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RIGID DRESSINGS

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2 Sheets-Sheet 1

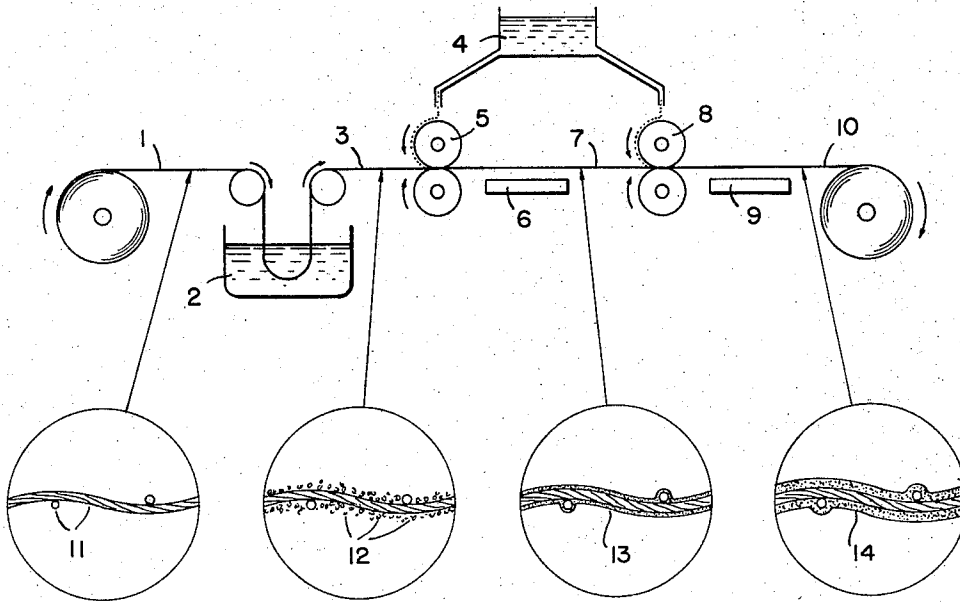


FIG. 1

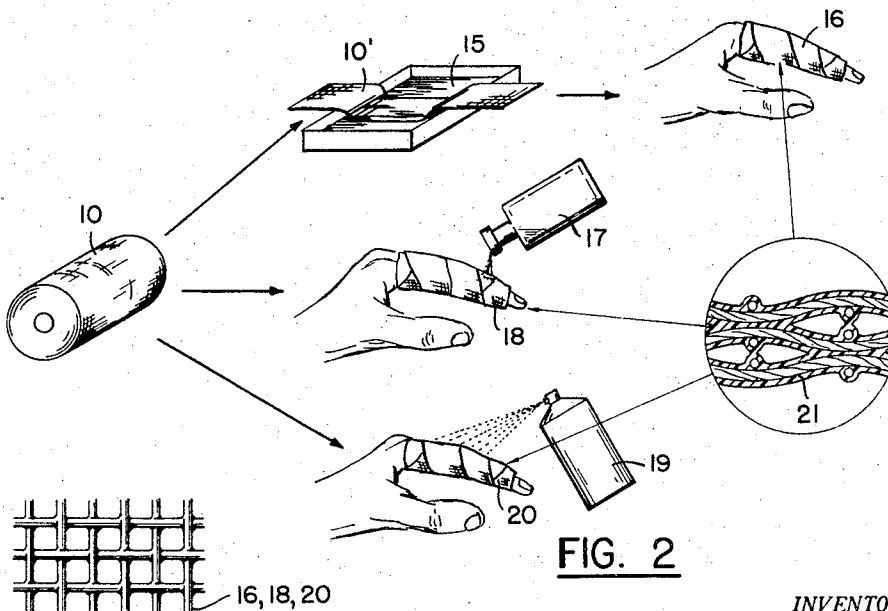


FIG. 2

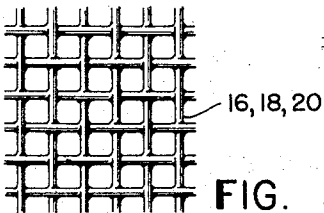


FIG. 3

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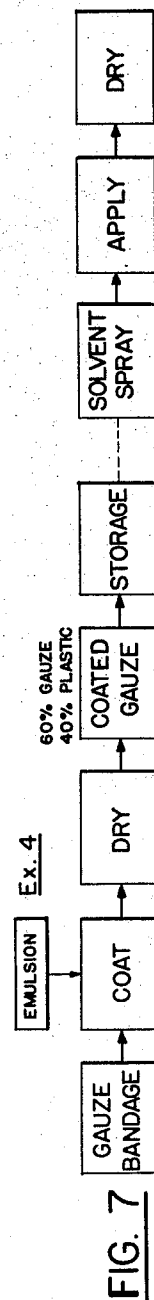
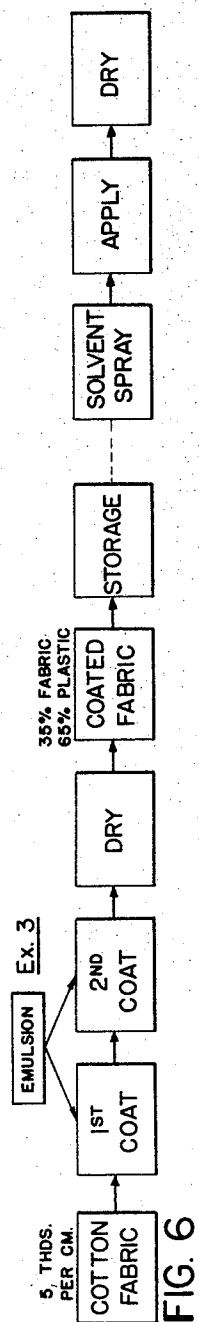
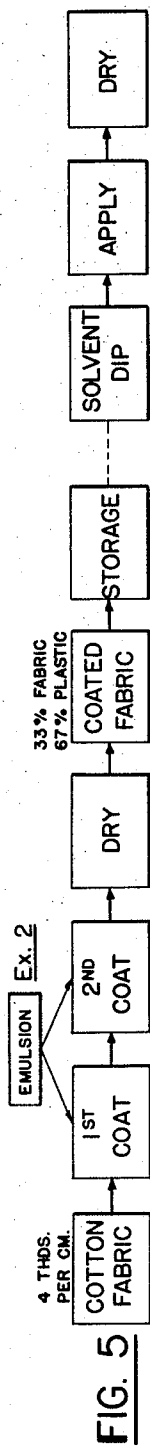
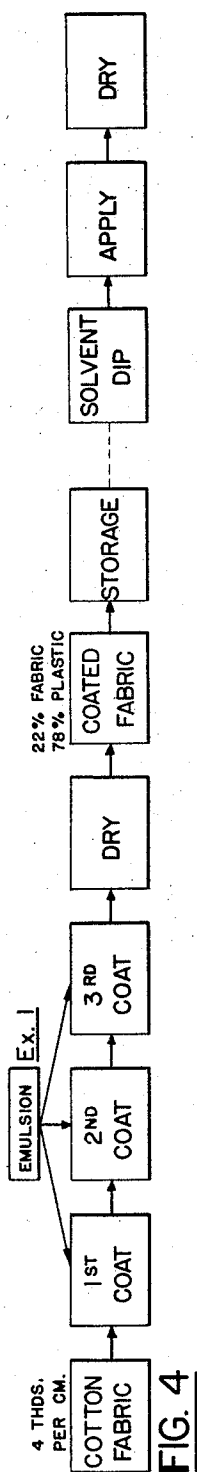
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RIGID DRESSINGS

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17 Claims. (Cl. 117—28)

This invention relates to dressings. In particular, it is directed to improved light weight dressings of rigid form as used, for example, in supporting fractured bones, and to methods of manufacturing the same.

It has long been the practice to use so-called plaster casts as a supporting dressing for fractured bones and other injuries. Such casts consist of a textile material with plaster as a binding agent. However, such plaster casts have certain disadvantages both with respect to the application thereof and the properties of the cast. A great disadvantage of plaster casts is the long drying time thereof as a consequence of which, an applied supporting dressing fails to attain maximum strength until the passage of several days. Furthermore, plaster casts become heavy and unwieldy because of the high specific gravity of the plaster and their comparatively low strength. A further great disadvantage of plaster casts arises from the fact that a detailed X-ray examination cannot be made of the injured member after the application thereto of the cast because the X-rays are absorbed by the plaster.

There have also been used bandages made of two types of fibers, one fiber being soluble in a solvent and the other fiber being insoluble in said solvent, as for example, a bandage manufactured from cotton and cellulose acetate. Although such bandages constitute an improvement over plaster, they are, however, expensive in that they are based upon a specially manufactured textile material.

It has now been found that in contrast to the aforesaid bandaging materials, it is possible to use commercially available textile materials for supporting dressings if they be made by coating the textile with a plastic having certain special properties, and applied by a special process; and which dressing after application, is treated with an appropriate solvent for the plastic material.

In accordance with the instant invention, the plastic material employed may be applied to the textile material in the form of a dispersion, as for example, a plastic emulsion or a latex. The emulsion or emulsion mixture is one which after drying on the textile material, does not produce a cohesive film. When the textile material is coated with such an emulsion, the textile material remains comparatively pliable and manageable and can be used in the same way as an ordinary gauze bandage. To attain that effect, the emulsion should be that of a hard plastic material, as for example, polymethylmethacrylate. However, the emulsion should not consist only of a dispersion of hard plastic materials, because after drying it gives a fine-grained powder which adheres poorly to the textile material and gives off much dust when handled. This disadvantage, however, may be avoided by adding a binding agent to the emulsion so that the hard emulsion particles remained fixed after the emulsion dries. An appropriate binding agent is an adhesive plastic material as for example polyethylacrylate.

The textile material to which the plastic is applied should be a rather loose fabric so that the finished supporting dressing is porous and permeable to the air. The coating of the fibers may be accomplished by dipping the

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textile fabric in the emulsion mixture, following which it is passed between a pair of rollers set in such a way that the desired amount of plastic becomes affixed to the textile. If an especially high plastic content is desired, the textile fabric may be coated twice or thrice, the textile being allowed either partially or completely to dry between each coating.

A textile coated and dried in the foregoing manner can then be used as a supporting dressing. The textile is then treated with a solvent which dissolves the plastic adhering to the textile so that the evaporation of the solvent results in the formation of a cohesive film on the threads in the textile thereby producing a hard, rigid material. The solvent can be applied by dipping the coated textile or by spraying the same, either before, during or after application of the supporting dressing. Solvents suitable for such use are typified by acetone or ethyl acetate to which may be added, if desired, low-boiling paraffin hydrocarbons or fluoro-chloro-carbon compounds, as for example, the "Freons."

The invention herein is shown in the accompanying drawings, wherein:

Fig. 1 is a schematic illustration of a mode of manufacturing the instant coated textile material used for forming the dressing.

Fig. 2 is a schematic illustration of a mode of applying a bandage to a finger, formed from the dressing material produced in Fig. 1.

Fig. 3 is a fragmentary view of the dressing material produced in Fig. 1.

Fig. 4 is a flow sheet of the steps involved in applying a bandage developed from the fabric in accordance with this invention.

Fig. 5 is a flow sheet of the steps involved in applying a bandage embodying another form of the dressing material.

Fig. 6 is a flow sheet of the steps involved in applying a bandage using a further form of the dressing material.

Fig. 7 is a flow sheet of the steps involved in applying a bandage using a still further modification of the dressing material.

As shown in Fig. 1, web 1 of open mesh fabric having warp and woof threads 11, is conveyed from a roll through emulsion mixture 2. The web 3 carrying plastic particles 12 moves through a first pair of rollers and is there further coated by roller 5 with additional emulsion mixture coming from supply 4. The web moves over dryer 6, emerging as coated web 7 whereof the threads carry the coating 13. Web 7 then passes through a second pair of rollers being further coated by additional emulsion mixture furnished by supply 4 by means of roller 8. The web then moves over dryer 9, emerging as coated web 10, the thickened coating being indicated at 14, and is wound on a take-up roll.

In Fig. 2 a suitable length of dressing material 10', taken from a roll of the dry dressing material 10, is dipped in a solvent 15 to soften the plastic coating. The thus-softened material is wrapped on a finger to form bandage 16. On evaporation of the solvent, the dressing provides the supporting structure, the threads of which are coated as at 21. An alternative mode of forming the dressing is shown by the bandage 18 wherein a suitable length of 10 is wrapped around the finger, and the said wrapping is made up into the finished dressing by applying thereto solvent poured from bottle 17. A still further mode of forming the dressing is shown by bandage 20. This bandage is formed by wrapping a suitable length of 10 around the finger. The said wrapping is then made up into the finished dressing by applying solvent thereto from spray can 19.

Among the plastics which are appropriate or suitable for providing the hard component are: polymethylmeth-

acrylate, polyisobutylmethacrylate, polystyrene, and other plastics that do not form films when emulsions thereof undergo drying. These materials are, moreover, readily soluble in the solvents mentioned above. Among the binding agents which can be used for the purpose mentioned, are emulsions, which, when dried, leave adhesive films. Materials which provide such adhesive films are, for example, polynonylmethacrylate, polyethylacrylate, or polybutylacrylate or other suitable materials. The following are illustrative examples in accordance with this invention.

Example 1

139 grams of a cotton fabric having a mesh count of four threads per centimeter both in the warp and the woof, are dipped into a 40 percent emulsion of polymers consisting of 10 percent polynonylmethacrylate and 90 percent polymethylmethacrylate. After three coatings and final drying, the weight is 630 grams. The coated fabric thus carries 78 percent plastic. The fabric is dipped in acetone and then applied as a supporting dressing. Evaporation of the acetone is hastened with hot air from a hair dryer. After 40 minutes the dressing is hard and rigid.

The dressing can thereafter be removed by cutting the same as in the case of an ordinary plaster cast or by first softening the same with acetone which facilitates the cutting.

Example 2

The same fabric as that used in Example 1, is coated with a 40 percent emulsion of polymers consisting of 15 percent polyethylacrylate and 85 percent polymethylmethacrylate. After two coatings, the fabric carries 67 percent of plastic. The coated fabric is dipped in a solvent mixture consisting of 30 percent by weight of acetone and 70 percent by weight of trichlorofluoromethane. The plastic bandage is applied as a supporting dressing and dried with a hair dryer. After 20 minutes, the supporting dressing is comparatively hard and rigid.

Example 3

A webbed fabric with a mesh count of five threads per centimeter in both directions (warp and woof) is coated with a 40 percent emulsion of polymers consisting of 25 percent polyethylacrylate and 75 percent polystyrene. After two coatings, the fabric carries 65 percent plastic. Acetone, from a spray bottle is sprayed on the dry plastic coated bandage as it is applied to the part to be supported. The result is generally the same as that described in the foregoing examples.

Example 4

A gauze bandage is coated once with a 40 percent emulsion of polymers consisting of 10 percent polyethylacrylate, 15 percent n-butylmethacrylate and 75 percent polymethylmethacrylate. After drying, the fabric carries 40 percent of plastic. When this plastic bandage is applied, acetone is sprayed thereon from an "aerosol" container using dichlorotetrafluoroethane as the propellant. After drying, a rigid and comparatively hard supporting dressing is obtained.

It will be evident from the foregoing, that the supporting dressing comprises a textile material wherein the threads are coated with particles of one or more hard plastics, which are bonded by one or more soft plastics. Thus, the advantages of the hardening effect of the hard particles is achieved, while at the same time non-coherency of these particles to each other, is obviated by the binding effect of the soft adhesive film-forming plastic(s).

The emulsion in Examples 1, 2 and 4 is made according to the following formula:

- (1) Water 1.920 gr.
- (2) Turkey red oil 60 gr.
- (3) Dioctylester of sodium sulfosuccinic acid 24 gr.

(4) Ammonium persulphate 1.2 gr. (2×0.6 gr.).

(5) Monomer 1.200 gr.

The components 1-3 are first solved and heated up to 80° C., whereafter 0.6 gr. ammonium persulphate is added and the monomer is added in drops during the course of about 2 hours at this temperature. An additional 0.6 gr. of ammonium sulphate is added when all monomers are dropped into the solution. The charge is then put to post-react for 1 to 2 hours, after which it is cooled down.

The emulsion in Example 3 is made according to the following formula:

- (1) Styrene 100 gr.
- (2) Water 150 gr.
- (3) Sodium oleate 5 gr.
- (4) Potassium persulphate 0.15 gr.

The compound is then polymerized in a three-pipe flask and stirred with a stainless steel stirrer in nitrogen, free from oxygen, at a temperature of 50° C. for 48 hours. When the polymerization is completed the residues of the monomers are removed through steam distillation. For further information see "High Polymeres, volume 19, Emulsion Polymere, page 18, Interscience Publ. Incorporated, New York."

The proportion of the soft plastic to the hard plastic should not be less than 70 parts of the soft plastic to 30 parts of the hard plastic; and should not exceed 96 parts of the soft plastic to 4 parts of the hard plastic. The most favorable proportion lies between 95 parts of the soft plastic to 5 parts of the hard plastic, and 85 parts of the soft plastic to 15 parts of the hard plastic. The amount of soft plastic in the total mixture of soft and hard plastic should be not less than 70% nor more than 96% of the total plastic content. The most favorable amount of the soft plastic in the combination of the two plastics lies between 95% and 85%.

The dry content of the emulsions should be between 15-60%, although a dry content of between 35-50% is preferable.

It will be understood that the foregoing description of the invention and the examples set forth are merely illustrative of the principles thereof. Accordingly, the appended claims are to be construed as defining the invention within the full spirit and scope thereof.

We claim:

1. An article for forming a supporting dressing comprising a woven textile material of open mesh structure wherein the threads carry a surface distribution of discrete particles of hard plastic selected from the group consisting of polymethylmethacrylate, polyisobutylmethacrylate and polystyrene, the said threads and particles thereon being covered by a film of a soft adherent plastic selected from the group consisting of polynonylmethacrylate, polyethylacrylate and polybutylacrylate.

2. An article in accordance with claim 1 wherein the discrete particles of hard plastic are those of a plurality of hard plastics.

3. An article for forming a supporting dressing comprising a woven textile material of open mesh structure wherein the threads carry a surface distribution of discrete particles of polymethylmethacrylate, the said threads and particles thereon being covered by a film of a soft adherent plastic selected from the group consisting of polynonylmethacrylate, polyethylacrylate and polybutylacrylate.

4. An article in accordance with claim 3 wherein the soft plastic is polynonylmethacrylate.

5. An article in accordance with claim 3 wherein the soft plastic is polyethylacrylate.

6. An article for forming a supporting dressing comprising a woven textile material of open mesh structure wherein the threads carry a surface distribution of discrete particles of polystyrene, the said threads and particles thereon being covered by a film of a soft adherent

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plastic selected from the group consisting of polynonylmethacrylate, polyethylacrylate and polybutylacrylate.

7. An article in accordance with claim 6 wherein the soft plastic is polyethylacrylate.

8. An article for forming a supporting dressing comprising a woven textile material of open mesh structure wherein the threads carry a surface distribution of discrete particles of polyisobutylmethacrylate, the said threads and particles thereon being covered by a film of a soft adherent plastic selected from the group consisting of polynonylmethacrylate, polyethylacrylate and polybutylacrylate.

9. An article in accordance with claim 8 wherein the soft plastic is polyethylacrylate.

10. Method of manufacturing an article of the class described which comprises immersing a woven textile material of open mesh structure in an aqueous emulsion wherein the dispersed phase comprises dispersed hard plastics and dispersed soft plastics, the hard plastics being a member of the group consisting of polymethylmethacrylate, polyisobutylmethacrylate and polystyrene, the soft plastics being a member of the group consisting of polynonylmethacrylate, polyethylacrylate and polybutylacrylate, removing the fabric from the emulsion, and drying the emulsion-coated fabric to evaporate the water to obtain an article wherein the threads carry a surface distribution of discrete particles of the hard plastic, the said threads and particles thereon being covered by a film of the said soft adherent plastic which is formed upon the evaporation of the water.

11. Method in accordance with claim 10 wherein the hard plastic is polymethylmethacrylate.

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12. Method in accordance with claim 11 wherein the soft plastic is polynonylmethacrylate.

13. Method in accordance with claim 10 wherein the hard plastic is polystyrene.

14. Method in accordance with claim 13 wherein the soft plastic is polyethylacrylate.

15. Method in accordance with claim 10 wherein the hard plastic is a mixture of polybutylmethacrylate and polymethylmethacrylate.

16. Method in accordance with claim 15 wherein the soft plastic is polyethylacrylate.

17. An article for forming a supporting dressing comprising a woven textile material of open mesh structure wherein the threads carry a surface distribution of discrete particles of hard plastic selected from the group consisting of polymethylmethacrylate, polyisobutylmethacrylate and polystyrene, the said threads and particles thereon being covered by a film of a soft adherent plastic of a poly lower alkylacrylate.

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