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MATERIAL FOR USE IN THE MANUFACTURE OF EAR DEFENDERS AND THE LIKE

Paul S. Veneklasen and Norman A. Watson, Los Angeles, Calif., assignors to the United States of America

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This invention relates to a composition of matter and relates more particularly to material for use in the manufacture of ear stoppers, the ear tips of hearing-aid ear phones, ear defenders, and the like. A general object of this invention is to provide a practical, durable and inexpensive material especially well adapted for use in the manufacture of ear defenders and other ear appliances.

Ear stoppers, ear defenders, etc., must be formed of a material that is soft and yielding, yet elastic, free from objectionable odors and resistant to ear wax, soap, alcohol, etc. Rubber is unsatisfactory because it becomes soft and gummy and expands when exposed to the action of ear wax. Most of the so-called synthetic rubbers have objectionable odors and for other reasons are unsuited for use in ear stoppers, ear defenders, etc.

Another object of this invention is to provide a material particularly well adapted for use in ear defenders, and the like, that is resistant to ear wax, soap, water and alcohol and that is free from all objectionable odor. The material of the present invention is stable or permanent and does not become soft or gummy and will not swell when exposed to ear wax and cleaning materials, such as soap, water, cleaning alcohol, etc. The material retains its original physical characteristics even after extended use and has no objectionable odor.

Another object of this invention is to provide a material of the character referred to that is soft, pliable and elastic. Ear defenders produced from the material of the present invention are soft and readily conform to the canals of the ear and may be worn without discomfort and yet have the required resiliency to effectively seal with and conform to the walls or surfaces of the auditory canals. The hardness and resiliency of the material are comparable with that of soft medical rubber.

Another object of this invention is to provide a material of the character referred to that is non-toxic and non-irritating.

Another object of this invention is to provide a material of the character mentioned that is substantially flesh colored so that the ear appliances are very inconspicuous.

A further object of this invention is to provide a material of the character mentioned that is simple and inexpensive to manufacture, being readily milled, compounded and cured.

The various objects and advantages of our invention will be more fully understood from the following detailed description of a preferred embodiment of the invention and manner of compounding the same. It is to be understood that the following detailed disclosure is typical of a preferred species of the invention and of a typical preferred mode of compounding the same and the invention is not to be construed as limited or restricted to the specific details herein set forth but is to be considered in its broader aspects.

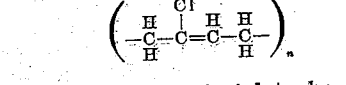
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The improved material or composition of the present invention may be said to comprise, generally, (1) a base in the form of a "synthetic rubber," (2) a neutralizing and vulcanizing agent, (3) a lubricant to aid in the plasticizing operation, (4) an ingredient to increase the resiliency or modulus of elasticity of the cured material, (5) a filler which renders the material non-inflammable, (6) a coloring ingredient, (7) softeners and lubricants, (8) an ingredient which acts as an accelerator for the initial phase of the cure and a retarder for the latter stages of the cure.

The following formula is a preferred typical example of the invention but is not necessarily restrictive of the invention. The quantities given are by weight.

(1) Synthetic rubber—neoprene GN	100.0
(2) Light magnesia	4.0
(3) Stearic acid	1.5
(4) Permalux	0.5
(5) Titanium dioxide	12.0
(6) Iron oxide	0.4
(7) Paraffin	3.0
(7) Lanolin (anhydrous)	20.0
(8) Zinc oxide	1.0

The base or principal ingredient (1) of the composition may be termed a "synthetic rubber" and is more specifically known as raw "neoprene GN," polychloroprene. This ingredient is represented by



We have found this material to be superior to the other synthetic rubbers as the base or principal element of the composition. The raw neoprene "GN" is cut and rolled on the mill until smooth to facilitate the mixing and further plasticizing of the material as will be more fully described.

The light magnesia MgO is employed as an acid accepter serving to neutralize any hydrogen chloride that may be liberated from the neoprene

during the milling and vulcanizing and subsequent aging. The magnesia is also effective as a vulcanizing agent during the curing process. This ingredient may be the first added to the neoprene when the latter has been prepared by cutting and rolling.

The stearic acid is added to the mixture following the addition of the magnesia to the neoprene and operates as an effective lubricant. The stearic acid reduces or eliminates "tackiness" or stickiness of the mixture during the plasticizing operation and prevents the material or mixture from sticking to the parts of the mill.

The Permalux is employed in a relatively small proportion by weight to increase the resiliency and modulus of elasticity of the finished product. The Permalux (diorthotolylguanidine salt of dicatechol borate) may be added following the addition of the stearic acid.

The titanium dioxide (TiO_2) has a double function, serving as a filler and operating to make the mixture non-inflammable. The titanium dioxide is especially desirable in the light colored material or stock. The small proportion of iron oxide employed serves to give the product the pinkish color or flesh color. It will be obvious that the proportion of the iron oxide may be varied greatly and that other coloring materials may be employed if desired or found necessary.

The lanolin and paraffin are softening and lubricating agents of the material. Lanolin being an animal-grease has many of the same ingredients as ear wax. Accordingly, lanolin is particularly well adapted for embodiment in the ear defender material since it renders the ear defender material substantially inert when in contact with the ear wax. Ear wax is inert when in contact with the lanolin but would tend to react with other oils or waxes different in nature from itself, thus making the employment of such other oils or waxes unsuitable in the ear defender material. The titanium dioxide, iron oxide, paraffin and lanolin may be added at one time or in close sequence. The paraffin and lanolin should be melted before they are added to the mix, but they should not be heated much above their melting points because the heat they would add to the batch in such a case might be sufficient to produce an incipient curing of the mix.

The zinc oxide (ZnO) operates as an accelerator in the early stages of the cure and further operates as a retarder in the latter stages of the cure. It is preferred to add the zinc oxide to the mix as the last ingredient to prevent premature "setting up" during the mixing or compounding. While the order of adding or mixing of the several ingredients outlined above has been found preferable it is to be understood that the invention is not to be construed as restricted to this specific order of operations.

As above described, the principal ingredient or base, neoprene GN is cut and rolled on the mill until smooth. The other ingredients are added in the proportions above named, or in substantially these proportions, and the mixture is cut and rolled until the material is thoroughly mixed. Any suitable form of mill may be employed and the mixing time may be varied as conditions may require. We have found that the mixing time starting with the feeding of the raw neoprene into the mill and terminating with the rolling of the batch from the mill will range between approximately 25 minutes to approximately 35 minutes depending upon the size of the batch and the character of the mill. The finished material or compounded material may have a tendency to pre-cure at room temperatures. For this reason it may be desirable to store the material in a cool place but the stored material should be kept well above freezing temperature.

If Duralumin or stainless steel molds are employed the material cures as quickly and as easily as rubber. The cure may take approximately 20 minutes, presuming it is started with a hot press at between 150° and 155° centigrade. We have found it desirable to lubricate the molds with an extract of soap bark in order to prevent the material from sticking during the cure.

The cured material is soft, having a "Shore" hardness No. 37 and is thus comparable to soft medical rubber. The material is very tough and durable. By test it has been found that the weight required to tear a nicked strip 2 cm. long, 1 cm. wide and 0.05 cm. thick, cut 0.4 cm. across from one edge, is 230 gm. wt. The material of the invention has substantially the same elasticity as rubber. The ratio of stretch to the original length of a strip 2 cm. long, 1 cm. wide and 0.05 cm. thick stretched by a force of 150 gm. wt., is 0.30 as compared to 0.33 for rubber. The material has proven to be permanent and to retain its original physical characteristics. It has been found that the cured material is unaffected by ear wax, soap, water, etc., when exposed to these elements for substantial periods. The ear defender material compounded as above described with the iron oxide is almost flesh colored and the ear defenders formed of the material are inconspicuous when in position in the ear.

Having described only a typical preferred form and application of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described our invention, we claim:

1. A composition of the class described comprising the following materials in the following proportions by weight: 100 parts polychloroprene, 4 parts magnesia, 1.5 parts stearic acid, 0.5 part diorthotolylguanidine salt of dicatechol borate, 12 parts titanium dioxide, 3 parts paraffin, 20 parts lanolin, and 1 part zinc oxide.

2. A composition as defined in claim 1, including 0.4 part iron oxide as a coloring material.

PAUL S. VENEKLASEN.
NORMAN A. WATSON.

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The following references are of record in the file of this patent:

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