

## UNITED STATES PATENT OFFICE

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## DETERGENT GERMICIDE

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My invention relates to detergent germicides, and more particularly to a composition for sterilizing surgical instruments without causing any rusting or corrosion thereof.

More particularly my invention relates to germicidal solutions, in which articles that are to be sterilized in the daily use of physicians and nurses, can be immersed for the purpose of sterilization, including metallic instruments which are commonly forged from steel, and others which are cast or stamped from soft metal alloys, and are usually electroplated, without in any manner damaging the plating thereof or causing rusting or other corrosion of the material from which the same are made.

It is one of the objects of my invention to provide a germicide for sterilizing of pathogenic organisms and spores in a cold fluid without rust, corrosion, or loss of temper and edge, of fine cutting instruments, when such instruments are submerged in the germicidal fluid for an indefinite period of time, although there may be articles of varying compositions stored in the same receptacle immersed in such fluid.

Sterilization of surgical instruments and similar apparatus has been previously accomplished by numerous methods, such as by the use of heat and water combined, steam at high pressure, boiling water, and so on. The effect of the combined action of heat and water is to coagulate the albumen in the germ cells. The objections to heat and water are in part, that these cause rusting corrosion, damage to fine edges of steel, and loss of temper of fine instruments, the length of time required to destroy resistant spores, the length of time required to cool instruments before the same can be used, and the lack of adequate storage facilities to keep instruments sterile and ready for immediate use.

Other methods of sterilizing have been used that include the immersion in aqueous solutions of compounds that are of a character that cause rust or corrosion of metals, are toxic, and not sufficiently volatile to quickly evaporate. During the slow drying of such solutions rust is formed on fine cutting edges, thus impairing the quality of delicate and expensive instruments, and if the solutions are used in concentration sufficient for rapid disinfecting, damage to the metal is increased.

My invention provides not only a means for sterilizing surgical and diagnostic instruments thoroughly and promptly, but also detergent means for cleaning the same, and a means of storing the same indefinitely in a safe and handy

manner. The germicidal agent in my invention has been selected with particular reference to reaction with the entire group of metals which it is employed to treat. It is not only important to select a reliable germicidal agent in providing a germicidal detergent fluid, such as forms the subject matter of my invention, but it is also important that a vehicle be used for this germicidal agent that will not cause rust or corrosion, and which will reach the most remote crevices of the instruments, so as to carry the germicidal agent into the most remote crevices. In my invention I have provided a vehicle for the germicidal agent, which prevents rust and corrosion, has a low surface tension and is an exceptional solvent for grease. As a result, my germicidal fluid spreads rapidly and thoroughly penetrates the recesses and dissolves the grease that is on the instruments from the factory, or which has accumulated from contact with human tissues in use. A surface that is free from tissue and fat is more readily and completely sterilizable, because tissues and fat act as protective coatings against the action of germicides, generally due to their aqueous nature and to the fact that many of such germicides precipitate albumin, thereby holding the spores unharmed in a capsular formation.

It is a particular purpose of my invention to provide a germicidal fluid that carries out its action in four stages; first, penetration; second, dissolution of tissue and fat; third, sterilization; fourth, preservation in a sterilized condition. My germicidal fluid is colorless, stainless, and has no objectionable odor, so common to many germicides. It provides a fluid that is very low in water content and contains a very high percentage of solvents, some of which themselves have a germicidal action.

In my improved germicidal fluid I utilize formaldehyde as the germicidal agent, and utilize solvents in conjunction therewith, that also act as inhibiting agents to prevent rust and corrosion, without the use of any foreign substances that do not have any solvent or germicidal action, accomplishing this by the use of methanol and acetone as solvents in my germicidal fluid. It is a particular purpose of my invention to utilize solvents in conjunction with the formaldehyde, so as to obtain the highest percentage of formaldehyde that can be obtained, with the smallest amount of water.

Other objects and advantages of my invention will appear as the description thereof proceeds. I desire to have it understood, however, that I

do not intend to limit myself to the particular details described, except as defined in the claims.

My improved germicidal detergent solution in its preferred form, contains the following:

	Per cent
5 Absolute alcohol (ethyl) -----	71.275
Acetone (U. S. P.) -----	10.00
Methanol -----	5.00
10 Formaldehyde -----	3.725
Water -----	10.00

The above referred to composition provides a fluid that is quite low in water content, and in this fluid the instruments and other articles that are to be sterilized, are kept from the air, excluding atmospheric oxygen, said fluid acting on the same to dissolve the fats and other greases therefrom, and carrying the germicide into all the crevices of the said instruments or other articles that are to be sterilized. In the composition described above, a safe margin is left between the maximum amount of water, which the fluid will absorb without injury to the instruments, and the actual amount of water present in the composition. Thus the fluid is capable of taking up considerable water from the instruments, which has adhered to them through use, without danger of corrosion. Also the formaldehyde is rendered more stable by the methanol, and both the methanol and acetone contain no appreciable amounts of water and are excellent solvents for fats. The tendency is for the formaldehyde to break up into certain of its polymers, and this is prevented by the addition of the methanol or methyl alcohol. The use of the methyl alcohol or methanol in the solution not only has the advantage of lessening the possibility of polymerization of the formaldehyde, but also lessens the amount of water in the composition from that which would otherwise be present, if some other solvent were utilized.

In making my improved germicidal detergent fluid, formalin is used as the source of the formaldehyde, this being a 40% solution of the gas in water. In making up the composition, one part of methanol by volume, and two parts of acetone by volume, are mixed, and to this is added the formalin or 40% formaldehyde solution, in the proportions of forty grams of the formalin to sixty grams of the mixed solvents, that is, the mixture of methanol and acetone. To this, in making up the above mentioned composition ready for use, is added ethyl (U. S. P.) alcohol in the proportions of one part of the formalin solution in acetone and methanol, to three parts of ethyl alcohol, this producing the solution of the composition above referred to. The ethyl alcohol used is, preferably, U. S. P. containing absolute alcohol 95.57% and water 4.43%. Alcohol of this purity will produce the percentage of alcohol given in the above formula.

Instead of adding the U. S. P. ethyl alcohol at the time the composition is prepared, the composition can be sold in a concentrated form without the addition of the ethyl alcohol thereto, and

the ethyl alcohol can be added in the above mentioned proportions by the user of the germicidal solution. This enables hospitals to buy the germicidal composition, in a concentrated condition, and add the alcohol before placing the germicidal solution into use, as hospitals may purchase such alcohol tax free. The concentrated solution will contain approximately 16 per cent formaldehyde, 40 per cent acetone, 20 per cent methanol and 24 per cent water.

Of course, the exact percentages given for the solution ready for use above set forth are preferred, but these proportions can be varied from the exact percentages given a substantial amount, as long as these are kept within the approximate proportions stated. Thus the formaldehyde content can vary between 3 and 5 per cent and still produce the desired germicidal effect, while the acetone and methanol can also be varied from the percentages given above by one or two per cent, or even a little bit more than that, without any undesirable effects being produced and without losing any of the effectiveness of these as solvents and as a vehicle for the formaldehyde. The important thing in having slight variations in the ingredients in the composition is that in the final solution used for germicidal detergent purposes, the water content must under no circumstances reach such a point that it will be impossible for the solution to absorb water from the instruments that are to be sterilized. It is found that to avoid rusting the total water content in the final solution must be kept safely under 15%. As the acetone and the methanol are substantially 99.99% pure, containing practically no water, if the water in the composition should approach too closely to the upper limit permissible, these solvents can be increased, rather than the ethyl alcohol, which always contains a certain percentage of water as sold.

What I claim is:

1. A germicidal detergent solution for sterilizing articles immersed therein containing from 3 to 5 per cent formaldehyde, ethyl alcohol, acetone, methanol and approximately 10 per cent water.
2. A germicidal detergent solution for sterilizing articles immersed therein containing from 3 to 5 per cent formaldehyde, ethyl alcohol, approximately 10 per cent acetone, approximately 5 per cent methanol and not more than 10 per cent water.
3. A germicidal detergent solution for sterilizing articles immersed therein containing substantially one part formaldehyde, one part methanol, two parts acetone, two parts water and fourteen parts ethyl alcohol.
4. A germicidal detergent solution for sterilizing articles immersed therein containing ethyl alcohol not less than 70 per cent, acetone U. S. P. 10 per cent, methanol 5 per cent, formaldehyde 3.725 per cent, water not over 10 per cent, and inert matter and impurities less than 1 per cent.

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