

1022.744



# PATENT SPECIFICATION

NO DRAWINGS

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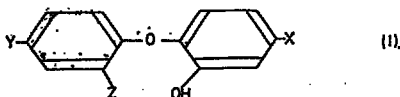
## COMPLETE SPECIFICATION

### New Phenolic Antimicrobial Compositions

We, J. R. GEIGY A.G. a body Corporate organised according to the laws of Switzerland, of 215, Schwarzwaldallee, Basle, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention concerns new antimicrobial compositions for the external and internal disinfection of warm blooded animals and for the prevention or cure of disease conditions caused by micro-organisms.

It has surprisingly been found that halogen-substituted o - hydroxydiphenyl ethers (o - phenoxy phenols) corresponding to the general formula I



wherein X, Y and Z independently of each other represent chlorine or bromine and one of the two symbols Y and Z can also represent hydrogen, have antimicrobial properties of surprising intensity and range and, at the same time, have relatively slight toxicity. Because of these properties, as well as their stability, substantial colourlessness and non irritant effect on the skin and mucous membranes, and because they are to a great extent eliminated from the organism in an unchanged, active form, they can be used as antimicrobial active ingredients for the prevention and cure of diseases of the skin, intestinal system and urinal tract, in warm blooded animals, which are caused by micro-organisms.

In different series of tests such as the incorporation test (determination of the growth

of bacteria and fungi on nutrients into which different concentrations of the active substances have been incorporated) described by X. Bühlmann, W.A. Vischer and H. Bruhin, Zbl. Bakt. Abteilung I, Originale, 180, 327—334 (1960) and the diffusion test (measurement of the inhibition zone) described by H. Bruhin and X. Bühlmann, Path. Microbiol. 26, 108—123 (1963), the compounds of the general formula I have an excellent growth-inhibiting action on, for example, the following gram positive and gram negative bacteria and pathogenic fungi: *Staphylococcus aureus* (Smith), *Staphylococcus lactis*, *Bacillus pumilus*, *Bacillus subtilis*, *Corynebacterium diphtheriae*, *Clostridium botulinum*, *Clostridium butyricum*, *Clostridium welchii*, *Clostridium tetani*, *Klebsiella pneumoniae*, *Alcaligenes faecalis*, *Salmonella pullorum*, *Salmonella typhi*, *Salmonella paratyphi A* and *B*, *Salmonella typhimurium*, *Salmonella enteritidis*, *Shigella dysenteriae*, *Shigella flexneri*, *Brucella abortus*, *Proteus mirabilis*, *Achromobacter spec.*, *Serratia marcescens*, *Pasteurella pseudotuberculosis*, *Trichophyton mentagrophytes*, *Trichophyton rubrum*, *Trichophyton tonsurans* var. *sabouraudi*, *Trichophyton schönleini*, *Trichophyton quinckeanum*, *Microsporon canis*, *Microsporon gypsum*, *Blastomyces dermatidis*, *Sporotrichum schenckii*, *Microsporon canis*, *Epidermophyton floccosum*.

That the active ingredients of the general formula I are suitable not only for local, external or internal application but also for the prevention and cure of infections of the urinal tract on oral application, can be seen, for example, from the following tests:

a) Determination of the elimination of bacteriostatically active urine: Albino mice weighing from 18 — 22 g are injected in the morning with 1 ml of physiological sodium chloride solution intraperitoneally. The urine is then collected for 2 hours in a metabolic cage. The substance to be tested is then

[Price 4s. 6d.]

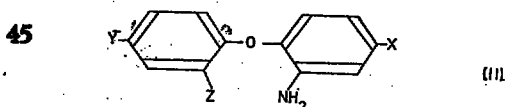
bacteriostatic

administered per os and the urine is again collected over a period of 4 hours. The test is repeated on the following day with the same mice. To determine the bacteriostatic activity of the urine, nutrient agar is mixed with a suspension of *Staphylococcus aureus* or *Escherichia coli* 86 and the mixture is poured into plates. After it has solidified, holes are made in the agar and each is filled with 0.1 ml of urine. The plates are stored for 24 hours at 37°C whereupon the diameter of the zones in which growth is inhibited is measured. After administration of 10 mg per kg bodyweight of 2 - hydroxy - 4,4<sup>1</sup> - dichlorodiphenyl ether, 2 - hydroxy - 4,2<sup>1</sup> - dichlorodiphenyl ether or 2 - hydroxy - 4,2<sup>1</sup>,4<sup>1</sup> - trichlorodiphenyl ether per os, diameters of inhibited zones on plates containing *Staphylococcus aureus* of 22—32 mm could be determined and on plates containing *Escherichia coli* 86 they were 19—26 mm.

b) Activity against experimental cystopyelitis in the rat: The tests were made by the method described by D. J. N. Hossack, Brit. J. Pharmacol. 19, 306—312 (1962) entitled "Proteus vulgaris Urinary Tract infections in Rats; Treatment with Nitrofurantoin Derivatives". In this test a clear therapeutical action could be determined. For example, with a daily dosage of 100 mg of 2 - hydroxy - 4,4<sup>1</sup> - dichlorodiphenyl ether per kg bodyweight per os, all 5 treated animals survived the duration of the test, i.e. 30 days, whereas of 9 control animals, only two survived.

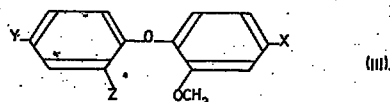
As has already been mentioned, the active ingredients usable according to the invention are only slightly toxic; the LD 50 on oral administration to the mouse is, in general near to or over 5 g per kg bodyweight.

There are various processes by which the active ingredients of the general formula I used according to the invention can be produced. For example, a substituted o - aminodiphenyl ether of the general formula II



wherein X, Y and Z have the meanings given above, is converted into a diazonium salt, in particular into the sulphate, and this is boiled down with aqueous sulphuric acid. The diazotisation and boiling down can be performed by methods known per se. The o - aminodiphenyl ethers are easily produced in their turn by reduction or hydrogenation of the corresponding o - nitrodiphenyl ethers.

Another possibility for the production of compounds of the general formula I consists in demethylating an o - methoxy - diphenyl ether corresponding to the general formula III



wherein X, Y and Z have the meanings given above, by treating it with aluminium chloride in boiling benzene or by heating it with concentrated aqueous hydrobromic acid or mixtures of hydrobromic acid and acetic acid. The compounds of general formula III are obtained in their turn, e.g. by first reacting alkali metal salts of 4 - chloro- or 4 - bromoguaiacol with 4 - halogen - 1 - nitrobenzenes, 3,4 - dihalogen - 1 - nitrobenzenes, 2,5 - dihalogen - 1 - nitrobenzene or 2,3,5 - trihalogen - 1 - nitrobenzenes, chlorine or bromine being understood by halogen, to form 2 - methoxy - 4 - halogen - 4<sup>1</sup> - nitrodiphenyl ethers, 2 - methoxy - 4,2<sup>1</sup> - dihalogen - 4<sup>1</sup> - nitrodiphenyl ethers, 2 - methoxy - 4,4<sup>1</sup> - dihalogen - 2<sup>1</sup> - nitrodiphenyl ethers or 2 - methoxy - 4,2<sup>1</sup>,4<sup>1</sup> - trihalogen - 6<sup>1</sup> - nitrodiphenyl ethers and converting these in the usual way into the corresponding amino compounds by hydrogenation or reduction. In these amino compounds, the amino group is either replaced by chlorine or bromine according to Sandmeyer, provided there are not already three halogen atoms in the molecule, or amino compounds which already contain at least two halogen atoms are converted into their diazonium sulphates and these are treated with ethanol in the presence of copper powder at room temperature or while heating, so that a hydrogen atom takes the place of the intermediary diazonium group.

Each of the possibilities mentioned above for the production of the active ingredients of the general formula I is further illustrated by a method:

#### EXAMPLE A

200 g of 100% nitrosyl sulphuric acid are dissolved in 1560 g of concentrated sulphuric acid and 381 g of 2 - amino - 4,4<sup>1</sup> - dichlorodiphenyl ether are added within about 2 hours while stirring well at 40—45°. The mixture is stirred for another 3 hours at room temperature. 450 ml of water are then poured in while cooling with ice water whereupon the temperature rises to 70°. 800 ml of o - dichlorobenzene are added and then the mixture is boiled in an oil bath at 200° (final inner temperature 165°) until no more diazo compound can be traced. The upper organic phase is then removed while still hot, 1000 ml of water and 125 ml of 30% sodium hydroxide solution are added and the o - dichlorobenzene is distilled off with steam. The aqueous residue of this steam distillation contains the 2 - hydroxy - 4,4<sup>1</sup> - dichlorodiphenyl ether dissolved therein as the sodium salt as well as, as precipitate, 3,6 - dichlorodibenzo-

furan which is formed as side product. After cooling, the aqueous residue is filtered off and washed. The filtrates are poured into 150 ml of concentrated hydrochloric acid and the precipitate formed, after it has solidified, is filtered off, washed neutral and dried. The crude 2 - hydroxy - 4,4<sup>1</sup> - dichlorodiphenyl ether obtained is purified by distillation in vacuo and the distillate is recrystallised from petroleum ether. B.P. 201—206°/12—13 Torr; M.P. 78—79° (white crystals).

If instead of the 381 g of 2 - amino - 4,4<sup>1</sup> - dichlorodiphenyl ether, equimolar amounts of:

a<sup>1</sup>) 2 - amino - 4,2<sup>1</sup>,4<sup>1</sup> - trichlorodiphenyl ether,

b<sup>1</sup>) 2 - amino - 4 - chloro - 4<sup>1</sup> - bromodiphenyl ether,

c<sup>1</sup>) 2 - amino - 4 - bromo - 4<sup>1</sup> - chlorodiphenyl ether,

d<sup>1</sup>) 2 - amino - 4,4<sup>1</sup> - dibromodiphenyl ether, or

e<sup>1</sup>) 2 - amino - 4,2<sup>1</sup>,4<sup>1</sup> - tribromodiphenyl ether

are used and the procedure described in the example is followed, then the following substituted diphenyl ethers are obtained:

a) 2 - hydroxy - 4,2<sup>1</sup>,4<sup>1</sup> - trichlorodiphenyl ether, M.P. 60—61°,

b) 2 - hydroxy - 4 - chloro - 4<sup>1</sup> - bromodiphenyl ether, M.P. 79—80°,

c) 2 - hydroxy - 4 - bromo - 4<sup>1</sup> - chlorodiphenyl ether, B.P. 214—215°/13 Torr,

d) 2 - hydroxy - 4,4<sup>1</sup> - dibromodiphenyl ether, M.P. 53—54° or

e) 2 - hydroxy - 4,2<sup>1</sup>,4<sup>1</sup> - tribromodiphenyl ether, B.P. 170—173°/0.06 Torr.

#### EXAMPLE B

a) In a three-necked flask fitted with a stirrer and sloping condenser, 476 g of 4 - chloro-2 - methoxyphenol (4 - chloroguaiacol) and 578 g of 3,4 - dichloro - 1 - nitrobenzene are melted in 400 ml of diethylene glycol dimethyl ether and, at about 120°, 342 g of 49.6% potassium hydroxide solution are added dropwise within about 4 hours. The inner temperature is then kept at 140—150° for 12 hours whereupon water and slight amounts of organic substances are distilled off, some even at the beginning of the dropwise addition of the potassium hydroxide solution. The reaction mixture is poured into a mixture of water and sodium hydroxide solution, the precipitate is filtered off, dried and recrystallised from benzene. The 2 - methoxy - 4,2<sup>1</sup> - dichloro - 4<sup>1</sup> - nitrodiphenyl ether obtained melts at 159—161°.

b) 623 g of 2 - methoxy - 4,2<sup>1</sup> - dichloro - 4<sup>1</sup> - nitrodiphenyl ether in 400 ml of dioxan are catalytically hydrogenated in the presence of 250 g of Raney nickel at room temperature and normal pressure. After the calculated amount of hydrogen has been taken up, the Raney nickel is filtered off and the 2 - methoxy - 4,2<sup>1</sup> - dichloro - 4<sup>1</sup> - aminodiphenyl ether is precipitated with water, filtered off,

washed and dried. M.P. 100—102°.

c) 204 g of well milled 2 - methoxy - 4,2<sup>1</sup> - dichloro - 4<sup>1</sup> - amino - diphenyl ether are added at room temperature while stirring well to a mixture of 254 ml of concentrated hydrochloric acid and 1600 ml of water. The suspension obtained is cooled to 0—5° and at this temperature, 225 g of 33% sodium nitrite solution are added under the surface of the liquid. The mixture is stirred for 12 hours at 0—5°.

A solution of 86 g of sodium sulphite and 60 g of sodium hydroxide in 640 ml of water is poured at 80° into a solution of 400 g of crystallised copper sulphate and 106 g of sodium chloride in 1280 ml of water. The cuprous chloride formed is allowed to settle, the water on top of it is poured off and the precipitate is purified by decanting three times with water.

The residue is dissolved in 640 ml of concentrated hydrochloric acid, heated to 65—70° and the diazo suspension obtained according to the first paragraph of c) is added while stirring. After cooling, the aqueous phase is poured off, the resinous organic phase is taken up in ether, the ether solution is extracted with sodium hydroxide solution, washed neutral, dried over sodium sulphate and concentrated. The residue is distilled under water jet vacuum. The 2 - methoxy - 4,2<sup>1</sup>,4<sup>1</sup> - trichlorodiphenyl ether obtained boils at 210—217°.

If, instead of 2 - methoxy - 4,2<sup>1</sup> - dichloro-4<sup>1</sup> - aminodiphenyl ether, the 2 - methoxy - 4,4<sup>1</sup> - dichloro - 2<sup>1</sup> - aminodiphenyl ether is diazotised in the same way and the diazo suspension formed is stirred with 10,000 ml of boiling ethyl alcohol and 28 g of copper powder until no more diazo compound can be traced (about 10 minutes), then after filtration and removal of excess alcohol, 2-methoxy-4,4<sup>1</sup>-dichlorodiphenyl ether is obtained. B.P.<sub>12</sub> 197—203°/12 Torr. However, the diazo suspension from 2 - methoxy - 4,2<sup>1</sup> - dichloro - 4<sup>1</sup> - aminodiphenyl ether obtained according to the first paragraph of c) can also be stirred with 10,000 ml of boiling ethanol and 28 g of copper powder until no more diazo compound can be traced, whereupon after working the product up as described in the previous paragraph, 2 - methoxy - 4,2<sup>1</sup> - dichlorodiphenyl ether is obtained. B.P. 196—202°/12—13 Torr.

d) 243 g of aluminium chloride are added to a solution of 187.5 g of 2 - methoxy - 4,2<sup>1</sup>,4<sup>1</sup> - trichlorodiphenyl ether in 800 ml of benzene and the reaction mixture is boiled for 30 minutes while stirring. After cooling, it is poured into a mixture of ice and hydrochloric acid, the benzene phase is separated and thoroughly shaken with water and sodium hydroxide solution. The yellowish alkaline aqueous phase is separated, the last traces of benzene are removed by bubbling steam



through, then filtered and acidified with hydrochloric acid. The 2 - hydroxy - 4,2',4' - trichlorodiphenyl ether which precipitates is at first smeary but it solidifies after some time. It is filtered off, washed and dried. After recrystallisation from petroleum ether it melts at 60—61°.

2 - Hydroxy 4,4' - dichlorodiphenyl ether (M.P. 78—79°) and 2 - hydroxy - 4,2' - dichlorodiphenyl ether (M.P. 61—62°) are obtained in an analogous manner from the methoxy compounds mentioned at the end of c).

e) If, in step a), instead of 4 - chloro - 2 - methoxyphenol, 4 - bromo - 2 - methoxyphenol is used and otherwise the procedure given in steps a) — d) is followed, then 2 - hydroxy - 4 - bromo - 2',4' - dichlorodiphenyl ether is obtained as end product. It boils at 223—229° under 12 Torr.

The antimicrobial compositions according to the invention contain at least one compound of the general formula I as active ingredient together with the usual pharmaceutical carriers. The type of carriers depends to a great extent on the intended use. Ointments, powders and tinctures are used in particular for external application, for example for the disinfection of healthy skin and also for the disinfection of wounds and for the treatment of dermatoses and affections of the mucous membranes which are caused by bacteria or fungi. The ointment bases can be anhydrous, e.g. they can consist of mixtures of wool fat and soft paraffin, or they can consist of aqueous emulsions in which the active substance is suspended. Suitable carriers for powders are, e.g. starches, such as rice starch, the bulk weight of which, if desired, can be made lighter, e.g. by the addition of highly dispersed silicic acid or heavier by the addition of talcum. Tinctures contain at least one active ingredient of the general formula I in aqueous ethanol, in particular 45—75% ethanol, to which if desired 10—20% glycerin can be added. Solutions prepared from the usual solubility promoters such as, e.g. polyethylene glycol, and also, optionally, from emulsifying agents, are used in particular for the disinfection of healthy skin. The content of active ingredient in the above forms for external application is preferably between 0.1 and 5%.

Gargles or concentrates for the preparation thereof and also tablets for slow dissolution in the mouth are suitable for the disinfection of the mouth and throat. The former are prepared in particular from alcoholic solutions containing about 1—5% of active substance to which glycerin and/or flavourings can be added. Lozenges, i.e. solid dosage units, have a relatively high content of sugar or similar substances and a relatively low content of active substance of about 0.2—20%, as well as the usual additives such as binding agents and flavourings.

Tablets, dragées (sugar coated tablets) and capsules are used in particular for intestinal disinfection and for the oral treatment of infections of the urinal tract. These preferably contain between 10% and 90% of an active substance of the general formula I to enable the administration of daily doses of between 0.1 and 2.5 g to adults or of suitably reduced doses to children to be made. Tablets and dragée cores are produced by combining the active substances of the general formula I with solid, pulverulent carriers such as lactose, sucrose, sorbitol, maize starch, potato starch or amylopectin, cellulose derivatives or gelatines, preferably with the addition of lubricants such as magnesium or calcium stearate or polyethylene glycols of suitable molecular weight. Dragée cores are then coated, for example, with concentrated sugar solutions which can also contain, e.g. gum arabic, talcum and/or titanium dioxide, or they are coated with a lacquer dissolved in volatile organic solvents or mixture of solvents. Dyestuffs can be added to these coatings, e.g. to differentiate between varying dosages. Soft gelatine capsules and other closed capsules consist, for example of a mixture of gelatines and glycerine and contain, e.g. mixtures of an active ingredient of the general formula I with polyethylene glycol. Hard gelatine capsules contain, for example, granulates of an active substance of the general formula I with solid, pulverulent carriers such as, e.g. lactose, sucrose, sorbitol, mannitol; starches such as potato starch, maize starch or amylopectin, cellulose derivatives or gelatines, as well as magnesium stearate or stearic acid.

In all forms for administration, compounds of the general formula I can be present as sole active ingredient or they can also be combined with other known antimicrobial, in particular antibacterial and/or antimycotic, active substances, for example to broaden the range of application. Also, carriers which themselves have favourable pharmacological properties may be used such as, e.g. sulphur as a powder base or zinc stearate as a component of ointment bases.

The following examples give a number of typical forms of application but the invention also embraces the choice of different amounts of components as well as other usual carriers and additives. 2 - Hydroxy - 4,4' - dichlorodiphenyl ether, 2 - hydroxy - 4,2',4' - trichlorodiphenyl ether, 2 - hydroxy - 4,2' - dichlorodiphenyl ether or another compound embraced by the general formula I for example, can be used as active ingredients.

#### EXAMPLE 1

Hand Disinfectant: A solution of 3.00 g of active substance of the general formula I and 3.00 g of sodium sulphuricinate in 47.00 g of polyethylene glycol 400 is prepared and also 7.00 g of sodium dodecyl sulphate are dissolved in 39.85 g of water. The

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two solutions are mixed and 0.15 g of perfume are added to the mixture. The liquid obtained is dropped or sprayed onto the hands and rubbed in.

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**EXAMPLE 2**

Wound Dusting Powder: 3.00 g of active substance of the general formula I, 5.0 g of zinc oxide and 41.9 g of rice starch are thoroughly mixed with 50.0 g of talcum which has been impregnated with 0.1 g of perfume. The mixture is passed through a suitable sieve and again well mixed.

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**EXAMPLE 3**

Antiseptic Ointment: 3.0 g of active ingredient of the general formula I are rubbed with 3.0 g of paraffin oil, the mixture is melted at a moderate temperature and 10.0 g of wool fat and 84.0 g of white soft paraffin are added. The mixture is allowed to cool while stirring.

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**EXAMPLE 4**

Lozenges for the disinfection of the mouth and throat: 50.0 g of active substance of the general formula I are carefully mixed with 400.0 g of castor sugar and the mixture is evenly wetted out with a granulating solution of 8.0 g of gelatine and 2.0 g of glycerin in about 120 g of water. The mass is granulated through a suitable sieve and dried. A sieved mixture of 3.0 g of highly dispersed silicic acid, 4.0 g of magnesium stearate, 0.7 g of flavouring and 42.3 g of talcum is added to the dry granulate, thoroughly mixed in and the mixture is pressed into 1000 tablets.

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**EXAMPLE 5**

Gargle Concentrate: 5.0 g of active substance of the general formula I are dissolved in 60.0 g of 96% ethanol, 15.0 g of glycerin and 0.3 g of flavouring are added and the solution is made up to 100.0 g with 19.7 g of distilled water. For gargling, 5—20 drops of this concentrate are used in water.

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**EXAMPLE 6**

Tablets for the disinfection of intestines and urinal tract: To prepare 1000 tablets each containing 150 mg of active substance of the general formula I, first 150.0 g of active substance are thoroughly mixed with 60.0 g of maize starch and 35.0 g of lactose and the mixture is evenly wetted out with a granulating solution prepared from 5.0 g of gelatine and 3.0 g of glycerin in about 70 g of water. The mass is granulated through a suitable sieve and dried. The granulate is thoroughly mixed with a sieved mixture of 15.0 g of talcum, 10.0 g of dried maize starch and 2.0 g of

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magnesium stearate and the mixture is pressed into 1000 tablets.

**EXAMPLE 7**

Dragées for the disinfection of the intestines and urinal tract: To prepare 1000 dragée cores, first 150.0 g of active substance of the general formula I are thoroughly mixed with 60.0 g of maize starch and 34.0 g of lactose. This mixture is mixed with a binding agent consisting of 6.0 g of starch, 3.0 g of glycerin and about 54 g of distilled water and the mass obtained is granulated through a suitable sieve and dried. The granulate is thoroughly mixed with a sieved mixture of 15.0 g of talcum, 10.0 g of maize starch and 2.0 g of magnesium stearate and the mixture is pressed into 1000 dragée cores each weighing 280 mg.

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Coating is carried out in the coating pan with a mixture consisting of: 2,000 g of Shellac, 7,500 g of gum arabic, 0.18 g of dyestuff, 2.00 g of silicic acid, 35.00 g of talcum, and 58.320 g of sugar.

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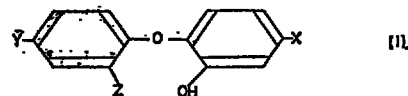
1000 Dragées are obtained each weighing 385 mg and containing 150 mg of active substance.

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**WHAT WE CLAIM IS:—**

1. Antimicrobial composition, which comprises a content of at least one compound of the general formula I

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wherein X, Y and Z independently of each other represent chlorine or bromine and one of the two symbols Y and Z also can represent hydrogen, together with a pharmaceutically acceptable carrier, for external or internal application.

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2. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1, together with a pharmaceutically acceptable carrier for external use.

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3. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1 together with a pharmaceutically acceptable carrier, for the disinfection of the mouth and throat.

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4. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1 together with a pharmaceutically acceptable carrier, for oral administration to disinfect the intestinal and urinal tracts.

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two solutions are mixed and 0.15 g of perfume are added to the mixture. The liquid obtained is dropped or sprayed onto the hands and rubbed in.

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magnesium stearate and the mixture is pressed into 1000 tablets.

#### EXAMPLE 7

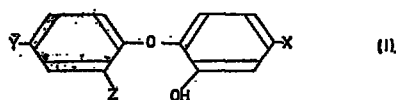
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Coating is carried out in the coating pan with a mixture consisting of: 2,000 g of Shellac, 7,500 g of gum arabic, 0.18 g of dyestuff, 2.00 g of silicic acid, 35.00 g of talcum, and 58.320 g of sugar.

1000 Dragées are obtained each weighing 385 mg and containing 150 mg of active substance.

#### WHAT WE CLAIM IS:—

1. Antimicrobial composition, which comprises a content of at least one compound of the general formula I



wherein X, Y and Z independently of each other represent chlorine or bromine and one of the two symbols Y and Z also can represent hydrogen, together with a pharmaceutically acceptable carrier, for external or internal application.

2. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1, together with a pharmaceutically acceptable carrier for external use.

3. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1 together with a pharmaceutically acceptable carrier, for the disinfection of the mouth and throat.

4. Composition as claimed in claim 1, which comprises a content of at least one compound of the general formula I defined in claim 1 together with a pharmaceutically acceptable carrier, for oral administration to disinfect the intestinal and urinal tracts.



D. 180



5. Antimicrobial composition substantially as hereinbefore described with reference to and as illustrated in any of the foregoing Examples 1 to 7.

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