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EQUIPMENT FOR SANITIZATION OF WATER FOR DRINKING PURPOSES–AN IMPORT SUBSTITUTE

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INTRODUCTION

Water to drink is an elementary need. In India, this need is indifferently fulfilled. In the rural areas water is scarce and where available it is often badly polluted. The 'workshop on water' organized recently by the Indian National Science Academy has pointed out several problems concerning water supply for the masses. An important aspect brought to bear upon was that over 50 per cent of deaths in rural India are caused by water-borne diseases[1].

The germicidal action of ultraviolet energy is well known. Several types of foreign manufactured equipment, using UV sources, for the reduction of bacteria, are available. The present paper pertains to the development by the author of a simple, easy to fabricate and inexpensive equipment which could sanitize (render safe from pathogenic bacteria which cause enteric diseases) large quantities of water for drinking purposes. Significance is attached to the fact that this equipment can be fabricated from indigenously available components. What is more, it is so designed as to be of use in private homes, offices, educational institutions, railway stations and such public places and also in villages.

THE EQUIPMENT

Flowing water is exposed to the UV energy of mercury vapour high pressure lamp which kills large numbers of bacteria. Several designs of equipment using ultraviolet energy source are available in foreign countries. The following methods of flowing water are mainly used with UV germicidal tubes :—

(1) UV germicidal lamps suspended over water flowing in horizontal channels.

(2) Water flowing vertically around a germicidal UV tube.

(3) Water flowing horizontally or vertically around germicidal tubes enclosed in special UV transparent glass tubing.

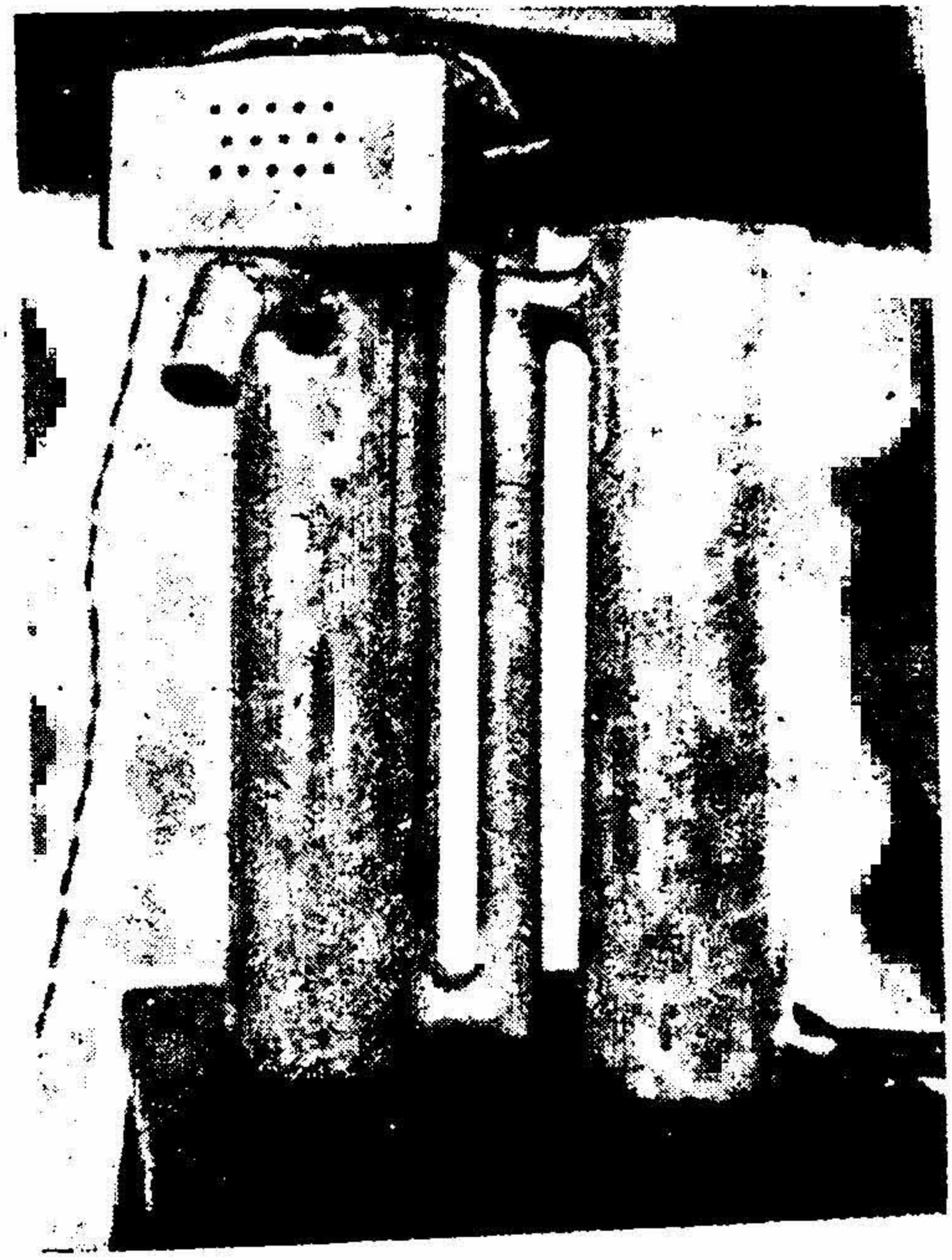

FIG. 1
Equipment for the sanitization of water

The available information shows that the method adoped in the equipment mentic ned in this paper is different from those used elsewhere. A vertic:lly rising column of water is exposed to a mercury vapour high pressure lamp (hpl) placed on top, in contradistinction to (2) above where water is allowed to flow vertically around the U.V. tube. The small size of the hpl makes the equipment more portable. Further, the hpl is less expensive, the whole equipment is easy to manufacture initially and works out cheap for future replacement. The bacteria are killed during the time it takes for the column of water to rise in the vessel and is drawn off from the outlet before it comes in contact with the lamp (See Fig. 1). Thus the lamp does not need rigid insulation and its working is independent of the temperature of the water.

The test organisms used in the experiments was *E. coli*, a representative of the enteric group of bacteria which includes organisms causing typhoid, paratyphoid food poisoning, and bacillary dysentry. In the tests[2] carried out with the present equipment, a flow rate of 300 L/hour has been achieved so far. At this flow rate the *E. coli* count has been reduced from an average of 10,000/100 ml to zero. An arbitrary assumption has been made that a polluted drinking water source could have a maximum of 1,000 coliform bacteria per 100 ml. Adjustments in the flow rate would have to be effected if countshappen to be higher, or lower than the test samples.

The penetration of ultraviolet energy no doubt depends on the clearness of the water. This factor varies from day to day and from place to place. The margin of safety in the experiments carried out has been deemed reasonable for application to any source of drinking water in India.

One sanitizing unit would consume 1 kilowatt of electricity in 8 hour.

The minimum cost of manufacturing one unit would be Rs. 100/- and maximum Rs. 250/-. It may be pointed out that an imported equipment of this type costs 10-15 times more in foreign exchange.

In the opinion of the author it is definitely possible to provide safe drinking water to the whole population of India at a very reasonable cost.

The savings on drugs and treatment of enteric diseases caused by drinking polluted water would be enormous.

The feasibility of sanitizing the entire water supply for cities, towns, and villages by applying the above method is being examined.

This inexpensive way of obtaining water with reduced or negligible counts of bacteria could also serve to economise on sterilization in the food and fermentation iudustries including antibiotics, brewing, soft drink, dairies etc. Such equipment is being used widely in foreign countries.

The locally available Mercury Vapour High Pressure Lamp could be used in almost all the applications where the germicidal UV tube is employed. To mention a few uses - sanitary storage rooms and cabinets for meat, etc., bakeries, in ducts for supply of sterile air and inoculation chambers for the laboratory.

ACKNOWLEDGEMENTS

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REFERENCE

1. Quoted from The Indian Express. September 17, 1971.
2. Ministry of Housing and Local Government, 1969.
The Bacteriological Examination of Water Supplies, London, HMSO.