

XR 2,791,518

United

2,791,518

Patented May 7, 1957

1

2,791,518

## PROCESS FOR MAKING A MICROBICIDAL ARTICLE

Thomas A. Stokes, Jr., and Fred W. Davis, Lake Worth, Fla., assignors, by mesne assignments, to Permchem Corporation, West Palm Beach, Fla., a corporation of Florida

No Drawing. Application March 21, 1955,  
Serial No. 495,766

26 Claims. (Cl. 117--120)

This invention relates to a method useful in treating an article to render it microbicidal to microorganisms coming in contact with its surface, particularly to a method for depositing economically on the surface of or within the interstices of an article a mixture comprising a substantially water-insoluble silver salt and another substantially water-insoluble compound effective as a light screen to protect the silver salt from the action of light normally tending to discolor it.

The treatment of articles, such as those made of synthetic organic resins, paper, leather, textiles, felt and other fibrous and non-fibrous products, to impart microbicidal properties to them whereby they would be lethal over long periods of time to bacteria and fungi coming into contact with them has long presented a problem for which no entirely satisfactory process has heretofore been disclosed. It is known that such articles, especially paper, fabrics and other cellulosic fibrous articles, can be impregnated or treated with certain types of microbicidal agents to maintain them in a sterile condition for short periods of time. A number of conventional germicides and fungicides have been proposed for such purposes. Bandages supporting germicides on the fibers and in the interstices between the fibers have been prepared which could be stored in the open air without becoming unduly contaminated with microorganisms and which could be applied subsequently to open wounds without danger of carrying air-borne infections into the wound. Even this process has, however, not been entirely satisfactory for a number of reasons and has not been used on a wide scale.

Most of the attempts made heretofore to render articles microbicidal have been confined to the treatment of bandages, surgical gauze and similar fibrous articles for the reason that such articles must of necessity be maintained in a strictly sterile condition until such time as they are used. There are many other instances, however, where the provision of an article which has been treated in such a way as to render it more or less permanently toxic to bacteria and fungi coming into contact with its surface would be highly advantageous. Not only would a treatment whereby this could be accomplished easily and economically be of value in connection with health problems to prevent the spread of disease and the like by the handling of such articles by different persons, but the avoidance of the deteriorating and destructive effects of the microorganisms on the articles themselves leading to molding, mildew, decay and the like would be avoided. The large annual loss, in terms of money, of cellulosic and other products subject to decay from bactericidal or fungicidal causes is well known.

It is apparent that, to be of more than limited applica-

2

bility in restricted fields, a process for treating articles to render them microbicidal must of necessity be such that the article retains its microbicidal properties as nearly permanently as possible. In particular, treated articles to be used out of doors should not lose their microbicidal properties by exposure to sunlight, rain and other weather conditions. Articles which must be cleaned and laundered frequently should not lose their microbicidal properties during cleaning or laundering. In addition, there are certain aspects relating to the appearance of the treated article which must be taken into account. Any treatment which changes the color or weight of the article, e. g., of a fabric or paper, or which otherwise alters its appearance would obviously be unsatisfactory in many instances. Not only should the appearance of the article suffer as little change as possible during the actual treatment, but any subsequent change in appearance even after long storage or use should be avoided as much as possible. Odorous substances cannot be tolerated in a majority of instances. It is thus apparent that the problem involved is highly complex and that a simple, inexpensive method for accomplishing the purposes outlined, while at the same time avoiding in great measure the difficulties mentioned, is not to be found readily.

The many attempts which have been made to accomplish the desirable results referred to are known in the art and need not be reviewed here. In particular, however, attention is directed to the numerous attempts which have been made to utilize silver compounds in the treatment of articles to give them microbicidal properties, especially bactericidal properties. The effective bactericidal properties and the generally non-corrosive nature of many types of silver compounds would indicate that these substances should find utility in this field. Little success has been attained, however, in this utilization of silver compounds because of their almost universal property of becoming colored when exposed to light over a period of time. White fabrics, for example, treated or impregnated with silver salts by most of the known methods acquire a greyish, bluish or even a darker shade of color after exposure to the light. Most colored articles when so treated suffer a distinct change in shade upon exposure to light. Such shades are often particularly displeasing to the eye and, of course, no change in color can be tolerated when a permanently uncolored article is desired.

In United States Patent No. 2,689,809 there is described and claimed a process for treating articles to form on the surfaces thereof a tightly adherent, germicidal, coprecipitated coating or deposit of a substantially water-insoluble silver halide or phosphate and a substantially water-insoluble salt of a metal other than silver. The latter salt functions, presumably because of its intimate admixture with the silver salt, as an effective stabilizer of the silver salt against the effect of light normally tending to discolor it. The process of U. S. Patent No. 2,689,809 is effected by first wetting the article which is to be treated with a first aqueous solution comprising a water-soluble silver salt and a water-soluble salt of a metal other than silver. In a typical instance the first solution contains silver nitrate and barium nitrate. The article is subsequently wetted with a second aqueous solution which comprises a water-soluble halide or phosphate and a water-soluble salt, which may also be a phosphate, the anion of which forms a water-insoluble compound with the cation of the metal other than silver in the first solu-

2791518  
OR IN 427/337