MIXTURE FOR THE PRODUCTION OF PASTES OF SYNTHETIC MATERIAL

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8 Claims. (C.I. 260—34.2)

1. For working up powders of synthetic material in accordance with the thermoplastic principle it is advantageous first to prepare a paste, i.e. a flowing suspension, which can be brought like a lacquer or latex into the desired form, for example by pouring, painting, dipping, injecting, etc., by mixing the powder with a liquid plasticiser, i.e. a liquid with a plasticising action on the powder in the heat but has no perceptible effect on the latter in the cold. The plasticising or softening then subsequently takes place by simple heating with or without pressure, whereby gelatinisation of the mixture takes place. Attempts are moreover to apply this method of working to many plastic masses, in particular this method of working is used in working up polyvinyl compounds, such for example as polyvinyl chloride, for the production of coatings on materials and the like. As a rule it is advantageous to bring about the fluent, i.e. liquid to paintable or pourable, condition of the paste with as small a quantity of liquid as possible. It has not hitherto been determined what particular properties of the powder of synthetic material are responsible for the paste-forming capacity. In production, for example, suitable pastes are found simply by practical experiment with softeners. It has now been found that fluent pastes with as small as possible quantities of liquid as plasticisers can be obtained by using for the production of the paste synthetic material powder containing larger quantities of larger particles of synthetic material and smaller quantities of smaller particles of synthetic material, whilst substantially excluding the intermediate particles of intermediate size. Whereas in the mixtures of powders hitherto generally used particles were contained in all intermediate sizes, even if in different quantities, for the present invention it is characteristic that the synthetic material mixture contains a gap in the distribution of particle sizes. I.e. particles of intermediate grain size are substantially absent between the larger and the smaller particle sizes. This specific novel particle distribution which has a fluent paste even with relatively small quantities of liquid, whereas the usual mixture of grains, containing grains of intermediate size, gives a non-fluent stiff paste with the same liquid content which cannot readily be worked up.

The synthetic material powders according to the invention may consist of particles of sizes less than 1 to 0.05 mm. up to 0.5 mm. and more. For example 1 part by weight of polymethylmethacrylate pearls with a particle size of 0.250 mm. to 0.300 mm. can give a readily flowing pourable suspension by simple stirring with 0.4 to 0.5 part by weight of monomeric methacrylate, if at least 15% by weight of the grains of 0.250 to 0.300 mm. diameter are replaced by pearls of only 0.010 to 0.050 mm. diameter. The inventive idea can particularly readily be demonstrated in this range of size. The idea is also applicable, however, to particles with a diameter of a smallness of the order of the length of light waves, for example 0.0005 mm. Thus for example a polyvinyl chloride powder with particles of 9 to 15 microns does not give a suspension with equal parts of dibutylphthalate, but only mixtures of muddy consistency; if, however, 20 to 90% of the polyvinyl chloride particles of 9 to 15 microns are replaced by particles of 0.4 to 1.5 microns, then a liquid suspension is obtained similar to a painting lacquer. It had hitherto been assumed that good paste-forming powders depended more or less on the degree of polymerisation and on the manner in which the polymer was isolated. This is not, however, of primary importance; according to the present invention paste-forming power is primarily a function of the fineness of the grain composition of the synthetic material powder.

The paste is produced by mixing or triturating the powder with the liquid plasticiser at low temperatures for example at room temperature, until a uniform suspension is produced, and the fractions of the powder of different granular sizes can be added to the liquid one after the other or as a mixture.

Preferably the granular distribution follows the following rules:

1. The powder is produced from two granular sizes, the ratio of the mean particle size of which is 1:6 or more.
2. Granular sizes between these proportions should be kept as small as possible, i.e. there should be as few particles as possible having a granular size of between 1.1 times and 5.9 times the size of the smaller grains.
3. The proportion by weight of larger grains should amount to 0.8 times to 5 times the weight of the smaller grains.

Examples

1. Grains of the following sizes:
   (a) 0.0005—0.0015 mm. diameter
   (b) 0.002—0.002 mm. diameter
   (c) 0.010—0.020 mm. diameter
   (d) 0.050—0.080 mm. diameter

are produced from polyvinyl chloride powder,
for example by sieving, elutriating, sifting or by carrying out the polymerisation under particular conditions. Each one of the above-mentioned granular sizes requires at least 1.2 parts of liquid for 1.0 part of powder to produce a liquid suspension as do mixtures of (a) with (b) or (c) with (d).

If, on the other hand, 1 part of the grains (a) is mixed with 1.4 parts of the grains (c), the intermediate grains (b) being left out, then with 0.5 to 1.0 parts of dibutylphthalate per 1 part of the mixture, easily flowing suspensions are obtained. The same result is obtained by mixing the grains (b) and (d). The paste may be plasticised in known manner by heating to 140 to 180° C.

2. Grains of the following size are obtained by sieving polymethylmethacrylate pearls:

(a) 0.010–0.020 mm. diameter
(b) 0.020–0.040 mm. diameter
(c) 0.120–0.150 mm. diameter
(d) 0.240–0.280 mm. diameter

None of the above grains gives a liquid suspension with 0.5 part of monomeric methylmethacrylate per 1 part of pearls. On the other hand if 15 to 50 parts of the grains (a) or (b) are mixed with 85 to 50 parts of the grains (c) or (d) respectively, then when 1 part of this mixture is triturated with 0.5 part of monomeric methylmethacrylate a paste or liquid suspension is obtained which can be poured, and which solidifies on heating to a glassy body.

I claim:
1. A powder for the production of pastes of thermoplastic polymeric material for thermoplastic working up, the powder consisting essentially of a mixture of coarse grained and fine grained powder of the polymeric material, the coarse grains having a diameter at least six times the diameter of the fine grains, and the ratio of the weight of the coarse grains to the weight of the fine grains being between 8:10 and 85:15, said powder mixture being substantially devoid of grains sized between the coarse and fine grain sizes.
2. A paste for the thermoplastic working up consisting of a powdery mixture of coarse and fine grained thermoplastic polymeric material, the coarse grains having a diameter at least six times the diameter of the fine grains, and the ratio of the weight of the coarse grains to the weight of the fine grains being between 8:10 and 85:15, said powder mixture being substantially devoid of grains sized between the coarse and fine grain sizes, and a sufficient quantity of liquid plasticizer to convert said powder mixture into a fluent paste.
3. A paste according to claim 2, wherein the weight of the plasticizer amounts to between 50 to 100 percent of the weight of said powder mixture.
4. A paste according to claim 2, wherein said thermoplastic polymeric material is a polyvinyl resin.
5. A paste according to claim 2, wherein said thermoplastic polymeric material is polyvinyl chloride.
6. A paste according to claim 2, wherein said thermoplastic material is an acrylic resin.
7. A paste according to claim 2, wherein said thermoplastic material is a polymethacrylate and said plasticizer is a monomeric methacrylate.
8. A paste according to claim 2, in which the diameter of the coarse grains is less than 0.1 mm.

No references cited.