

# UNITED STATES PATENT OFFICE

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## SURGICAL AND MEDICAL PREPARATIONS

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This invention relates to surgical and medical preparations and has for its object the production of improved materials for insertion, infusion or injection into the human or animal system for their desirable therapeutic or cosmetic effects, or for use as plastic fillings, joint lubricants and other surgical purposes.

By means of our preparations, for example, medical deposits may be introduced into the tissues as a substitute for the usual method of making frequent injections of dissolved medicines. Similar deposits may be made for the purpose of introducing disinfectants, cosmetics, contrast media and anaesthetics into the body. An important advantage of the invention is that the effect of such deposits, whether for surgical or medical purposes, may be localized in any given region of the body; for example, by the infusion of a suitable deposit in lumbar anaesthesia, a localized effect of the anaesthetic contained in the deposit may be obtained.

Plastic fillings made according to our invention may be used wherever cavities are to be filled in the body. For example, lumbar fillings may be introduced after the resection or pathological destruction of parts of the lungs. Likewise, bone fillings may be inserted, paste-like joint greases introduced and the like. Not only does our invention provide improved materials for these and other surgical and medical purposes, but it furthermore extends the field of application of such materials to a wide variety of purposes not contemplated in the prior art.

Fillings and deposits for some of the purposes mentioned above have been manufactured from paraffine, stearic acids, waxes and the like, but they have met with only indifferent success. One disadvantage of such materials is that they have an irritating effect upon the environment and are treated as foreign bodies. Another disadvantage is that they can be sterilized only by means of additions which have a bactericidal effect, but which thereby aggravate the irritation and are furthermore not resorptive. Moreover, previously known materials of this type are very difficult to apply, and it is impossible accurately to adjust their viscosity, plasticity and other colloidal properties to medical and surgical requirements.

We have discovered certain novel preparations which can be adapted to the above surgical and medical purposes with the greatest accuracy and which, furthermore, are entirely free from the disadvantages of other deposit and filling ma-

terials. These novel preparations are polymerized vinyl alcohols of various viscosities, and their esters, acetals and ethers as well as esteracetals and mixtures of such compounds, in so far as they have an appreciable solubility in water, which requirement is met in certain cases if the preparations are capable of swelling in water. These polymerized vinyl compounds are particularly well suited for the above purpose because they do not exercise any irritating effect upon living tissues but are tolerated in any quantity without any reaction; they can be made absolutely sterile without the addition of bactericidal substances because they can stand heating up to 130–140° C. without injury to their properties; and by means of suitable additions, preferably electrolytes and particularly organic acids such as lactic acid, acetic acid and the like, they can be made reabsorbable to any desired degree. Moreover, they are distinguished by an extraordinary compatibility with the most varied medicaments, for instance alkaloids, cardiacs, gland preparations, etc., anaesthetics, disinfectants, contrast media and cosmetics. Their excellent suitability as vehicles for iodine, iodoform and other iodine preparations is particularly important. In addition, these polymerized vinyl compounds may be treated to form solutions, jellies, pastes or powders adapted merely to swell up with solvents, or kneadable masses, with surprising deftness and with such exactness in their qualities as to meet the requirements of medicine and surgery from the standpoint of the patient as well as the physician, with the result that the desired final condition is attained with precision and entirely new fields of application are made possible.

The foregoing desirable results are obtained by treating the said solutions, jellies, pastes, swollen masses, etc., with solvents such as, for example, glycols, glycerine, formamid, and particularly water, which alter the colloidal properties of these more or less homogeneous mixtures in a manner dictated by the purposes to which the products are to be applied. The most important characteristic of this change is an alteration of the viscosity of the product. For example it causes more or less free flowing solutions to thicken, gelatinize or become more solid; it causes a further thickening or solidification of jellies; an increase of solidity of pastes; a rigidifying or toughening of plastic masses. In general the purpose is to effect an accurately graded conversion of flowable materials into thinner or thicker