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STERILIZATION OF SHOES AND SHOE LEATHER

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6 Claims. (Cl. 21—56)

This invention relates to the steam sterilization of shoes and shoe leather.

The use of second hand shoes has heretofore been extremely dangerous in view of the fact that no effective method for sterilizing shoes has heretofore been known. It is known that shoes harbor a multitude of micro-organisms, of which the best known is that of the fungus popularly known as athlete's foot. Steam sterilization of shoes has heretofore been impossible because the shoe leather broke down under the treatment required to kill the micro-organisms.

It has now been discovered that the use of carefully controlled temperatures, combined with the utilization of a relatively dry atmosphere, will produce sterilization at a temperature below the deterioration point of the leather.

In accordance with this process, shoes are subjected to a vacuum to remove air. This may be accomplished in any closed chamber as, for example, by the process of Merriam and Wiles, described in Patent 2,080,179. In view of the volume taken up by a small weight of shoes, it is generally desirable to supplement the steam produced from the shoe leather by small amounts of added steam, care being taken, however, not to wet the shoes. Other methods for removing air may be employed, but the process of Merriam and Wiles permits the removal of air at low temperature without harming the shoes.

Thereafter superheated steam is introduced into the chamber to produce an atmospheric temperature adjacent the shoes, of not over 190 to 200° F. Preferably the temperature is approximately 175° F., at which temperature a 10-minute exposure will satisfactorily sterilize shoe leather. The steam employed is highly superheated so that at a temperature of 175° F. the pressure is only approximately 150 mm., which corresponds to a saturated steam pressure at 140° F. It is preferred that the relative humidity be maintained at not substantially more than 50% during the sterilizing portion of the treatment.

The particular temperature employed is sufficiently high to cause sterilization. This should not be materially below 160° F. and for prompt and efficient action the range of 165 to 185° F. is preferred.

The invention is of particular value in connection with the armed forces of the country where it has heretofore been undesirable to distribute used shoes to any other individual than the prior user. Furthermore, the invention makes possible for the first time the control of athlete's foot in the army or in the civilian population, since rein-

fection from the individual's own shoes has been the major source of reinfection.

The invention is also useful for the treatment of other products. In connection with the treatment of textiles, sterilization has been procured without the disadvantage of shrinking. The invention is particularly valuable on gauze, mattresses, clothing and the like.

For example, the following table shows results in the treatment of shoe leather:

Table I

Run No.	Form of treatment	Initial bacteria count per sq. in.	Bacterial content per sq. in. after treatment
1-----	175° 5 minutes..	149,000,000	9
2-----	175° 10 minutes..	285,000,000	0
3-----	185° 10 minutes..	200,000,000	5
4-----	185° 15 minutes..	54,000,000	0

Similar results were shown in the treatment of textile fabrics. For example, the following Table II shows results obtained in a typical operation on cotton gauze. In each case the initial bacteria count was 24,000,000,000 per square inch obtained by inoculating sterile cotton gauze:

Table II

Run No.	Form of treatment	Bacterial content per sq. in. after treatment
1-----	175° for 5 minutes....	0
2-----	175° for 10 minutes....	0
3-----	185° for no minutes....	68,000
4-----	185° for 10 minutes....	2,200
5-----	185° for 15 minutes....	0

Army mattresses stuffed with cotton were likewise tested. These contained an initial contamination of about 240,000,000 bacteria per square inch, to which was added a contamination of 160,000,000,000 per square inch. The mattresses were treated at different temperatures from 165 to 185° F., as described, and in each case the vegetative bacteria were completely destroyed. In some cases a few residual spores were indicated.

The term "humidity" as used in this specification means the pressure of steam in the sterilizing zone. The term "relative humidity" is the ratio of the pressure of steam in the sterilizing zone to the pressure of dry saturated steam at the prevailing temperature.

The superheat necessary for this purpose may be obtained in any of the normal manners either

by previously superheating the steam or by expanding superheated steam under appropriate pressure and temperature into the evacuated sterilizing zone.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom.

What I claim as new, and desire to secure by Letters Patent, is:

1. The method of destroying active micro-organisms contaminating a product disposed within a closed space which comprises drawing a vacuum within said space and supplying an atmosphere of superheated steam to such space at a sterilizing temperature not substantially below 160° F. and not substantially above 190° F., and maintaining the product in such atmosphere for a sterilizing period.

2. The method as set forth in claim 1, in which the atmosphere is maintained during the sterilizing treatment at a pressure not substantially more than 50% of the pressure of dry saturated steam at the prevailing temperature.

3. The method as set forth in claim 1, in which the sterilizing temperature is approximately 170° to 180° F.

4. The method as set forth in claim 1, in which the sterilizing temperature is approximately 170° to 180° F., and the pressure is maintained at approximately 150 mm.

5. The method as set forth in claim 1, in which the product is shoe leather.

6. The method as set forth in claim 1, in which the product is a textile fabric.

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