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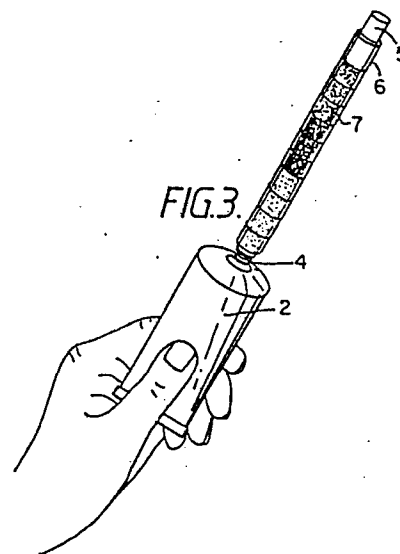
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54 **Formulating pasty materials.**

57 Two or more pasty materials may be accurately formulated together by sequentially extruding the desired amounts of those materials into a tube (5) with graduations (7) associated with it to measure the amounts extruded. After the components have been put serially into the tube (5), they are removed from the tube, e.g. by squeezing the tube and moving the squeeze towards one end, and mixed to homogeneity. Preferably the mixing takes place in a container on to which a lid may be put and from which the mixture may then be extruded, e.g. by having a movable base on the container which then acts as a piston to extrude the mixed formulated paste through a nozzle in the lid.



- 1 -

Formulating pasty materials

This invention relates to formulating pasty materials and to apparatus for use in doing so. It is of particular value in colour mixing, but it can be used for analogous systems where it is desired to mix two or more
5 pasty materials together in controlled proportions to make an appropriate formulation.

Many paints are customarily available in pasty form. Mixing paint of a particular colour is generally done by eye. This is a satisfactory process for small scale work
10 such as, e.g. making an oil painting but it is unsatisfactory for many graphic arts and commercial purposes, particularly if a match to a particular colour is desired. Even though in the hands of a skilled person, a close match may be obtained, an exact match is very
15 difficult to achieve, particularly having regard to the fact that the colour of the wet paint is different from the colour of the paint when it is dry, particularly with water-based systems.

Even if the user is assisted by some sort of mixing
20 or formulation guide, he or she has no easy and accurate method of measuring the relative volumes of material necessary and subsequently mixing them evenly to give the desired final colour. U.K. Specification 2106794 proposes a system for measuring accurately small quantities of
25 viscous coloured liquids for use in paint formulation, but

such a system is impractical for doing colour formulation. It is effectively useful only for tinting white or neutral bases to alter the colour slightly.

5 The problems referred to above are compounded in the case of colour matching or colour proofing systems in which it is desired not only to produce a given colour, but also to produce a specific mixed volume of that colour, e.g. sufficient to cover a proofing sheet completely but without leaving any material excess and
10 without incomplete coverage at any point.

We have now found that the disadvantages noted above may be avoided and accurate formulation of pasty materials obtained using a sequential extrusion technique as explained below.

15 In accordance with the first feature of the present invention there is provided a method of formulating pasty materials together which comprises extruding successively given amounts of pasty material from a storage container into a tube, there being associated with the tube a set of
20 graduations which are used to estimate the given amounts, ejecting the total quantity of pasty material from the tube, and mixing the same to homogeneity. Preferably mixing takes place in a container from which the homogeneous mixture can subsequently be extruded.

25 The present invention also provides apparatus for carrying out the method including a set of containers each adapted to contain a pasty material and each having a first extrusion nozzle, a tube adapted to fit on each first extrusion nozzle, means for estimating the amount of
30 material so extruded, means for ejecting material extended into the tube from the tube, a container for the receipt of such ejected material, and means for stirring or mixing to homogeneity material in the container. Preferably the container has a lid or cap capable of being fitted on the
35 container and provided with a second extrusion nozzle from which the mixture in the container may be extruded. This

may be achieved by making the container cylindrical with a movable bottom which may be moved towards the container lid like a piston to extrude material from the container through the second nozzle.

The tube and graduations may be integral, or separate. For example, the tube may be a rigid plastics or glass tube with graduations marked on it. This is, however, not preferred. It is much preferable to use as the tube a thin walled, even bore plastics tube from which material may be ejected by pinching the tube flat at one point and then moving the pinch toward the material in the tube whereon it is moved along the tube and out of its end, and to provide the graduations on a tube holder, e.g. of rigid plastics or glass. This enables accurate graduations to be used. The holder may be, e.g. an outer tube into which the plastics tube may be slid. Graduations may also printed or embossed on a thin walled plastics tube, but this is less preferred.

The tube for receipt of the pasty material may be so shaped and dimensioned that it is simply a press fit over the nozzles of the various containers of different materials. Alternatively a suitable adaptor may be used to effect a relatively fluid-tight seal between one end of the tube and the nozzle. Tubes of different sizes may be provided for formulating relatively small or relatively large quantities of pasty material together. Generally the bore of the tube used will be from 0.5 to 2.0 times the size of the outlet nozzle from the tube of pasty material, and the total internal volume of the tube will be a fixed volume in the range from 2 to 10 ml.

In use of such apparatus, the tube is placed over the first nozzle and material extruded into it up to a desired graduation. The tube is then removed, placed over the next nozzle and further extrusion of material into the end of the tube over the nozzle then takes place until the free surface of the pasty material in the tube has reached

the next appropriate graduation. This process is repeated until all of the ingredients of the formulation have been inserted into the tube, whereafter the tube is emptied.

5 The tube is conveniently of round cross-section, though other cross-sections could be used. Different cross-sections of tubes may be used for formulating different total quantities of materials. The graduations may vary to suit the system in question, a convenient system being graduations from 0 to 100 divided into 10
10 units each of 10 graduations. The length of the tube may be any convenient length, for example 10 cm to 25 cm.

The major advantage of the system is that it enables the consistent and accurate formulation of uniform quantities, e.g. 5 ml each time, of mixed pasty material.
15 By separating the graduations from the tube itself, e.g. printing them on a tube holder or outer tube, consistency and accuracy can be achieved economically. In addition, the tube can be a disposable item which, once the successive amounts of material extruded into it have been
20 ejected, can simply be discarded. The ejector may be e.g. a simple plastics moulding which may then be used as a stirrer to mix the ejected material to homogeneity and then itself be thrown away. Even the mixing container may be disposable if desired.

25 Once the homogeneous mix has been made, it may be used in any desired fashion, e.g. applied with a brush, palette knife, sponge or other applicator to the desired article or surface. In the case of colour proofing systems, the material may be laid down as a bead of pasty
30 material along one edge of a suitable substrate and then coated across that substrate using a drawdown bar. Even coating may be assisted by laying down an even bead, e.g. by extrusion via a container lid using a movable container base as a piston, as noted above.

35 The method and apparatus of the present invention may be used in a wide variety of mixing and formulating

applications for graphic arts and analogous purposes. In addition to use in colour matching or colour proofing systems noted above, the invention is of value in mixing non-photosensitised materials, for example gouache paints, e.g. acrylic based gouache, and for mixing printing inks, either silk screen or lithographic, e.g. offset inks, or other pasty ink types.

The invention is illustrated with reference to the formulation of colour ink materials for use in a colour proofing system and with reference to the accompanying drawings in which:

Figure 1 shows a first extrusion step.

Figure 2 shows a second extrusion step.

Figure 3 shows a final extrusion step.

Figure 4 shows the ejection of material from the tube into a container.

Figure 5 illustrates the mixing of the material in the container to homogeneity, and

Figure 6 is a cross-section through the mixed material in the container showing the container lid in position.

In a practical colour proofing system a number of colour-based materials may be used, but for simplicity of illustration the case is considered of the production of a somewhat de-saturated orange coating, for example, to produce the colour PANTONE 164 (PANTONE is a Registered Trade Mark).

In order to do this, the user must first look up the desired formula in a formulation book. We take as a simplified example that the formulation calls for three parts of red base material, three parts of yellow base material and four parts of white base material.

The base materials are provided in squeeze tubes 1 of substantially conventional type consisting of a lead/aluminium alloy foil tube 2 having integrally formed at its top an externally screw-threaded extrusion nozzle

4, on to which an internally threaded closure cap 3 is normally applied. Such tubes are convenient, but not essential. The pasty material may be stored in any other convenient container with an extrusion nozzle, e.g. a plastics squeeze bottle or a plastics bottle or jar, fitted with a pump in its lid for extruding pasty material when operated. This last is useful if there is a tendency for the paste, on standing to become inhomogeneous, as the pump can be used as a stirrer before dispensing starts.

A flexible thin-walled tube 5 is a press fit over the external threaded surface of the nozzle 4. Tube 5 is a transparent tube of polyvinyl chloride having an internal diameter of 6 mm and a wall thickness of 0.5 mm. It is surrounded on its exterior by a methacrylate plastics transparent tube 6 having a scale of graduations 7 on it. Tube 5 is a snug fit inside tube 6 so that once inserted there is little tendency to axial movement between the two. With inner tube 5 press fitted over the nozzle 4, the tube 2 is squeezed to extrude colour material into the tube 5 up to the 30 units graduation marking. The assembly of inner and outer tubes 5, 6 is then pulled off and placed on the next tube 2, i.e. as shown in Figure 2. Further material is now squeezed into the tube 5 from the tube 2 shown in Figure 2 until the rising surface of pasty material in tube 5 reaches the graduation mark 60.

The two tubes 5 and 6 are now removed and, as shown in Figure 3, placed on the nozzle of a corresponding white base containing container 2 from which a further 40 units of white material are extruded into the tube 5 to bring the free end face of pasty material up to the 100 mark.

The assembly of inner and outer tubes 5, 6 is now removed from the third container of pasty material and the inner tube 5 removed from the outer tube 6. A disposable tube emptying and stirring tool denoted 10 in Figure 4 is now used to remove the pasty material (denoted 18) from

inside the thin-walled flexible tube 5. The tool 10 consists basically of a rigid strip of plastics material having a slot 11 and throat 12 open at one end, its other end 13 being plain. The transverse measurement of the slot 11 is such that the tube 5 can be introduced via throat 12 into the slot 11 (arrow 16) but when so introduced, the walls of the slot 11 press the two sides of the tube 5 together. The tube is now pulled axially, pulling from its upper empty end, and accordingly as the slot 11 moves along the tube 5 (arrow 17), it pushes the material 18 in the tube 5 before it, so causing material 18 to be extruded from the end of the tube 5. Following such extrusion, tube 5 is empty and collapsed flat, and is simply thrown away. The material 18 is extruded from tube 5 into a transparent, clear plastics container 20 which consists of a generally cylindrical section 21 having an external thread 22 at one end and an internal flange 23 at the other, a movable base 24 seated on the flange 23 and, for later use, a lid 25 having an internal screw thread 26 and a central dispensing orifice 27.

At this stage lid 25 is not on the container section 21 but the movable base 21 is in the position shown and the pasty material 18 is extruded from tube 5 into the container. Using the plain end of the tube emptying tool 10, the pasty material 18 can now be blended by hand to homogeneity. It can easily be seen when homogeneity has been achieved, particularly having regard to the transparency of the walls of the container 20.

When homogeneity has been achieved, the lid 25 is screwed on to the external container thread 22 and the base 24 pushed towards lid 25 in order to move the mixed pasty material 18 towards the orifice 27 and, with continued pushing upwards of the base 24, to extrude it from the orifice 27.

In the colour proofing system under consideration, it is now relatively straightforward to extrude an even

bead of pasty material 18 from the orifice 27 in the lid 25 of the container and lay that bead across a sheet of colour test material. The bead is then distributed over the sheet of colour test material using, e.g. a draw-down coating bar, and the sheet may then be dried and put to use in the colour proofing or colour matching system in question. The formulation of the material drawn down is homogeneous because of the use of the intermediate container, and accurate because of the use of the formulation guide coupled with the graduations on the tube 6 while the individual components are being extruded into the tube 5. This enables very much more accurate colour matching to be obtained than using previous systems.

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CLAIMS

1. A method of formulating pasty materials together which includes the steps of mixing amounts of two or more pasty materials to homogeneity, characterised in that the mixing is effected by successively extruding given amounts
5 of pasty material from each of a plurality of storage containers into a tube, there being associated with the tube a set of graduations which are used to estimate the given amounts, ejecting the total quantity of pasty material from the tube, and mixing the same to
10 homogeneity.

2. A method according to claim 1 and wherein the mixing step takes place in a container from which the homogeneous mixture can subsequently be extruded.

15

3. Apparatus for carrying out the method of claim 1 and including:

a set of containers (2) each adapted to contain a pasty material and each having a first extrusion nozzle
20 (4),

a tube (5) adapted to fit on each first extrusion nozzle (4),

means (7) for estimating the amount of material so extruded,

25 means (10, 11, 12) for ejecting material extruded into the tube from the tube,

a container (20) for the receipt of such ejected material, and

30 means (10) for stirring or mixing to homogeneity material in the container.

4. Apparatus according to claim 3 wherein the container (20) has a lid or cap (25) capable of being fitted on the container (20) and provided with a second extrusion nozzle

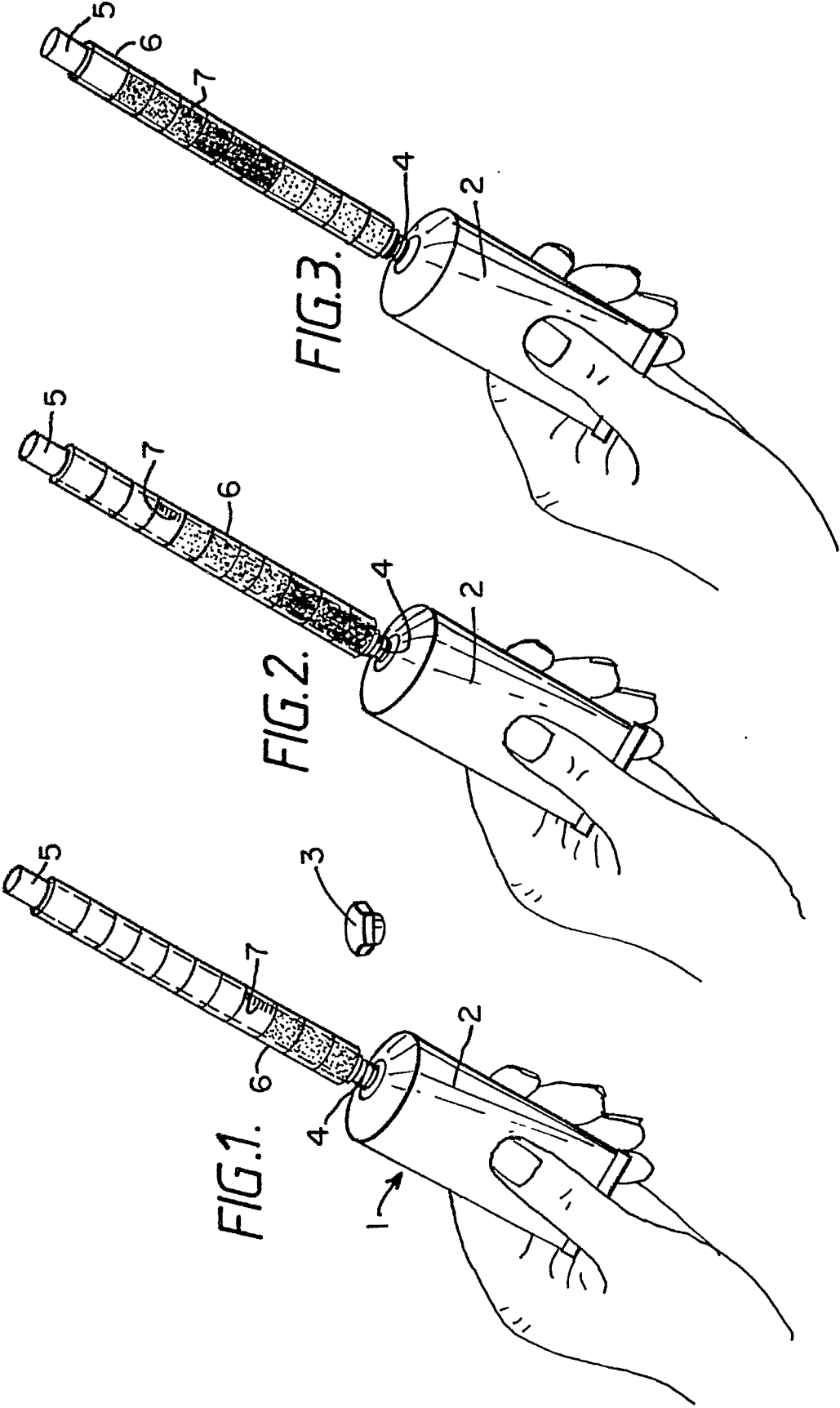
(27) from which the mixture in the container may be extruded.

5. Apparatus according to claim 4 wherein the base (24) of the container (20) is movable to enable it to act as a piston and extrude material through the second extrusion nozzle (27).

6. Apparatus according to any one of claims 3 to 5 wherein the tube (5) is a thin walled, even bore transparent plastics tube from which material may be ejected by pinching the tube flat at one point and then moving the pinch.

5 7. Apparatus according to claim 6 wherein the means for estimating the amount of material is an outer cylindrical second tube (6) adapted to fit around the plastics tube (5) and which can be removed from the tube (5) to enable material to be ejected from the tube (5).

8. Apparatus according to any one of claims 3 to 7 and including an adaptor to effect a relatively fluid-tight seal between one end of the tube (5) and the first extrusion nozzle (14).



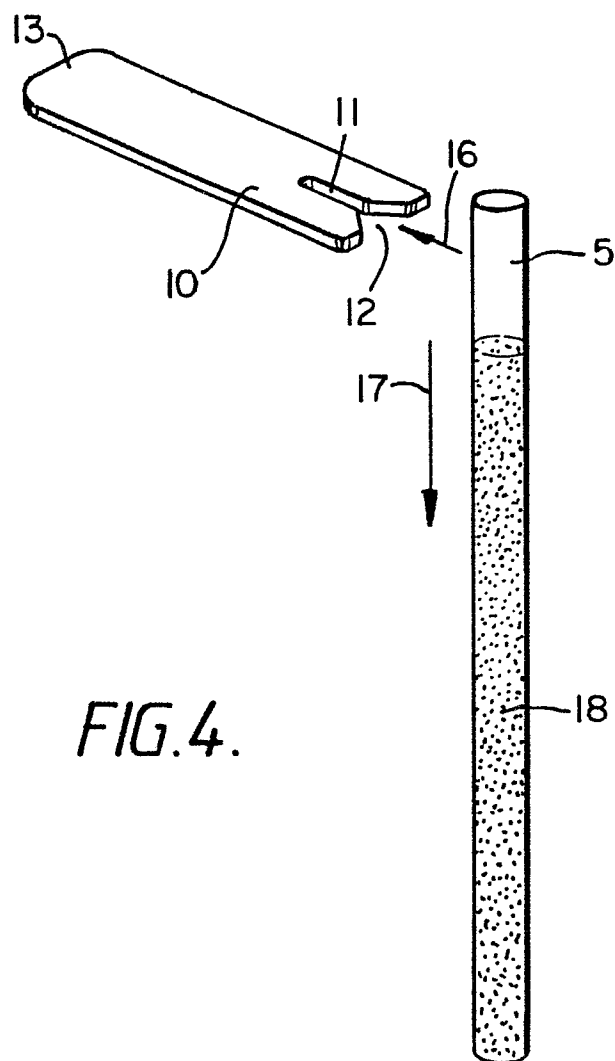


FIG. 4.

