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COMPRESSED FOAM GELATIN

Samuel E. Sheppard and James H. Hudson, Rochester, N. Y., assignors to Eastman Kodak Company, Rochester, N. Y., a corporation of New York

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This invention relates to gelatin and to a process of preparing it in a highly desirable and convenient form. One object of our invention is to provide a form of gelatin which is readily soluble, yet convenient for packing and shipping, which can be handled without disintegration, yet can be ground to a powder without the expenditure of an excessive amount of energy, and which is free from horny, relatively insoluble edges. Another object of our invention is to provide a process of making such a form of gelatin. Other objects will hereinafter appear.

We have discovered a process of making a form of gelatin which contains compressed air cells, and have found that such gelatin has all the desirable properties enumerated above.

According to our process, an aqueous solution of gelatin is first converted into foam by agitating it with air. The concentration of the gelatin solution may be anywhere from about 3% to 15%, or even higher, depending upon the jelly strength at the temperature employed. We prefer to use low concentrations, first, because gelatin is extracted from animal waste in the form of a 2% to 3% solution, and by foaming it at this dilution we avoid the necessity of concentrating the solution, and second, the final product obtained from a dilute gelatin solution is more readily soluble in water than the product obtained from a more concentrated solution. The agitation of the gelatin solution with air may be carried out by means of a colloid mill, such as a Hurrell homogenizer, or by means of an injector, such as a Hauk emulsifier, in which air passing through baffles sucks up the liquid and forces it through the baffles.

The foam structure of the gelatin foam is then set by running it either onto a chill roll, cooled in any suitable manner, or onto cold water. The chilled foam is run onto a belt or drum for drying, the drying being carried out by means of warm air, the temperature of which must not be high enough to melt the gelatin.

The melting points of the chilled gelatin foams are approximately as follows:

Concentration of original gelatin solution	Melting point of chilled foam
Percent	°F.
3	60–70
5	80–90
10	100–110

The dried gelatin crepe produced by our process has a moisture content of from about 7% to 12%, usually about 10%, and its melting point is above 200° F. Therefore, it is obvious that if the air for drying is introduced at the dry end of the sheet of gelatin foam, that is, flows countercurrent to the gelatin, it may be introduced at a temperature of around 200° F., whereas if the air is introduced at the wet end, and flows concurrently with the gelatin, its temperature must conform roughly to or possibly be a little higher than the temperature at which the chilled, wet gelatin foam melts.

The dried foam or crepe is then compressed. This may be done as a continuous process by passing the band of dried crepe through rolls, or discontinuously by stacking or baling sections or sheets of the crepe and compressing them in a hydraulic press. If rolls are used, they may be warmed, if desired, to temperatures not to exceed 200° F., but we prefer to operate at temperatures of from 70–100° F. The pressure of the rolls or of the hydraulic press is preferably from 500 lbs. to 1000 lbs. per square inch. The dried gelatin foam is thus compressed to approximately ⅕ of its original thickness. For example, an air dried foam produced in accordance with our invention from a 5% solution of gelatin weighed 0.0282 grams per cc. After compression it weighed 0.1410 grams per cc., the same as ordinary flake gelatin. However, it was found to be much more readily soluble in water than the flake gelatin. The size of the air cells in the dried, compressed foam ranges from 0.1 mm. to 3 mm. in diameter, the average being about 1 mm. in diameter.

By such compression, the air cells in the gelatin foam are compressed, and form minute cells containing air under pressure. The ease of solution of our product is due to the compressed air cells which it contains. These expand rapidly when the product is placed in warm water, causing a disintegration of the gelatin, so that it swells and absorbs water rapidly. In water at 70° C., the time required for our compressed foam gelatin to dissolve is approximately one-fourth of the time required to dissolve an equal amount of ordinary flake gelatin. Our product is free from horny edges which result from uneven drying in the preparation of flake gelatin, and which, being more difficultly soluble than the rest of the gelatin, prolong the time required for solution. Our compressed foam gelatin can, if desired, be readily ground to fine powder with little expenditure of work, whereas the grinding of flake gelatin requires a large expenditure of work. Our compressed foam gelatin is opaque and white in ap-

pearance, and can be readily impressed with legends or designs, such as trade marks.

What we claim as our invention and desire to be secured by Letters Patent of the United States is:

1. A permanently set sheet of compressed, substantially dry gelatin foam, having an apparent specific gravity of approximately 0.14.

2. A permanently set sheet of compressed, substantially dry gelatin foam which, at atmospheric pressure, contains air cells the air in a substantial number of which is under substantial pressure.

3. A process of producing gelatin containing a substantial number of compressed air cells, comprising agitating an aqueous gelatin solution with air to form a gelatin foam, casting the gelatin foam in sheet form, setting the structure of the gelatin foam sheet by chilling, substantially dehydrating the gelatin foam with a current of air at atmospheric pressure substantially warmer than the chilling temperature, and compressing the gelatin sheet to such an extent that it is permanently set in a compressed, flattened condition.

4. A process of producing gelatin containing a substantial number of compressed air cells, comprising agitating an aqueous gelatin solution of approximately 3% to 15% concentration with air to form a gelatin foam, casting the gelatin foam in sheet form, setting the structure of the gelatin foam sheet by chilling, substantially dehydrating the gelatin foam with a current of air at atmospheric pressure substantially warmer than the chilling temperature, and compressing the gelatin sheet to such an extent that it is permanently set in a compressed, flattened condition.

5. A process of producing gelatin containing a substantial number of compressed air cells, comprising agitating an aqueous gelatin solution of approximately 3% concentration with air to form a gelatin foam, casting the gelatin foam in sheet form, setting the structure of the gelatin foam sheet by chilling, substantially dehydrating the gelatin foam with a current of air at atmospheric pressure substantially warmer than the chilling temperature, and compressing the gelatin sheet to such an extent that it is permanently set in a compressed, flattened condition.

6. In a process according to claim 3, the step of setting the structure of the gelatin foam by floating it on cold water.

7. A process which comprises setting the structure of a gelatin foam by chilling, substantially dehydrating the set gelatin foam with a current of air warmer than the chilling temperature, and compressing the gelatin foam to such an extent that it is permanently set in a compressed, flattened condition and contains a substantial number of compressed air cells.

8. A process of producing a sheet of compressed, dry gelatin foam, which comprises agitating an aqueous gelatin solution with air to form a gelatin foam, setting the structure of the foam by chilling, drying the gelatin foam at atmospheric pressure, and compressing it to an apparent specific gravity of approximately 0.14.

SAMUEL E. SHEPPARD.
JAMES H. HUDSON.