

UNITED STATES PATENT OFFICE.

CHARLES H. DENNISON, OF WOLLASTON, MASSACHUSETTS, ASSIGNOR TO AMERICAN RUBBER COMPANY, A CORPORATION OF MASSACHUSETTS.

METHOD OF COLORING FIBROUS MATERIAL.

1,332,974.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, CHARLES H. DENNISON, a citizen of the United States, residing at Wollaston, county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Methods of Coloring Fibrous Material, of which the following is a full, clear, and exact description.

My invention relates to improvements in coloring fibrous material, such as fabrics, particularly those in which it is desired to produce a yellow or orange color which will not fade when exposed to strong light or moisture and which will not be affected by sulfur when associated with rubber compounds such as on balloon cloth or fabrics used in the construction of airships and similar aircrafts. Fabrics used in the construction of gas envelopes should be practically impervious or opaque to actinic or ultra-violet rays of light, owing to the tendency of such rays to affect rubber and cause the same to deteriorate. The dyeing of cloth to produce yellow or orange colors for different purposes has up to the present time been accomplished with natural or artificial organic dye stuffs, also lead chromate dyes. However, the latter are unsuitable because of their tendency to turn dark under the action of sulfur owing to the formation of lead sulfid, and the former are unsuitable because of their slight opaqueness to light rays.

Briefly stated the present invention contemplates impregnating the fabric with cadmium sulfid which is deposited directly on or within the fibers of the fabric at the time of its formation.

For a detailed description of one embodiment of my invention the following procedure is set forth: The cloth is prepared for dyeing by being boiled for ten or fifteen minutes in a dilute solution of sodium carbonate, and then washed with water. Next it is passed through a hot dilute solution of a polysulfid of an alkali or alkaline-earth metal, preferably calcium polysulfid. However, the sequence of the application of these materials may be reversed. The greater part of the liquid is then removed as completely as possible by the use of a centrifugal machine or wringer, but a small amount of the polysulfid is allowed to remain in the fibers of the fabric as well as a small amount

of free sulfur. The latter seems to act somewhat as a mordant to hold the cadmium sulfid subsequently formed. The fabric is then thoroughly washed or worked in a cold dilute solution (approximately 5%) of a soluble cadmium salt, preferably cadmium chlorid. The fabric is then wrung out and immersed in a cold dilute solution of polysulfid. The excess of the solution is removed and the cloth washed with plain water. The treatment with cadmium chlorid solution and with polysulfid solution may be repeated as often as necessary to obtain the desired depth of color. The fabric is finally boiled a few minutes in a dilute solution of sodium carbonate to remove any free sulfur, again washed with water and dried. The fabric is then ready for use, the cadmium sulfid being permanently fixed on the fibers of the fabric. The compounds may be applied in other ways such as by brushing or spraying the same simultaneously on the fabric, or respectively on opposite sides of the material being treated, the essential requirement being that the ingredients shall not become combined before being absorbed by the fibers of the material.

By this process the pigment is formed directly within or upon the fibers of the fabric in such an evenly divided condition that the granular structure is entirely absent. The resulting dyed fabric upon the closest examination of the individual fibers shows a more efficient penetration of the color than in case other ingredients are used where the pigment seems to result in a more superficial distribution which gives the fabric a granular or powdery appearance and feeling. This intimate and extremely fine deposition of the cadmium sulfids probably penetrates much farther into the interior of the fabric structure than in the case of other salts, such as lead chromate, where there is a tendency of the material to accumulate upon the surface of the fabric, giving the effect above referred to. Thus a greatly improved color effect is produced, particularly in connection with cloths combined with vulcanized compounds containing sulfur, such as used for balloon and similar envelopes.

I do not wish to be understood as limiting myself to the particular salts or compounds above set forth for various other compounds of cadmium may be employed in addition to

other compounds including various soluble sulfids to produce substantially the same results.

Having thus described my invention what I claim and desire to protect by Letters Patent is:

1. As a new article of manufacture, a fibrous material having intimately deposited in or upon the fibers thereof cadmium sulfid or sulfids resulting from the action of a soluble salt of cadmium and a soluble polysulfid and combined with a vulcanizable plastic compound.

2. A fibrous material colored by a cadmium-compound-containing coloring-matter resisting penetration by actinic rays and immune to discoloration by sulfur and coated with vulcanized rubber.

3. As a new article of manufacture, fibrous material impregnated with a vulcanized plastic containing sulfur or sulfur compounds, and having intimately deposited in or upon the fibers thereof cadmium sulfid or sulfids.

4. A process of treating fibrous material which comprises applying to the material a cadmium-compound coloring-matter resist-

ing penetration by actinic rays immune to discoloration by sulfur and treating the material with a vulcanizable plastic compound.

5. The process of treating fibrous material, which comprises applying to said material a solution of a salt of cadmium and applying a solution of a soluble metallic polysulfid which reacts with said cadmium salt to form sulfid of cadmium, and finally applying a vulcanizable plastic compound.

6. The process of treating fibrous material, which comprises subjecting said material to the action of a solution of cadmium chlorid and to the action of a polysulfid of an alkaline-earth metal, and finally applying a vulcanizable plastic compound.

7. The process of coloring fibrous material, which comprises, treating the same with a solution of sodium carbonate, washing with water, passing the material through a solution of calcium polysulfid, then extracting the greater part of the residue, and treating with a solution of cadmium chlorid.

Signed at Cambridge, county of Middlesex, State of Massachusetts, this 25th day of July, 1916.

CHARLES H. DENNISON.