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SURGICAL WRAPPING

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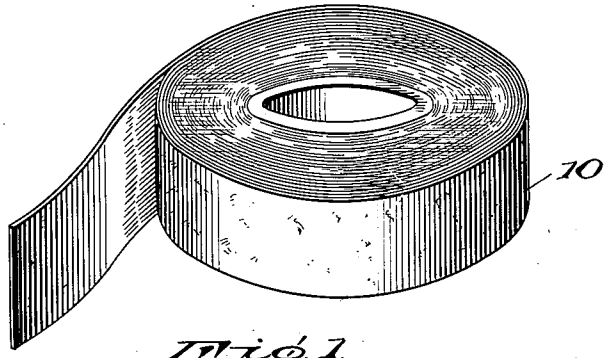


Fig. 1.

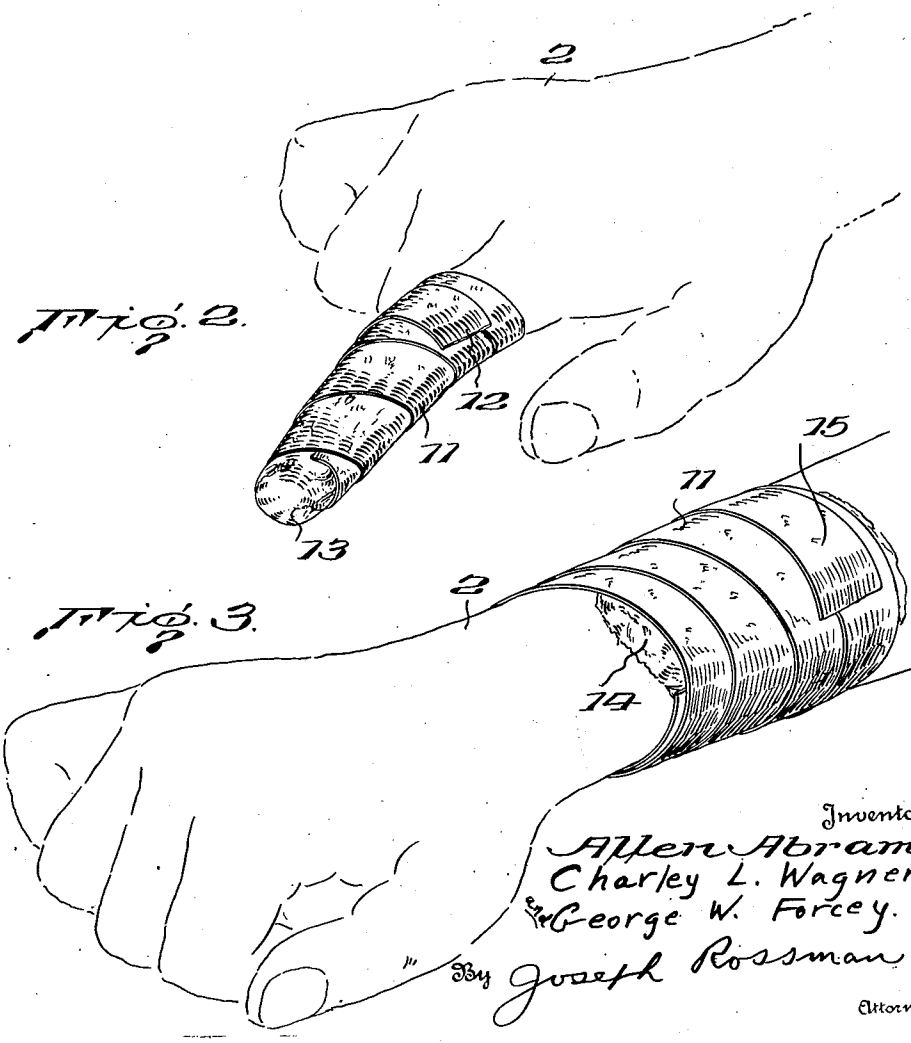


Fig. 2.

Fig. 3.

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SURGICAL WRAPPING

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10 Claims. (Cl. 128—156)

This invention relates to a bandage or tape. One of the objects of the invention is to provide a flexible stretchable, pressure sealable bandage made from a thermoplastic composition.

Another object of this invention is to provide a surgical tape made from a wax-rubber composition.

A further object of the invention is to provide a surgical wrapping which will keep out dirt and moisture.

Another object of the invention is to provide a surgical wrapping for retaining wet dressings without loss of fluids or moisture in such dressings.

Further objects of this invention will be apparent from the annexed drawing and the following specification.

On the drawing:

Figure 1 is a view in perspective of a roll of our surgical bandage or tape.

Figure 2 is a view showing the surgical bandage applied to an injured finger.

Figure 3 is a view illustrating the application of the bandage for holding a surgical dressing in place.

There has been a need for a long time for an inexpensive surgical wrapping or dressing which can be readily applied to any part of the body and held in place by mere application of pressure. Further requirements of such bandage are that it should not adhere to the hair or skin, it should be stretchable and elastic and remain in place until removed.

It has been previously proposed to use pale crepe rubber sheets for this purpose as disclosed in the patent to Rosenblatt 1,885,007 October 25, 1927. It has also been proposed in patent to Lloyd 1,981,561 November 20, 1934 to use a strip of unvulcanized and partially depolymerized crude rubber. It has also proved to be very troublesome to manufacture such rubber bandages of uniform quality and characteristics because crude rubber is difficult to manipulate and can be sheeted out only by means of expensive and heavy equipment.

On the other hand, we have succeeded in making strip material from inexpensive thermoplastic materials such as paraffin wax to which is added a small proportion of a binder such as rubber, gutta percha, or other gummy substance. This composition is easily handled and can be converted into sheets of uniform thickness without difficulty.

In forming our novel tape we have found that it is possible by adding suitable binders under controlled conditions to certain thermoplastic substances which are brittle and not flexible at ordinary temperatures to render such thermoplastic substances pliable and flexible to a remarkable degree so that they can be converted into a flexible tape. We have, for example, discovered that substances such as paraffin wax or certain types of asphalt which are brittle and not flexible at ordinary temperatures can be rendered pliable and flexible by adding thereto certain binders such as rubber, gutta percha, "Viskanol", (a straight hydrocarbon produced by suitably polymerizing some of the unsaturated hydrocarbon gases produced in cracking petroleum) and similar binding agents.

We have also found that by properly controlling the proportions and compounding conditions we can uniformly produce compositions having a desired predetermined viscosity and cohesiveness whereby they can be employed for conversion directly into self-sustaining sheets, films or tapes.

The major ingredient or body of our composition thus consists essentially of a thermoplastic substance which is not flexible or pliable at ordinary temperatures. Such body substance is furthermore solid at normal temperatures, but liquefies at higher temperatures, is insoluble in water and acts as a dispersing medium or solvent for the binder which is added thereto. Any substance having the aforementioned properties can be used for our invention, as, for example, paraffin-wax, beeswax, spermaceti, asphalt, etc.

The binder which we add to our body portion is thermoplastic, insoluble in water and solid at ordinary temperatures. It is furthermore elastic, flexible and has strong adhesive properties. It is dispersible or soluble in the body portion. Any natural or synthetic substances having the aforementioned properties may be used as our binder, as, for example, rubber, balata, gutta percha, "Viskanol" or other artificial gummy or rubber-like substances.

A specific embodiment of our composition adapted for conversion into flexible sheets, films, or tapes comprises a composition of rubber, or a rubber-like substance, and a wax, or a wax-like substance. Suitable rubber and rubber-like substances include pale crepe rubber, smoked sheet rubber, vulcanizable rubbers generally and gutta percha. We have successfully used paraffin-wax, beeswax, spermaceti, and other waxes, in the preparation of our composition. However, pale crepe rubber and paraffin-wax are the in-

gredients which we prefer to use, for producing a substantially colorless and tasteless product.

The proportion of pale crepe rubber to paraffin-wax may, in general, vary between 6% rubber, 94% paraffin-wax and 30% rubber, 70% paraffin-wax by weight. Using other rubber-like and wax-like substances the proportions should be so chosen as to give suitable viscosities of at least 8000 secs. (50 cc. at 90° C. measured on Scott viscosimeter).

The following will illustrate a preferred composition of our invention and a preferred method of preparing the composition:

	Per cent by weight
Paraffin-wax, melting point between 120 and 180° F.	85 to 88
Pale crepe rubber, 0.020 to 0.050 inch in thickness	15 to 12

The composition must be prepared under carefully regulated conditions which we have determined by long study and experimentation. The paraffin-wax is first melted by heating in a jacketed vessel, preferably provided with a kneader type of stirrer, to a temperature of about 200–210° F. The individual sheets of rubber are then carefully added to the bath so that the surfaces are completely wetted with the molten paraffin as they are being immersed in the bath so as to avoid sticking and welding of the rubber sheets to each other in the bath.

During the addition of the rubber the temperature of the bath is permitted to drop to 180° to 190° F. and is maintained at this temperature throughout the compounding operations. After all the rubber has been added the bath is gently stirred with a paddle so as to permit thorough penetration of the paraffin into the rubber and to prevent lumping of the rubber during solution. This stirring operation is continued for about fifteen minutes until the rubber sheets are adequately soaked.

The mixture is then stirred mechanically in a kneader type of mixer until the batch is free of lumps of undissolved rubber. This operation requires 1½ to 2 hours. The temperature of the mass is maintained at 180° to 190° F. during the entire period. At the end of this time any undissolved lumps may be strained out, broken up and returned. However, this is not ordinarily necessary. The composition so prepared is then ready for direct conversion into thin films.

Various pigments or other coloring matters, fillers, antioxidants and the like, may be incorporated, either directly or by means of a master batch, into the rubber-wax mixture, depending upon the type of pigment, filler or added ingredient to be incorporated. If a white composition is desired, for example, a white pigment such as titanium dioxide, or mixtures of titanium dioxide with either calcium sulphate or barium sulphate may be incorporated into the composition. We have also found that it is possible to vulcanize our rubber-paraffin wax composition at practically any temperature between say 70° and 300° F. as disclosed in our copending application Serial No. 40,765, Patent No. 2,054,115, September 15, 1936. However, if such mixtures are vulcanized or even partially vulcanized before being formed into films the entire composition becomes highly viscous and attains a gelled condition so that it cannot be satisfactorily sheeted out or used to coat or laminate fabrics. It is therefore necessary to first form the self-sustaining film and then to vulcanize the composition.

We have found that high vulcanizing temperatures cannot be employed for our preformed films as the film loses its original characteristics and becomes distorted on account of the effect of the high temperature on the composition. It is therefore desirable to vulcanize the films or sheets at low temperatures after being formed. We have found that this can be readily effected by the use of super-accelerators which permit self-curing after the film is formed. For this purpose we may use the "split batch" method of compounding our ingredients, although it is also possible to combine all the ingredients in one batch.

Examples of superaccelerators that can be satisfactorily used are the following:

"Butyle zimate"—a zinc salt of dibutyl dithiocarbamate.

"Zimate"—zinc dimethyl dithiocarbamate.

"R-2"—the reaction product of carbon bisulphide and methylene dipiperidine.

"ZBX"—zinc butyl xanthate.

"552"—piperidine pentamethylenedithiocarbamate.

To avoid vulcanization when subjected to the high temperatures required for the film forming operation, two batches are prepared, one containing the vulcanizing agent and activator or pigment and the other containing the accelerator are mixed just before the film is to be formed. The final batch is made in such quantities that it will not gel within the normal operating time for using it up even at the temperatures occurring during the film forming operation. Thereafter, notwithstanding the relatively low temperatures prevailing during the storage of the product, the accelerators are effective in bringing about vulcanization in a period, say, of up to several weeks.

The final batch of rubber-wax composition may have the following proportions by weight of materials:

	Per cent
Accelerator	½
Sulphur	½
Zinc oxide	½
Paraffin-wax (M. P. 130°–132° F.)	83½
Pale crepe rubber	15

When a milder cure is desired the proportion of accelerator and vulcanizing agent used are reduced. For example, in the final batch of the aforementioned example, the accelerator may be reduced to ⅛% and the sulphur to ¼%. This freshly prepared composition can be kept at not over 180° F. and used any time within eight to ten hours after it is compounded, without gelling sufficiently to render it unworkable.

When transparency is desired it is preferable to use zinc carbonate instead of zinc oxide in the above composition.

The vulcanized film will shrink in the grain direction much less than the unvulcanized film when subjected to elevated temperatures and will more successfully resist the action of ultra-violet light and will still retain its self-sustaining properties at elevated temperature. The vulcanized film is also more resistant to solvents than the unvulcanized film. However, the vulcanized film has lost its ability to "heat-seal" to itself, to paper and other sheet materials which is desirable for some purposes. These properties may be increased or diminished in degree by controlling the degree of vulcanization.

Antioxidants may be incorporated into our rubber-paraffin-wax composition whether it is to be vulcanized or not. We have found the following

antioxidants suitable: hydroquinone, pyragollol, para-hydroxy-phenyl morpheline, aniline-beta-naphthol.

The addition of these antioxidants, age resistors or photo-chemical inhibitors increases the resistance of the finished sheet or film to the action of light and air.

Where it is desired to make the film more sticky, up to 15% of a gum or resin, such as rosin, may be added to replace an equal weight of wax. Similarly, the gloss may be improved and a harder film produced by the addition of a hydrogenated vegetable oil, such as cottonseed, in amounts up to, say, 15% by weight, to replace an equal weight of wax.

During mixing and before the final rubber-paraffin wax batch is ready to be supplied to the film forming machine, it is subjected to a vacuum of 15 to 20 inches of mercury, preferably as high as is practical of attainment, to eliminate air from the batch and prevent its inclusion in the film.

We have also succeeded in preparing flexible, self-sustaining films from compositions consisting of asphalt and rubber. In preparing such compositions, we may, for example, take 7½ parts of rubber and dissolve same in 42½ parts of paraffin-wax. This mixture is then added to 50 parts of asphalt (paradura), which has been melted and heated to about 350° F. The composition is intimately mixed and can be formed into a film which is non-tacky and flexible by sheeting out on a chilled forming roller similar to the method used in making films from rubber-wax compositions. The asphalt in its original state is brittle and not flexible but by the addition of the rubber binder to same, it becomes flexible and can be formed into a self-sustaining film.

We have also prepared compositions comprising asphalt and 10% by weight of rubber from which we have formed self-sustaining sheets or films. The tackiness, strength, and flexibility of such sheets is dependent upon the type of asphalt used. By selecting high melting point asphalts, it is possible to produce films which are flexible and non-tacky but when these are desired the time of heating must be carefully controlled.

The thin flexible self-sustaining sheets or films produced by any of the methods described above are particularly adapted for use as a surgical tape. When formed from a rubber-wax composition of the type described, the sheet or film material is practically moistureproof and waterproof, and if not vulcanized, has excellent heat and pressure sealing properties without being tacky at ordinary room or atmospheric temperatures. The sheet material may be either semi-transparent or opaque, depending upon whether pigments or fillers are incorporated into the composition or not.

The surgical tape made from our sheet material is highly flexible. In addition to this the sheet is capable of being stretched considerably; and after stretching it will tend to return to its original length although it will not fully regain its original length. At the same time the film has a certain degree of cohesion to itself when firmly pressed together, particularly if slight heat is applied. On the other hand, the film can be made to stick to itself better by stretching out and then pressing firmly together while stretched, as, for example, when it is wound around any part of the body.

After forming thin flexible sheets according to the method described they may be cut into suitable widths and wound up into rolls. If desired the rolls may be interwound with paper or other suitable materials but this is not essential as under normal conditions the layers will not cohere.

Our bandage is waterproof and when unvulcanized has excellent heat sealing properties without being tacky at ordinary room temperatures. The sheet is highly flexible and can be stretched considerably; and after stretching it will only partially return to its original length. The film has also a certain degree of cohesion to itself when firmly pressed together, particularly if slight heat such as that of the hand is applied thereto. Our sheet material may be translucent or opaque depending upon whether or not pigments or fillers are incorporated in the composition. Our bandage can be made sterile as the composition from which it is made can be readily sterilized. Suitable medicaments or antiseptic substances may be incorporated in the film forming composition. When our bandage is wrapped around living body portions the heat generated in said body portions causes the bandage to shrink, thereby more firmly engaging the parts wrapped.

Our bandage is preferably supplied in a compactly wound roll as illustrated in Figure 1 of the drawing so that it may be readily applied to any desired part of the body.

Figure 2 illustrates our bandage applied directly to a wound on a finger. Our bandage 11 is wrapped around the finger in overlapped relation under a slight and suitable tension or without any tension if so desired. The end 12 of the bandage is then pressed down with the hand causing it to pressure seal it to the layer beneath it. Our bandage material being very flexible and stretchable can be readily applied over the end of the finger as shown at 13. The bandage will remain on the finger very snugly even though the finger may be frequently flexed or used in any normal manipulative movements.

In Figure 3 our bandage is shown as applied to a wound on an arm. The gauze or other material which is applied to the wound is held firmly in place by wrapping our bandage 11 under suitable tension in slightly overlapping convolutions and pressing down the end 15 so as to pressure seal it to the layer beneath it.

It is obvious that many other similar applications can be made with our novel bandage material. Our bandage can be wrapped under no tension or if desired, under small or great tension as it is readily stretchable. It is thus possible to apply tourniquets at any desired part of the body by merely winding our bandage strip under the necessary tension. It is also possible to make finger cots to completely enclose the end of the finger. Our bandage can be quickly and easily applied in case of sprains, blisters, bruises, cuts, wounds or sore fingers. It can be used for forming an elastic chin strap for holding up and molding sagging face tissues on the chin and throat. Our bandage is also very useful for application to the parts of the body which move constantly such as elbow or knee. Our bandage can be used for supporting weak arches or ankles by wrapping the desired body parts. Enlarged veins in the legs can be effectively supported with our bandage. Bunions or enlarged toe joints may be covered with our bandage with a suitable number of shaped layers to relieve suffering.

We can also use our surgical wrapping fo- -e-

taining wet dressings without loss of fluids or moisture contained in the dressing as our wrapping is moistureproof and waterproof. Furthermore, the affected parts when completely wrapped with our bandage are protected against entrance of germs, dirt, moisture or fluids from without.

Our bandage is also very suitable for use in treating animals in case of injuries of any kind. Our bandage can be readily removed by simply lifting the pressure sealed end and unwinding the layers. Although the layers adhere to themselves they separate upon applying a gentle pulling force. The same bandage can be removed and then reapplied as it retains its pressure sealing properties. If desired our bandage material may be perforated by a series of any suitably spaced, regular openings to permit the circulation of air in the bandaged part.

Many other uses in addition to those enumerated may readily suggest themselves and it is intended in the appended claims to include the use of our bandage material for general surgical uses whether for human or animal purposes.

We claim:

1. A bandage for wrapping living body portions comprising a strip of a pressure sealable thermoplastic composition comprising wax and rubber, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

2. A bandage for wrapping living body portions comprising a strip of a pressure sealing thermoplastic composition comprising wax and from at least 6 to 30% rubber, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

3. A bandage for wrapping living body portions comprising a strip of a pressure sealable thermoplastic comprising wax, rubber and an antioxidant, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

4. A bandage for wrapping living body portions comprising a strip of a pressure sealable thermoplastic composition comprising wax, rubber, pigment and an antioxidant.

5. A bandage for wrapping living body portions comprising a strip of a pressure sealable thermoplastic composition comprising wax, rubber and an antiseptic, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

6. A bandage for wrapping living body portions comprising a flexible self-sustaining strip of a vulcanized composition comprising wax and rubber, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

7. A bandage for wrapping living body portions comprising a flexible self-sustaining strip of a vulcanized composition comprising wax and from at least 6 to 30% rubber, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

8. A bandage for wrapping living body portions comprising a flexible self-sustaining strip of a vulcanized composition comprising wax, rubber and an antioxidant, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

9. A bandage for wrapping living body portions comprising a flexible self-sustaining strip of a vulcanized composition comprising wax, rubber, pigment and an antioxidant, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

10. A bandage for wrapping living body portions comprising a flexible self-sustaining strip of a vulcanized composition comprising wax, rubber and an antiseptic, said bandage being shrinkable by heat generated in said body portions so as to firmly engage same.

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