consistency desired.

In order to increase the viscosity of the described mucilage, I prefer to add thereto about one to five per cent. (by volume) of alcohol, either methyl or ethyl, which will have the effect to partly coagulate or thicken the solution and also acts as a powerful preservative and makes the mucilage dry more rapidly when applied.

If desired, the dextrine may first be dissolved in hot or boiling water and then allowed to cool, and when cool the alkali may be added and dissolved and the boracic acid may then be added, as before. This will make a little clearer and lighter solution, as the alkali will need to be only a very short time in contact with the dextrine, and this modification will secure all the other advantages described, with little, if any, corresponding disadvantage. Of course the alkali may be added to the solution of dextrine when hot, if desired, or when the whole mixture is made cold, as at first described, heat may then be finally applied after the boracic acid is added; but while these variations will not depart from the essential features of my invention, yet one of the main advantages lies in the ahility to dispense with heat altogether, as already set forth, which will be duly appreciated.

The temperature at which I prefer to make the cold alkaline solution of the dextrine is between 60° Fahrenheit and blood-heat, as very little darkening action of the alkali on the dextrine will occur within this range, whereas a high temperature or prolonged heat would make a very dark and watery solution. If desired, however, the solution may be made at a much lower temperature by the application of cold or refrigeration to the solution, which will still further reduce the darkening effect, while the solvent effect of the alkali is still active at low temperatures.

My preferred formula for a dextrine paste according to my present system is as follows: To one gallon of cold water add three ounces of caustic soda of 40° Baumé. Then add from five to six pounds of white dextrine and stir thoroughly till all is dissolved. When dissolved, add five to six ounces boracic acid slightly moistened or made into a paste with water or other excipient. Then incorporate this acid thoroughly with the dextrine until fully dissolved and combined therewith. This will produce a white semifluid pasty mass, very smooth, spreading under the brush, and very adhesive, and having a nearly neutral or slightly alkaline reaction. A suitable flavoring or antiseptic substance may be then added, and the finished paste may now be run into jars or other receptacles and sealed in the same ready for sale.

Of course the variations before described in reference to the mucilage will apply to the paste formula also, as will be understood.

In some cases the dextrine may be first dissolved directly in pure cold water and the alkali then added after the dextrine is fully dissolved, to be followed by the addition of the boracic acid, as already described. This variation will be particularly desirable where white dextrine is employed, but may also be used with yellow dextrine.

In making the mucilage after the addition of the boracic acid and before the bottling the mucilage may be left to stand and settle for some time or it may be strained or filtered before bottling up, if preferred.

I generally prefer to add the boracic acid to the alkaline solution of dextrine as soon as the dextrine is fully dissolved in the alkali or as soon as the alkali is fully combined with the dextrine, or a few minutes thereafter, as this will generally make a lighter solution; but in some cases the alkali may be allowed to act upon the dextrine for some prolonged time before the boracic acid is added, as this will produce a smooth and more adhesive and tenacious quality in the finished product, although it may be a little darker in color, but not objectionably so.

Instead of adding the boracic acid in a dry, moistened, or pasty state to the dextrine solution it can of course be first dissolved in hot water or alcohol and then added to the dextrine solution.

What I claim is—

1. The described process of making an adhesive compound, viz., dissolving or combining dextrine with an alkaline solvent and then adding boracic acid until neutrality is nearly or actually reached or exceeded, substantially as herein set forth.

2. The described process of making an adhesive compound, viz., dissolving dextrine in a cold alkaline solution and then adding bo-

racic acid until neutrality is nearly or actually reached or exceeded, substantially as herein set forth.

3. A dextrine paste or mucilage formed by the combination with a dilute caustic alkali and with dextrine dissolved therein, of boracic acid added thereto till neutrality is nearly or actually reached or exceeded, substantially as set forth.

4. A dextrine paste or mucilage formed by the combination with solvent water and dextrine dissolved therein, of the ingredients of borax combined therewith in proportion of about five or more per cent. of the weight of the dextrine and having the acid and alkali in such proportions that some of the boracic acid remains in excess, giving an alkalinity to the compound less than borax, substantially as and for the purpose set forth.

5. A dextrine paste or mucilage formed by the combination with a dilute alkali and dextrine dissolved therein, with boracic acid added thereto in such proportions as to give an alkaline reaction less than borax, substantially as herein set forth.

CHAS. M. HIGGINS.

Witnesses:
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