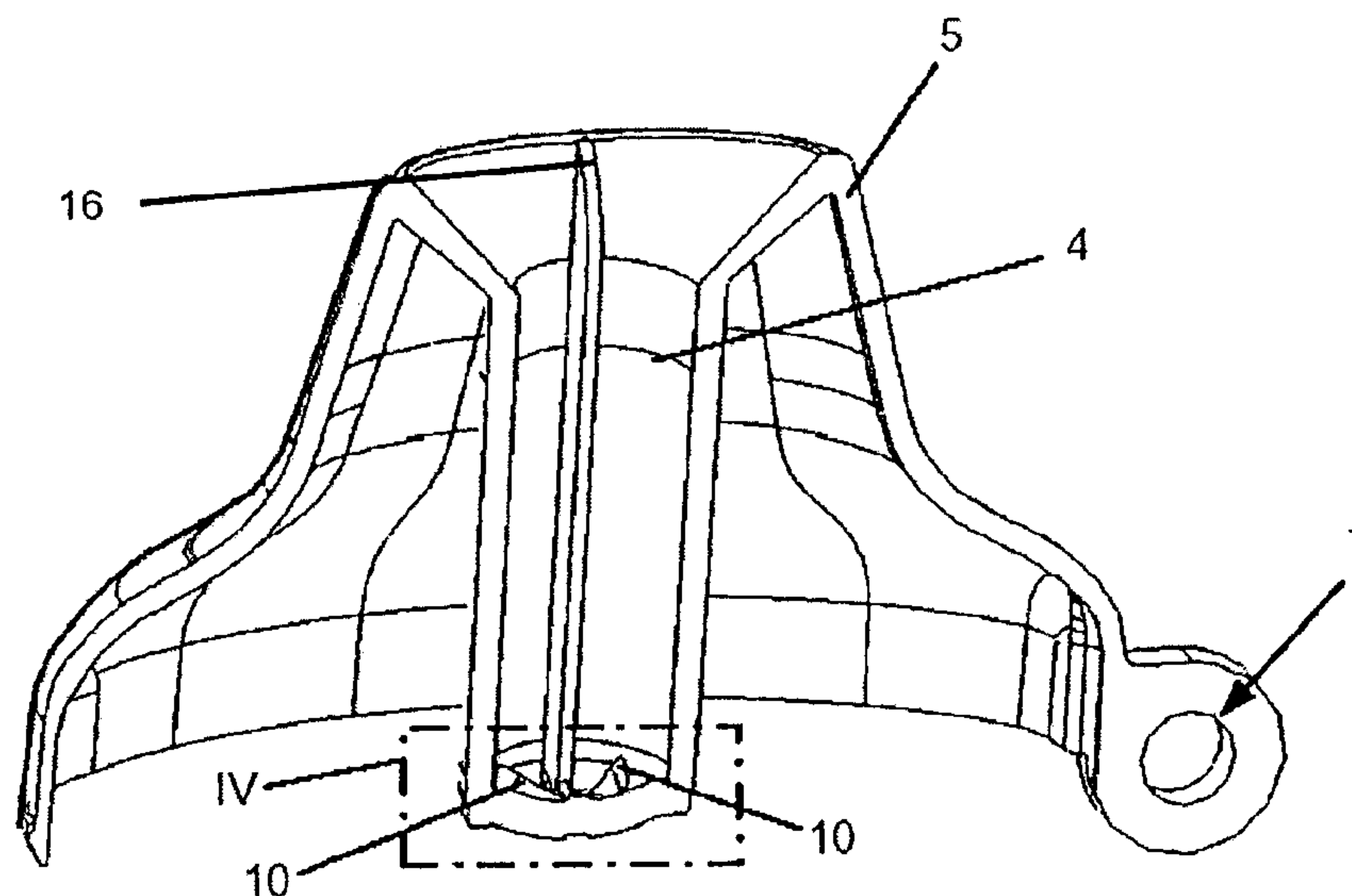




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(54) **Titre : EMBOUT BUCCAL D'INHALATEUR AVEC COMPOSANTES AERODYNAMIQUES DANS LE CANAL D'INHALATION**
(54) **Title: INHALER MOUTHPIECE WITH AERODYNAMIC COMPONENTS WITHIN THE INHALATION CHANNEL**



(57) **Abrégé/Abstract:**

A mouthpiece for an inhaler for administering a drug in the form of substances, substance formulations or substance mixtures that can be inhaled comprises an inhalation channel (4) for coupling to a chamber for receiving the drug. At least one component (10) having an aerodynamic cross-section is arranged in the inhalation channel (4).

Abstract

A mouthpiece for an inhaler for administering a drug in the form of substances, substance formulations or substance mixtures that can be inhaled comprises an inhalation channel (4) for coupling to a chamber for receiving the drug. At least one component (10) having an aerodynamic cross-section is arranged in the inhalation channel (4).

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INHALER MOUTHPIECE WITH AERODYNAMIC COMPONENTS WITHIN THE INHALATION CHANNEL

Specification

5

The invention relates to a mouthpiece for an inhaler for administering a medicament in the form of inhalable substances, formulations or mixtures of substances, comprising an inhalation channel for coupling to a chamber for holding the medicament, and an inhaler for this purpose.

10

EP 0 911 047 A1 discloses an inhaler for inhaling powdered medicaments from capsules, which comprises a lower part having two windows and a plate in which are provided capsule holders and air inlet openings. In addition, an inhalation chamber is connected to the plate, on which is provided a head having two sharp pins which is movable counter to a
15 spring. A mouthpiece tube is connected to an upper part of the inhaler and a lid is foldably connected to the lower part, the plate and the upper part.

20

Moreover, DE 39 27 170 A1 describes an inhaler for inhaling powdered, particularly micronised medicaments from capsules, the housing of which contains, for receiving the capsules, a tubular chamber with an air inlet in the base and an air outlet merging into a
mouthpiece at the opposite end of the chamber, and a cutting device having two blades that are movable inside the chamber for opening the capsules in the vicinity of the upper and lower ends thereof. In the upper part of the chamber, where it merges into the inhalation channel, there is provided a sieve plate which is part of a funnel-shaped connector that can
25 be fitted onto the start of the inhalation channel such that the edge of the funnel with the sieve plate engages in an insert plate that forms the bottom of the mouthpiece. Alternatively, the sieve plate is replaceably fitted in a clamped position between the funnel edge of the connector and an abutment of the insert plate. This inhaler is disadvantageous inasmuch as the sieve has to be mounted separately and uncontrolled turbulence in the aerosol
30 to be inhaled in the inhalation channel with concomitant deposition of the medicament cannot be ruled out.

The aim of the invention is to provide a mouthpiece and an inhaler of the kind mentioned hereinbefore, each of which ensures improved delivery of the medicament.

5 According to the invention the aim is achieved by providing at least one component with an aerodynamic cross section in the inhalation channel.

This measure reduces the uncontrolled turbulence of the aerosol which is to be inhaled in the inhalation channel and brings about a reduction in unhygienic residues of medicament
10 in the region of the mouthpiece. The skilled man will be familiar with profiles having an aerodynamic cross-section from fluidics technology, by which comparatively low turbulence can be obtained in an aerosol during inhalation.

Inhalers are known under the brand names HandiHaler[®], Spinhaler[®], Rotahaler[®], Aerol-
15 izer[®], Flowcaps[®], Turbospin[®], AIR DPI[®], Orbital[®], Directhaler[®] and/or described in DE 33 45 722, EP 0 591 136, DE 43 18 455, WO 91/02558, FR-A-2 146 202, US-A-4 069 819, EP 666085, EP 869079, US 3,991,761, WO 99/45987, WO 200051672, Bell, J. Pharm. Sci. 60, 1559 (1971); Cox, Brit. Med. J. 2, 634 (1969). Single- and multi-dose powder inhalers are known, particularly the Spinhaler[®], Rotahaler[®], Aerolizer[®], Inhalator[®],
20 HandiHaler[®], Diskhaler[®], Diskus[®], Accuhaler[®], Aerohaler[®], Eclipse[®], Turbohaler[®], Turbuhaler[®], Easyhaler[®], Novolizer[®], Clickhaler[®], Pulvinal[®], Novolizer[®], SkyeHaler[®], Xcelovair[®], Pulvina[®], Taifun[®], MAGhaler[®], Twisthaler[®] and the Jethaler[®].

The compounds listed below may be used in the device according to the invention on their
25 own or in combination. In the compounds mentioned below, W is a pharmacologically active substance and is selected (for example) from among the betamimetics, anticholinergics, corticosteroids, PDE4-inhibitors, LTD4-antagonists, EGFR-inhibitors, dopamine agonists, H1-antihistamines, PAF-antagonists and PI3-kinase inhibitors. Moreover, double or triple combinations of W may be combined and used in the device according to the in-
30 vention. Combinations of W might be, for example:

- W denotes a betamimetic, combined with an anticholinergic, corticosteroid, PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist,
- W denotes an anticholinergic, combined with a betamimetic, corticosteroid, PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist,
- 5 - W denotes a corticosteroid, combined with a PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist
- W denotes a PDE4-inhibitor, combined with an EGFR-inhibitor or LTD4-antagonist
- W denotes an EGFR-inhibitor, combined with an LTD4-antagonist.

10 The compounds used as betamimetics are preferably compounds selected from among albuterol, arformoterol, bambuterol, bitolterol, broxaterol, carbuterol, clenbuterol, fenoterol, formoterol, hexoprenaline, ibuterol, isoetharine, isoprenaline, levosalbutamol, mabuterol, meluadrine, metaproterenol, orciprenaline, pirbuterol, procaterol, reproterol, rimiterol, ritodrine, salmefamol, salmeterol, soterenol, sulphonterol, terbutaline, tiaramide, tolubuterol, zinterol, CHF-1035, HOKU-81, KUL-1248 and

- 3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-benzyl-sulphonamide
- 5-[2-(5,6-diethyl-indan-2-ylamino)-1-hydroxy-ethyl]-8-hydroxy-1H-quinolin-2-one
- 4-hydroxy-7-[2-{[2-{[3-(2-phenylethoxy)propyl]sulphonyl}ethyl]-amino}ethyl]-2(3H)-benzothiazolone
- 20 - 1-(2-fluoro-4-hydroxyphenyl)-2-[4-(1-benzimidazolyl)-2-methyl-2-butylamino]ethanol
- 1-[3-(4-methoxybenzyl-amino)-4-hydroxyphenyl]-2-[4-(1-benzimidazolyl)-2-methyl-2-butylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-N,N-dimethylaminophenyl)-2-methyl-2-propylamino]ethanol
- 25 - 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-methoxyphenyl)-2-methyl-2-propylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-n-butyloxyphenyl)-2-methyl-2-propylamino]ethanol

- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-{4-[3-(4-methoxyphenyl)-1,2,4-triazol-3-yl]-2-methyl-2-butylamino} ethanol
- 5-hydroxy-8-(1-hydroxy-2-isopropylaminobutyl)-2H-1,4-benzoxazin-3-(4H)-one
- 1-(4-amino-3-chloro-5-trifluoromethylphenyl)-2-tert.-butylamino) ethanol
- 5 - 6-hydroxy-8-{1-hydroxy-2-[2-(4-methoxy-phenyl)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(ethyl 4-phenoxy-acetate)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-phenoxy-acetic acid)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 10 - 8-{2-[1,1-dimethyl-2-(2,4,6-trimethylphenyl)-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-hydroxy-phenyl)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 15 - 6-hydroxy-8-{1-hydroxy-2-[2-(4-isopropyl-phenyl)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 8-{2-[2-(4-ethyl-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 8-{2-[2-(4-ethoxy-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 20 - 4-(4-{2-[2-hydroxy-2-(6-hydroxy-3-oxo-3,4-dihydro-2H-benzo[1,4]oxazin-8-yl)-ethylamino]-2-methyl-propyl}-phenoxy)-butyric acid
- 8-{2-[2-(3,4-difluoro-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 25 - 1-(4-ethoxy-carbonylamino-3-cyano-5-fluorophenyl)-2-(tert-butylamino) ethanol
- 2-hydroxy-5-(1-hydroxy-2-{2-[4-(2-hydroxy-2-phenyl-ethylamino)-phenyl]-ethylamino}-ethyl)-benzaldehyde
- N-[2-hydroxy-5-(1-hydroxy-2-{2-[4-(2-hydroxy-2-phenyl-ethylamino)-phenyl]-ethylamino}-ethyl)-phenyl]-formamide

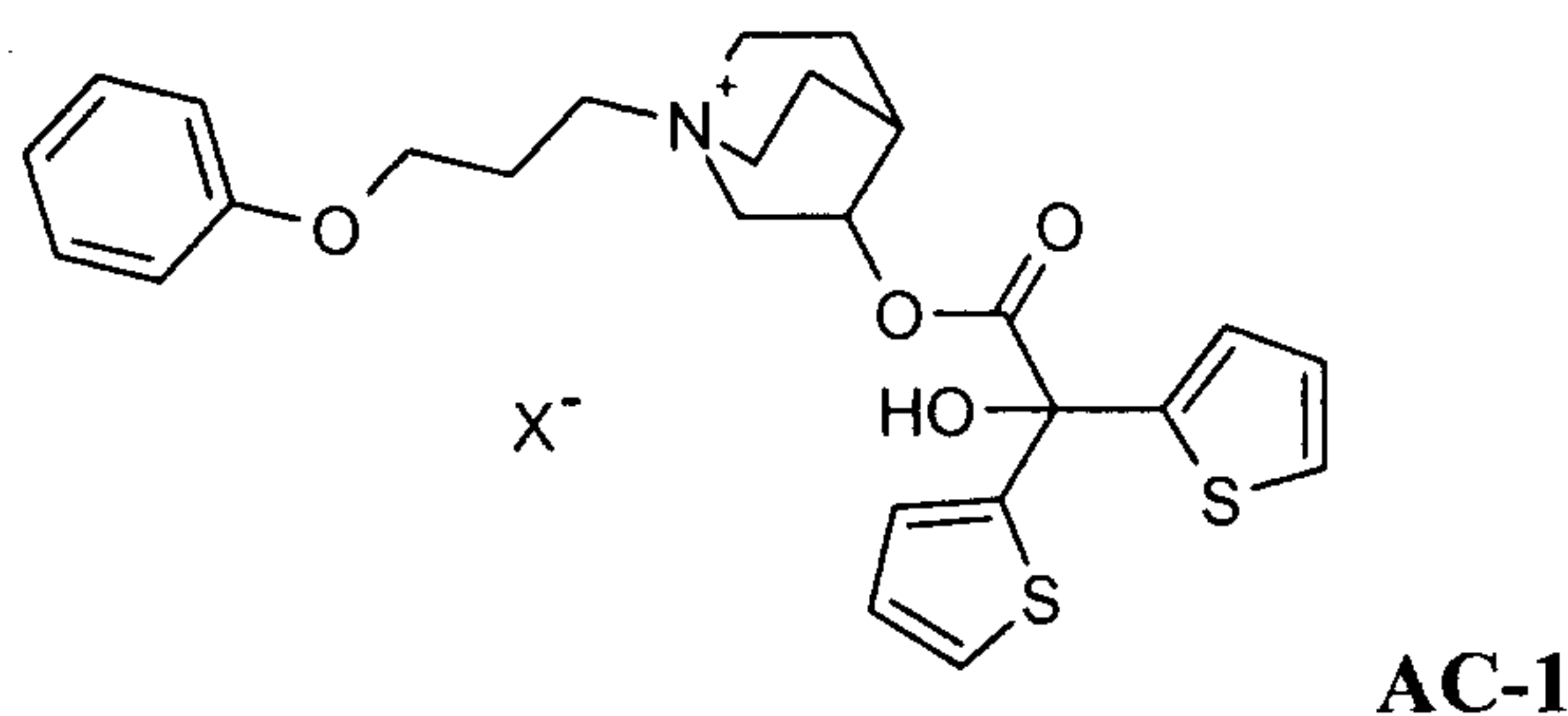
- 8-hydroxy-5-(1-hydroxy-2-{2-[4-(6-methoxy-biphenyl-3-ylamino)-phenyl]-ethylamino}-ethyl)-1H-quinolin-2-one
- 8-hydroxy-5-[1-hydroxy-2-(6-phenethylamino-hexylamino)-ethyl]-1H-quinolin-2-one
- 5-[2-(2-{4-[4-(2-amino-2-methyl-propoxy)-phenylamino]-phenyl}-ethylamino)-1-hydroxy-ethyl]-8-hydroxy-1H-quinolin-2-one
- [3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-5-methyl-phenyl]-urea
- 4-(2-{6-[2-(2,6-dichloro-benzyloxy)-ethoxy]-hexylamino}-1-hydroxy-ethyl)-2-hydroxymethyl-phenol
- 3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-benzylsulphonamide
- 3-(3-{7-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-heptyloxy}-propyl)-benzylsulphonamide
- 4-(2-{6-[4-(3-cyclopentanesulphonyl-phenyl)-butoxy]-hexylamino}-1-hydroxy-ethyl)-2-hydroxymethyl-phenol
- N-Adamantan-2-yl-2-(3-{2-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-propyl}-phenyl)-acetamide

optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

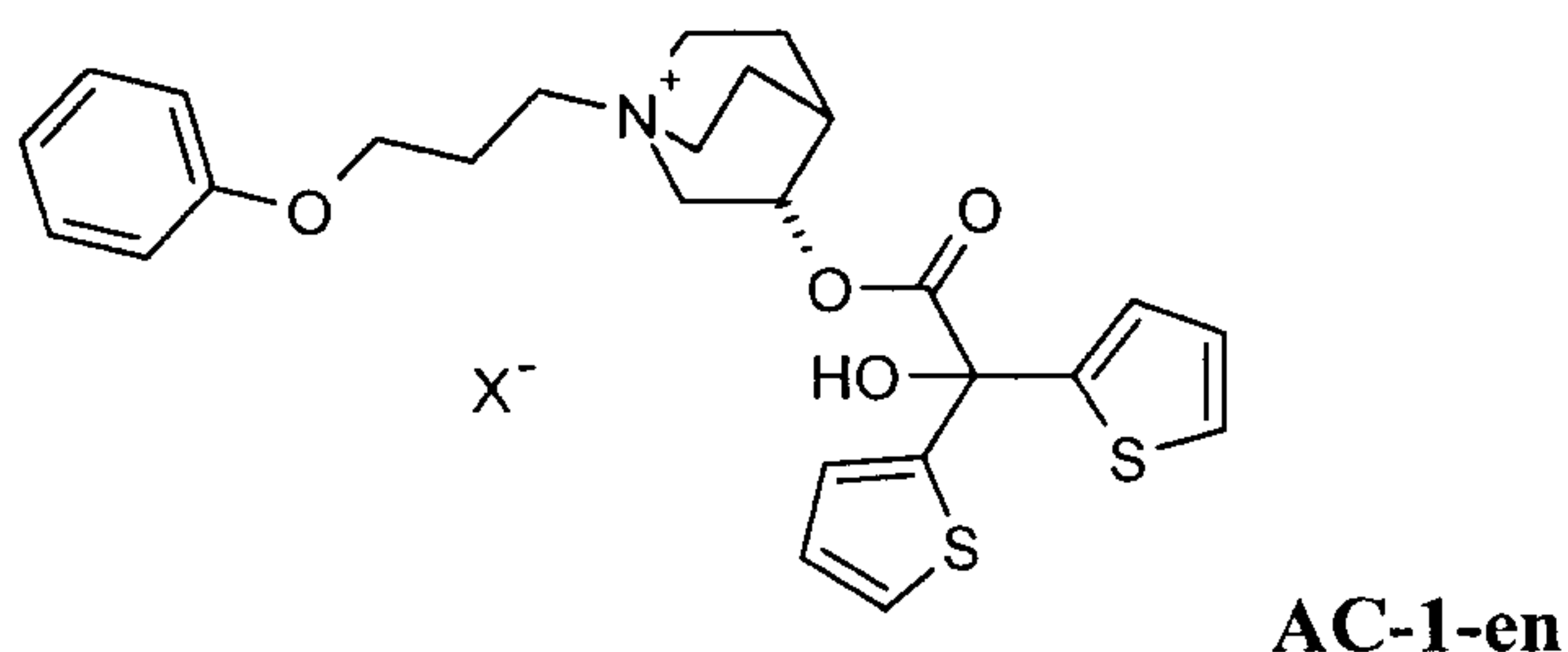
The anticholinergics used are preferably compounds selected from among the tiotropium salts, preferably the bromide salt, oxitropium salts, preferably the bromide salt, flutropium salts, preferably the bromide salt, ipratropium salts, preferably the bromide salt, glycopyrronium salts, preferably the bromide salt, trospium salts, preferably the chloride salt,

tolterodine. In the above-mentioned salts the cations are the pharmacologically active constituents. As anions the above-mentioned salts may preferably contain the chloride, bromide, iodide, sulphate, phosphate, methanesulphonate, nitrate, maleate, acetate, citrate, fumarate, tartrate, oxalate, succinate, benzoate or p-toluenesulphonate, while chloride, bromide, iodide, sulphate, methanesulphonate or p-toluenesulphonate are preferred as counter-ions. Of all the salts the chlorides, bromides, iodides and methanesulphonates are particularly preferred.

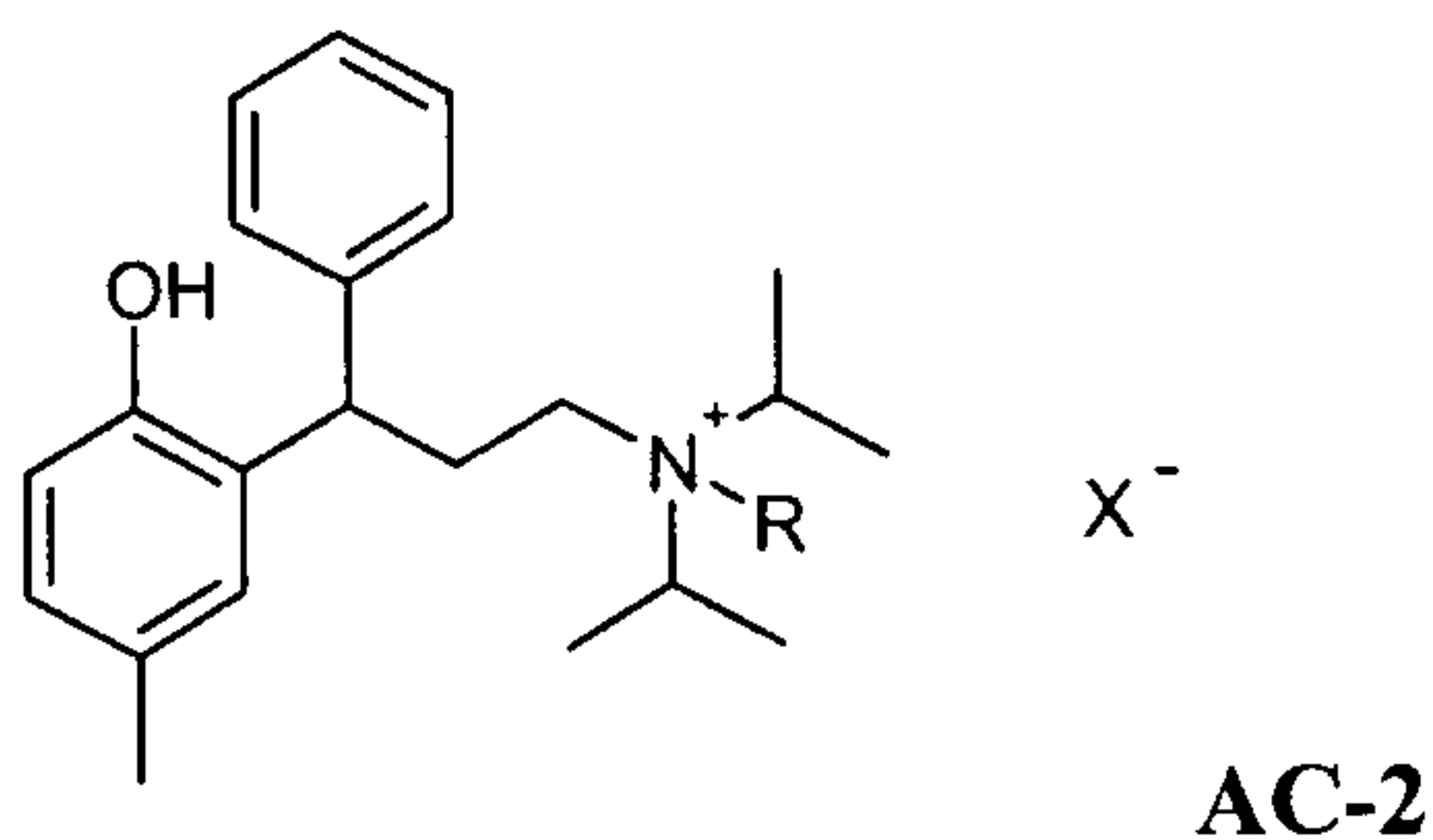
Other preferred anticholinergics are selected from among the salts of formula **AC-1**



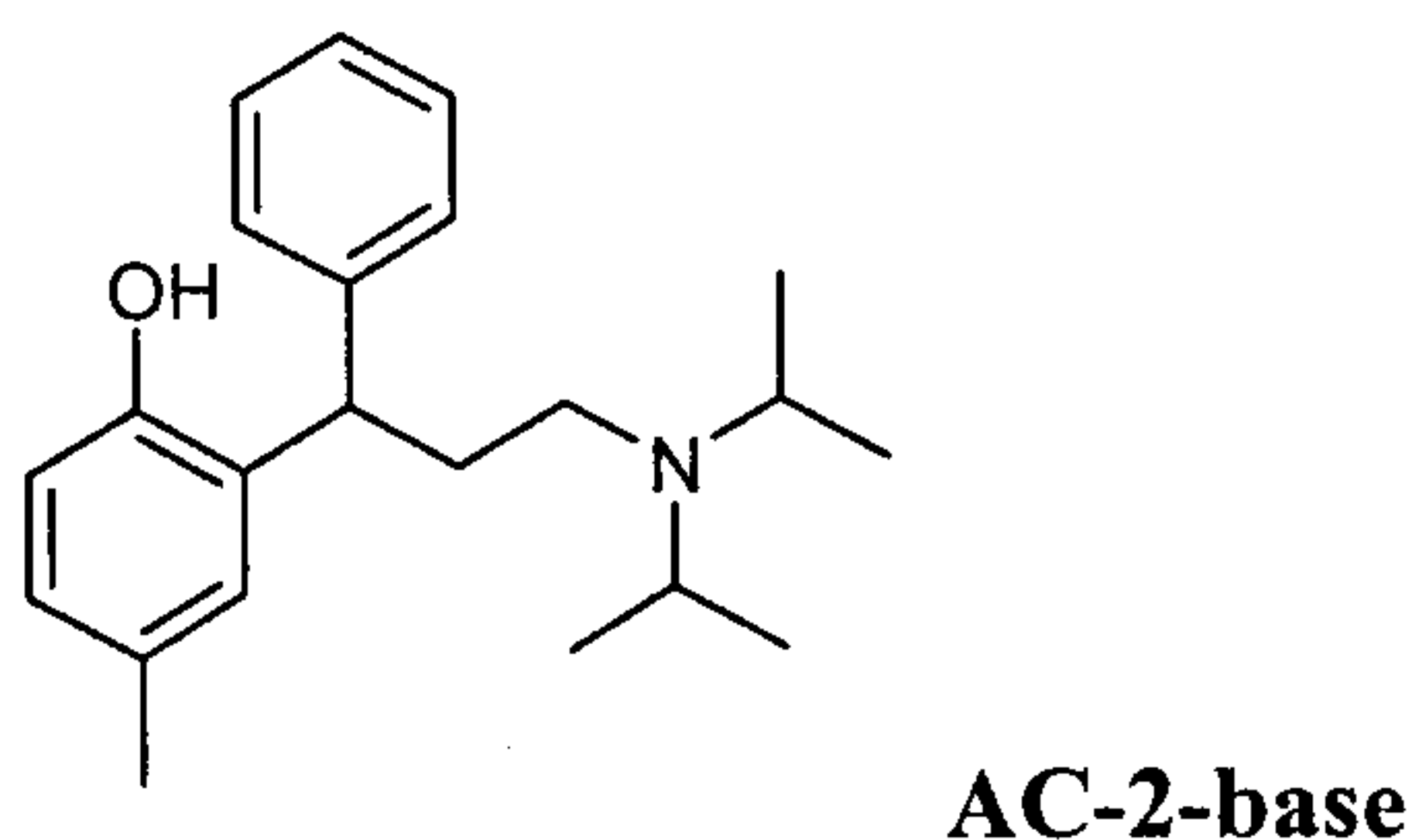
wherein X^- denotes an anion with a single negative charge, preferably an anion selected from among the fluoride, chloride, bromide, iodide, sulphate, phosphate, methanesulphonate, nitrate, maleate, acetate, citrate, fumarate, tartrate, oxalate, succinate, benzoate and p-toluenesulphonate, preferably an anion with a single negative charge, particularly preferably an anion selected from among the fluoride, chloride, bromide, methanesulphonate and p-toluenesulphonate, particularly preferably bromide, optionally in the form of the racemates, enantiomers or hydrates thereof. Of particular importance are those pharmaceutical combinations which contain the enantiomers of formula **AC-1-en**



wherein X^- may have the above-mentioned meanings. Other preferred anticholinergics are selected from the salts of formula **AC-2**



wherein R denotes either methyl or ethyl and wherein X^- may have the above-mentioned meanings. In an alternative embodiment the compound of formula **AC-2** may also be present in the form of the free base **AC-2-base**.



Other specified compounds are:

- tropenol 2,2-diphenylpropionate methobromide,
- 15 - scopine 2,2-diphenylpropionate methobromide,
- scopine 2-fluoro-2,2-diphenylacetate methobromide,
- tropenol 2-fluoro-2,2-diphenylacetate methobromide;
- tropenol 3,3',4,4'-tetrafluorobenzilate methobromide,
- scopine 3,3',4,4'-tetrafluorobenzilate methobromide,
- 20 - tropenol 4,4'-difluorobenzilate methobromide,
- scopine 4,4'-difluorobenzilate methobromide,
- tropenol 3,3'-difluorobenzilate methobromide,

- scopine 3,3'- difluorobenzilate methobromide;
- tropenol 9-hydroxy-fluorene-9-carboxylate methobromide;
- tropenol 9-fluoro-fluorene-9-carboxylate methobromide;
- scopine 9-hydroxy-fluorene-9-carboxylate methobromide;
- 5 - scopine 9-fluoro-fluorene-9-carboxylate methobromide;
- tropenol 9-methyl-fluorene-9-carboxylate methobromide;
- scopine 9-methyl-fluorene-9-carboxylate methobromide;
- cyclopropyltropine benzilate methobromide;
- cyclopropyltropine 2,2-diphenylpropionate methobromide;
- 10 - cyclopropyltropine 9-hydroxy-xanthene-9-carboxylate methobromide;
- cyclopropyltropine 9-methyl-fluorene-9-carboxylate methobromide;
- cyclopropyltropine 9-methyl-xanthene-9-carboxylate methobromide;
- cyclopropyltropine 9-hydroxy-fluorene-9-carboxylate methobromide;
- cyclopropyltropine methyl 4,4'-difluorobenzilate methobromide.
- 15 - tropenol 9-hydroxy-xanthene-9-carboxylate methobromide;
- scopine 9-hydroxy-xanthene-9-carboxylate methobromide;
- tropenol 9-methyl-xanthene-9-carboxylate methobromide;
- scopine 9-methyl-xanthene-9-carboxylate methobromide;
- tropenol 9-ethyl-xanthene-9-carboxylate methobromide;
- 20 - tropenol 9-difluoromethyl-xanthene-9-carboxylate methobromide;
- scopine 9-hydroxymethyl-xanthene-9-carboxylate methobromide,

The above-mentioned compounds may also be used as salts within the scope of the present invention, wherein instead of the methobromide the salts metho-X are used, wherein X
 25 may have the meanings given hereinbefore for X⁻.

As corticosteroids it is preferable to use compounds selected from among beclomethasone, betamethasone, budesonide, butixocort, ciclesonide, deflazacort, dexamethasone, etipred-
 nol, flunisolide, fluticasone, loteprednol, mometasone, prednisolone, prednisone, roflepon-
 30 ide, triamcinolone, RPR-106541, NS-126, ST-26 and

- (S)-fluoromethyl 6,9-difluoro-17-[(2-furanylcarbonyl)oxy]-11-hydroxy-16-methyl-3-oxo-androsta-1,4-diene-17-carbothionate

- (S)-(2-oxo-tetrahydro-furan-3S-yl)6,9-difluoro-11-hydroxy-16-methyl-3-oxo-17-propionyloxy-androsta-1,4-diene-17-carbothionate,

- 5 - cyanomethyl 6 α ,9 α -difluoro-11 β -hydroxy-16 α -methyl-3-oxo-17 α -(2,2,3,3-tertamethylcyclopropylcarbonyl)oxy-androsta-1,4-diene-17 β -carboxylate

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the salts and derivatives thereof, the solvates and/or hydrates thereof.

Any reference to steroids includes a reference to any salts or derivatives, hydrates or solvates thereof which may exist. Examples of possible salts and derivatives of the steroids may be: alkali metal salts, such as for example sodium or potassium salts, sulphobenzoates, phosphates, isonicotinates, acetates, dichloroacetates, propionates, dihydrogen phosphates, palmitates, pivalates or furoates.

15 PDE4-inhibitors which may be used are preferably compounds selected from among enprofyllin, theophyllin, roflumilast, ariflo (cilomilast), tofimilast, pumafentrin, lirimilast, arofyllin, atizoram, D-4418, Bay-198004, BY343, CP-325.366, D-4396 (Sch-351591), AWD-12-281 (GW-842470), NCS-613, CDP-840, D-4418, PD-168787, T-440, T-2585, V-11294A, CI-1018, CDC-801, CDC-3052, D-22888, YM-58997, Z-15370 and

- 20 - N-(3,5-dichloro-1-oxo-pyridin-4-yl)-4-difluoromethoxy-3-cyclopropylmethoxybenzamide
- (-)p-[(4aR*,10bS*)-9-ethoxy-1,2,3,4,4a,10b-hexahydro-8-methoxy-2-methylbenzo[s][1,6]naphthyridin-6-yl]-N,N-diisopropylbenzamide
- (R)-(+)-1-(4-bromobenzyl)-4-[(3-cyclopentyloxy)-4-methoxyphenyl]-2-pyrrolidone
- 25 - 3-(cyclopentyloxy-4-methoxyphenyl)-1-(4-N'-[N-2-cyano-S-methylisothioureido]benzyl)-2-pyrrolidone
- cis[4-cyano-4-(3-cyclopentyloxy-4-methoxyphenyl)cyclohexane-1-carboxylic acid]
- 2-carbomethoxy-4-cyano-4-(3-cyclopropylmethoxy-4-difluoromethoxyphenyl)cyclohexan-1-one
- 30 - cis[4-cyano-4-(3-cyclopropylmethoxy-4-difluoromethoxyphenyl)cyclohexan-1-ol]

- (R)-(+)-ethyl[4-(3-cyclopentyloxy-4-methoxyphenyl)pyrrolidin-2-ylidene]acetate
- (S)-(-)-ethyl[4-(3-cyclopentyloxy-4-methoxyphenyl)pyrrolidin-2-ylidene]acetate
- 9-cyclopentyl-5,6-dihydro-7-ethyl-3-(2-thienyl)-9*H*-pyrazolo[3,4-*c*]-1,2,4-triazolo[4,3-*a*]pyridine
- 5 - 9-cyclopentyl-5,6-dihydro-7-ethyl-3-(*tert*-butyl)-9*H*-pyrazolo[3,4-*c*]-1,2,4-triazolo[4,3-*a*]pyridine

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts thereof, the solvates and/or hydrates thereof. According to the invention the acid addition salts of the

10 PDE4 inhibitors are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-*p*-toluenesulphonate.

15 The LTD4-antagonists used are preferably compounds selected from among montelukast, pranlukast, zafirlukast, MCC-847 (ZD-3523), MN-001, MEN-91507 (LM-1507), VUF-5078, VUF-K-8707, L-733321 and

- 1-(((R)-3-(2-(6,7-difluoro-2-quinolinyl)ethenyl)phenyl)-3-(2-(2-hydroxy-2-propyl)phenyl)thio)methylcyclopropane-acetic acid,
- 20 - 1-(((1(R)-3(3-(2-(2,3-dichlorothieno[3,2-*b*]pyridin-5-yl)-(E)-ethenyl)phenyl)-3-(2-(1-hydroxy-1-methylethyl)phenyl)propyl)thio)methyl)cyclopropaneacetic acid
- [2-[[2-(4-*tert*-butyl-2-thiazolyl)-5-benzofuranyl]oxymethyl]phenyl]acetic acid

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates and/or

25 hydrates thereof. According to the invention these acid addition salts are preferably selected from among the hydrochloride, hydrobromide, hydroiodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-*p*-toluenesulphonate. By salts or derivatives which the LTD4-antagonists may optionally

30 be capable of forming are meant, for example: alkali metal salts, such as for example so-

dium or potassium salts, alkaline earth metal salts, sulphobenzoates, phosphates, isonicotines, acetates, propionates, dihydrogen phosphates, palmitates, pivalates or furoates.

EGFR-inhibitors which may be used are preferably compounds selected from among

5 cetuximab, trastuzumab, ABX-EGF, Mab ICR-62 and

- 4-[(3-chloro-4-fluorophenyl)amino]-6-[[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]-amino]-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-[[4-(N,N-diethylamino)-1-oxo-2-buten-1-yl]-amino]-7-cyclopropylmethoxy-quinazoline
- 10 - 4-[(3-chloro-4-fluorophenyl)amino]-6-[[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino]-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-[[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]amino]-7-cyclopentyloxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino]-7-cyclopropylmethoxy-quinazoline
- 15 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino]-7-[(S)-(tetrahydrofuran-3-yl)oxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[[4-((R)-2-methoxymethyl-6-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino]-7-cyclopropylmethoxy-quinazoline
- 20 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-((S)-6-methyl-2-oxo-morpholin-4-yl)-ethoxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-[[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino]-7-cyclopentyloxy-quinazoline
- 25 - 4-[(R)-(1-phenyl-ethyl)amino]-6-[[4-(N,N-to-(2-methoxy-ethyl)-amino)-1-oxo-2-buten-1-yl]amino]-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-ethyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline

- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl} amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(tetrahydropyran-4-yl)-N-methyl-amino]-1-oxo-2-buten-1-yl} amino)-7-cyclopropylmethoxy-quinazoline
- 5 - 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-((R)-tetrahydrofuran-3-yloxy)-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-((S)-tetrahydrofuran-3-yloxy)-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl} amino)-7-cyclopentyloxy-quinazoline
- 10 - 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N-cyclopropyl-N-methyl-amino)-1-oxo-2-buten-1-yl]amino}-7-cyclopentyloxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-[(R)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 15 - 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6.7-to-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-7-[3-(morpholin-4-yl)-propyloxy]-6-[(vinyl-carbonyl)amino]-quinazoline
- 20 - 4-[(R)-(1-phenyl-ethyl)amino]-6-(4-hydroxy-phenyl)-7H-pyrrolo[2,3-d]pyrimidine
- 3-cyano-4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-ethoxy-quinoline
- 4-{[3-chloro-4-(3-fluoro-benzyloxy)-phenyl]amino}-6-(5-{[(2-methanesulphonyl-ethyl)amino]methyl}-furan-2-yl)quinazoline
- 25 - 4-[(R)-(1-phenyl-ethyl)amino]-6-{[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]-amino}-7-[(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N,N-to-(2-methoxy-ethyl)-amino]-1-oxo-2-buten-1-yl} amino)-7-[(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 30

- 4-[(3-ethynyl-phenyl)amino]-6-{[4-(5,5-dimethyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-methoxy-quinazoline
- 5 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-[(R)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-7-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-6-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{2-[4-(2-oxo-morpholin-4-yl)-piperidin-1-yl]-ethoxy}-7-methoxy-quinazoline
- 10 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(tert.-butoxycarbonyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-amino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 15 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-methanesulphonylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-3-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 20 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(methoxymethyl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 25 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(piperidin-3-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(2-acetylamino-ethyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-ethoxy-quinazoline

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-((S)-tetrahydrofuran-3-yloxy)-7-hydroxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-methoxy-ethoxy)-quinazoline
- 5 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(dimethylamino)sulphonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(morpholin-4-yl)carbonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(morpholin-4-yl)sulphonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 10 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-acetylamino-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-methanesulphonylamino-ethoxy)-quinazoline
- 15 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(piperidin-1-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-aminocarbonylmethyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(tetrahydropyran-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 20 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(morpholin-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(morpholin-4-yl)sulphonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 25 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-ethanesulphonylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-ethoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-(2-methoxy-ethoxy)-quinazoline
- 30

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(2-methoxy-acetyl)-piperidin-4-yloxy]-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-acetylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 5 - 4-[(3-ethynyl-phenyl)amino]-6-[1-(tert.-butyloxycarbonyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(piperidin-1-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 10 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(4-methyl-piperazin-1-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{cis-4-[(morpholin-4-yl)carbonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[2-(2-oxopyrrolidin-1-yl)ethyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 15 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(1-acetyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 20 - 4-[(3-ethynyl-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-isopropylloxycarbonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 25 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-methylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{cis-4-[N-(2-methoxy-acetyl)-N-methyl-amino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 30 - 4-[(3-ethynyl-phenyl)amino]-6-(piperidin-4-yloxy)-7-methoxy-quinazoline

- 4-[(3-ethynyl-phenyl)amino]-6-[1-(2-methoxy-acetyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 5 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(cis-2,6-dimethyl-morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(2-methyl-morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(S,S)-(2-oxa-5-aza-bicyclo[2,2,1]hept-5-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 10 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(N-methyl-N-2-methoxyethyl-amino)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-ethyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 15 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(2-methoxyethyl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(3-methoxypropyl-amino)-carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[cis-4-(N-methanesulphonyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline
- 20 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[cis-4-(N-acetyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-methylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 25 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[trans-4-(N-methanesulphonyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-dimethylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-{N-[(morpholin-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 30

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 5 - 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-cyano-piperidin-4-yloxy)-7-methoxy-quinazoline

optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention these acid addition salts are preferably selected from

10 among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

15 The dopamine agonists used are preferably compounds selected from among bromocriptin, cabergoline, alpha-dihydroergocryptine, lisuride, pergolide, pramipexol, roxindol, ropinirol, talipexol, tergurid and viozan, optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention these acid addition

20 salts are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

25 H1-Antihistamines which may be used are preferably compounds selected from among epinastine, cetirizine, azelastine, fexofenadine, levocabastine, loratadine, mizolastine, ketotifen, emedastine, dimetindene, clemastine, bamipine, cexchlorpheniramine, pheniramine, doxylamine, chlorphenoxamine, dimenhydrinate, diphenhydramine, promethazine, ebastine, desloratidine and meclozine, optionally in the form of the racemates,

30 enantiomers, diastereomers thereof and optionally in the form of the pharmacologically

acceptable acid addition salts, solvates or hydrates thereof. According to the invention these acid addition salts are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

It is also possible to use inhalable macromolecules as disclosed in EP 1 003 478.

In addition, the compound may come from the groups of ergot alkaloid derivatives, the triptans, the CGRP-inhibitors, the phosphodiesterase-V inhibitors, optionally in the form of the racemates, enantiomers or diastereomers thereof, optionally in the form of the pharmacologically acceptable acid addition salts, the solvates and/or hydrates thereof.

Examples of ergot alkaloid derivatives are dihydroergotamine and ergotamine.

For inhalation it is possible to use medicaments containing the above-mentioned active substances, as well as the salts and esters thereof and combinations of these active substances, salts and esters.

Preferably the component is integrally connected to the inhalation channel and extends radially into the inhalation channel. This saves costs in the assembly of the mouthpiece or inhaler.

According to a further feature, the component is constructed as an aerodynamic body, particularly an NACA profile. An NACA profile is a symmetrical profile from a series of tests run by the National Advisory Committee for Aerodynamic (NACA). NACA profiles are characterised by their rounded nose and back half tapering to a point. Different NACA profiles are described, for example, on pages 210 to 213, 218, 219, 222 and 223 of Dubs, Fritz, Aerodynamik der reinen Unterschallströmung, 4th newly revised edition, published by Birkhäuser, Basle, ISBN 3-7643-1073-1.

Preferably an NACA profile 0030 or similar is used; it has been found that the dose of medicament delivered is increased by the use of a such a profile, compared with a conventional screen. Expediently, the rounded nose of the streamlined body faces in the direction
5 of the mouthpiece and the pointed end towards the chamber.

To prevent relatively large particles from passing through the inhalation channel and moreover to provide an abutment for a capsule containing a medicament, a plurality of streamlined bodies are arranged in a star shape relative to one another. This arrangement
10 also ensures comparatively high stability which helps with the emptying of the capsule vibrating during inhalation. In addition, the star-shaped alignment of the NACA profiles generates a cyclone-like vortex during inhalation, which can be used to modify the particle size distribution of the medicament, as strong turbulence leads to the preferred depositing of large and heavy particles in the inhalation channel, whereas light particles of active substance reach the patient or user of the inhaler. Preferably the inhalation channel is round in
15 cross-section. Expediently, the streamlined bodies are arranged at the opposite end of the inhalation channel from the mouth end.

In its construction, the mouthpiece together with the inhalation channel and the NACA
20 profiles is made of plastics. Preferably the plastics are polymers, thermoplastic polycondensates, polyadducts, modified natural materials or rubbers or mixtures of these plastics. Particularly preferred plastics are polyolefins, vinyl chloride polymers, styrene polymers, polyacetals, polyamides, thermoplastic polyesters and polyarylethers or mixtures of these plastics. Examples of these plastics are polyethylene, polyvinyl chloride, polyoxymethylene, polyacetal, acrylonitrile/butadiene/styrene (ABS), acrylonitrile/styrene/acrylate
25 (ASA), polyamides, polycarbonate, poly(ethyleneterephthalate), poly(butyleneterephthalate) or poly(phenylene ether). Such plastics may be obtained for example from Ensinger of Nufringen, Germany.

30 Preferably the mouthpiece together with the inhalation channel and the NACA profiles ar-

ranged therein may be produced by injection moulding. The NACA profiles act as distributors for the plastic melt, while an injection moulding point may be formed, for example, in the centre of the profiles that are arranged in a star shape relative to one another. Besides a star-shaped arrangement, in a further embodiment, it is also possible to have a
5 bracket-like connection of the crosspieces in the internal channel of the mouthpiece (Fig. 2).

The mouthpiece described hereinbefore is preferably used in an inhaler for inhaling a powdered medicament from a capsule, the inhaler having a lower part to which a plate that can
10 be latched to the lower part is hinged for closing off the lower part. The plate has a capsule holder that can be countersunk in the lower part for receiving the capsule and can be latched to the mouthpiece. A cover that covers the mouthpiece in a position of closure is latched by means of a closure element. The lower part, the plate, the mouthpiece and the cover are pivotably connected to one another by a single joint. In addition, an actuating
15 member is provided that can be set in motion from a resting position and cooperates with at least one pin that can be pushed into the capsule holder. Preferably, two pins are provided, at a spacing from each other.

It will be realised that the features mentioned above and those still to be described hereinafter can be used not only in the particular combination specified but also in other combinations. The scope of the invention is defined only by the claims.

The invention is hereinafter explained in more detail by means of an exemplifying embodiment, with reference to the accompanying drawings, wherein:

25 Fig.1 is a perspective partial sectional view of an inhaler with a mouthpiece according to the invention,

Fig.2 is a perspective view of a section through the mouthpiece according to Figure 1,

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Fig.3 is a cross-section through an aerodynamic component of the mouthpiece in the view according to Fig. 2 and

Fig.4 is a magnified perspective view of the detail IV from Fig. 2.

Fig. 5 is a magnified perspective view of the detail IV corresponding to an alternative
5 mouthpiece according to Fig. 1.

According to one aspect of the present invention, there is provided mouthpiece for an inhaler for administering a medicament in the form of inhalable substances, substance formulations or mixtures, having an inhalation channel for coupling with a chamber for receiving the medicament, wherein in the inhalation channel is provided at least one component with an
10 aerodynamic cross-section wherein the at least one component is constructed as a streamlined body and wherein the at least one component is integrally connected to the inhalation channel and extends radially into the inhalation channel.

According to another aspect of the present invention, there is provided inhaler with a mouthpiece as described herein for inhaling a powdered medicament from a capsule, having a
15 lower part, a plate that can be latched to the lower part for closing the lower part, to which the mouthpiece can be latched, and a capsule holder that can be countersunk in the lower part for receiving the capsule, a cover, which covers the mouthpiece in a closure position and latches the mouthpiece by means of a closure element, the lower part, the plate, the mouthpiece and the cover being pivotably joined together by a single joint, and an actuating member, which
20 can be set in motion from a resting position, thereby cooperating with at least one pin that can be pushed into the capsule holder.

According to still another aspect of the present invention, there is provided inhaler for administering a powdered medicament in the form of inhalable substances, substance formulations or mixtures from a capsule, wherein the inhaler comprises a capsule holder for
25 receiving the capsule in a chamber and a mouthpiece, the mouthpiece comprising an inhalation channel for coupling with the chamber, wherein the mouthpiece comprises at least one crosspiece, to prevent improper insertion of the capsule.

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The inhaler has a lower part 1, to which a plate 2 that can be latched to the lower part 1 is hinged for closing the lower part 1. The plate 2 is provided with a capsule holder 3 that can be countersunk in the lower part 1 for receiving a capsule filled with a powdered medicament in a chamber and can be latched to a mouthpiece 5 comprising an inhalation channel 4. A
5 cover 6 that covers the mouthpiece 5 in a position of closure is latched by means of a closure element. The lower part 1, the plate 2, the mouthpiece 5 and the cover 6 are pivotably connected to one another by a common joint 7. In addition, an actuating member 8 is provided that cooperates with two pins 9 that can be pushed into the capsule holder 3 in order to pierce the capsule. The pins 9, at a spacing from each other, are movably guided in guide
10 connectors 14 of the capsule holder 3. To draw back the pins 9 so as to expose the holes in the capsule after the release of the actuating member 8, a compression spring 15 is arranged between the capsule holder 3 and the actuating member 8.

The mouthpiece 5 with the inhalation channel 4 of round cross-section formed therein is made of plastics and produced by injection moulding. At the opposite end of the inhalation
15 channel 4 from the mouth end are provided a number of components 10 of aerodynamic cross-section, arranged in a star shape relative to one another. The components 10 are constructed as NACA profiles 11 and each have a rounded nose 12 and a pointed end 13, while the end may also be rounded so as to make production easier. The mouthpiece also has one or more crosspieces 16, to prevent the improper insertion of unsuitable capsules, and also to
20 favourably affect the flow characteristics of the inhaler and the exit speed of the medicament.

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CLAIMS:

1. Mouthpiece for an inhaler for administering a medicament in the form of inhalable substances, substance formulations or mixtures, having an inhalation channel for coupling with a chamber for receiving the medicament, wherein in the inhalation channel is provided at least one component with an aerodynamic cross-section wherein the at least one component is constructed as a streamlined body and wherein the at least one component is integrally connected to the inhalation channel and extends radially into the inhalation channel.
2. Mouthpiece according to claim 1, wherein the streamlined body has a NACA profile.
3. Mouthpiece according to claim 1 or 2, wherein a rounded nose of the aerodynamic body faces in the direction of the mouthpiece and a pointed end faces towards the chamber.
4. Mouthpiece according to any one of claims 1 to 3, wherein a plurality of aerodynamic bodies are aligned with one another in a star shape.
5. Mouthpiece according to any one of claims 1 to 4, wherein the aerodynamic bodies are arranged at the opposite end of the inhalation channel from the mouth end.
6. Mouthpiece according to any one of claims 1 to 5, wherein the mouthpiece is made of plastics.
7. Mouthpiece according to any one of claims 1 to 6, wherein the mouthpiece is produced by injection moulding.
8. Mouthpiece according to any one of claims 1 to 7, wherein the inhalation channel of the mouthpiece has round cross section and at least one crosspiece, which is arranged at the inner wall of the inhalation channel.
9. Inhaler with a mouthpiece according to any one of claims 1 to 8 for inhaling a powdered medicament from a capsule, having

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- a lower part

- a plate that can be latched to the lower part for closing the lower part, to which the mouthpiece can be latched, and a capsule holder that can be countersunk in the lower part for receiving the capsule,

5 - a cover, which covers the mouthpiece in a closure position and latches the mouthpiece by means of a closure element, the lower part, the plate, the mouthpiece and the cover being pivotably joined together by a single joint, and

- an actuating member, which can be set in motion from a resting position, thereby cooperating with at least one pin that can be pushed into the capsule holder.

10 10. Inhaler according to claim 9 for administering a powdered medicament.

11. Inhaler according to claim 10 for administering a powdered medicament having one or more active substances selected from the group consisting of anticholinergics, betamimetics, steroids, phosphodiesterase IV-inhibitors, LTD4-antagonists, EGFR-kinase inhibitors, antiallergics, ergot alkaloid derivatives, triptans, CGRP-antagonists, and

15 phosphodiesterase-V-inhibitors.

12. Inhaler according to any one of claims 9 to 11 for administering a formulation containing tiotropiumbromide.

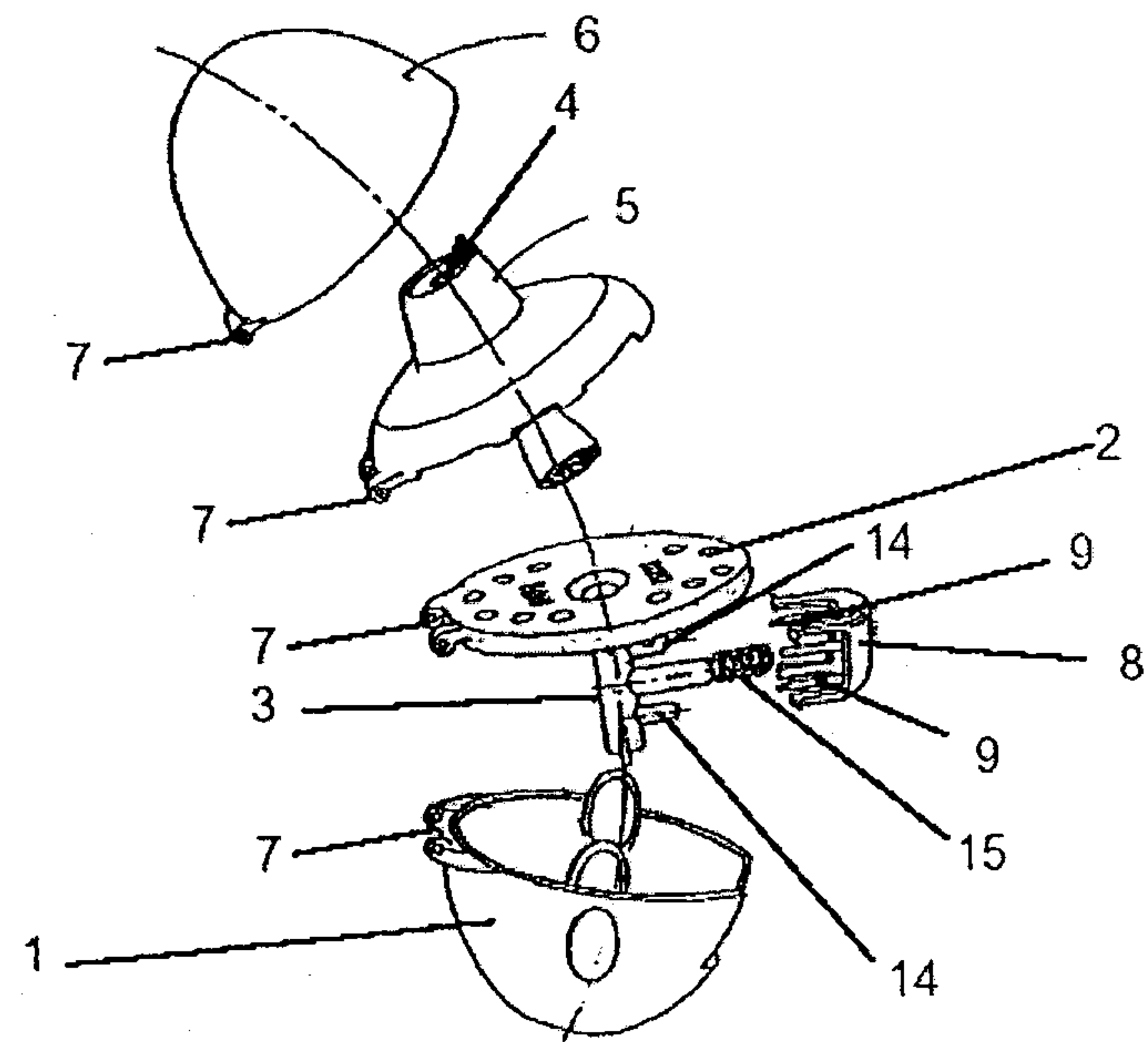


Fig. 1

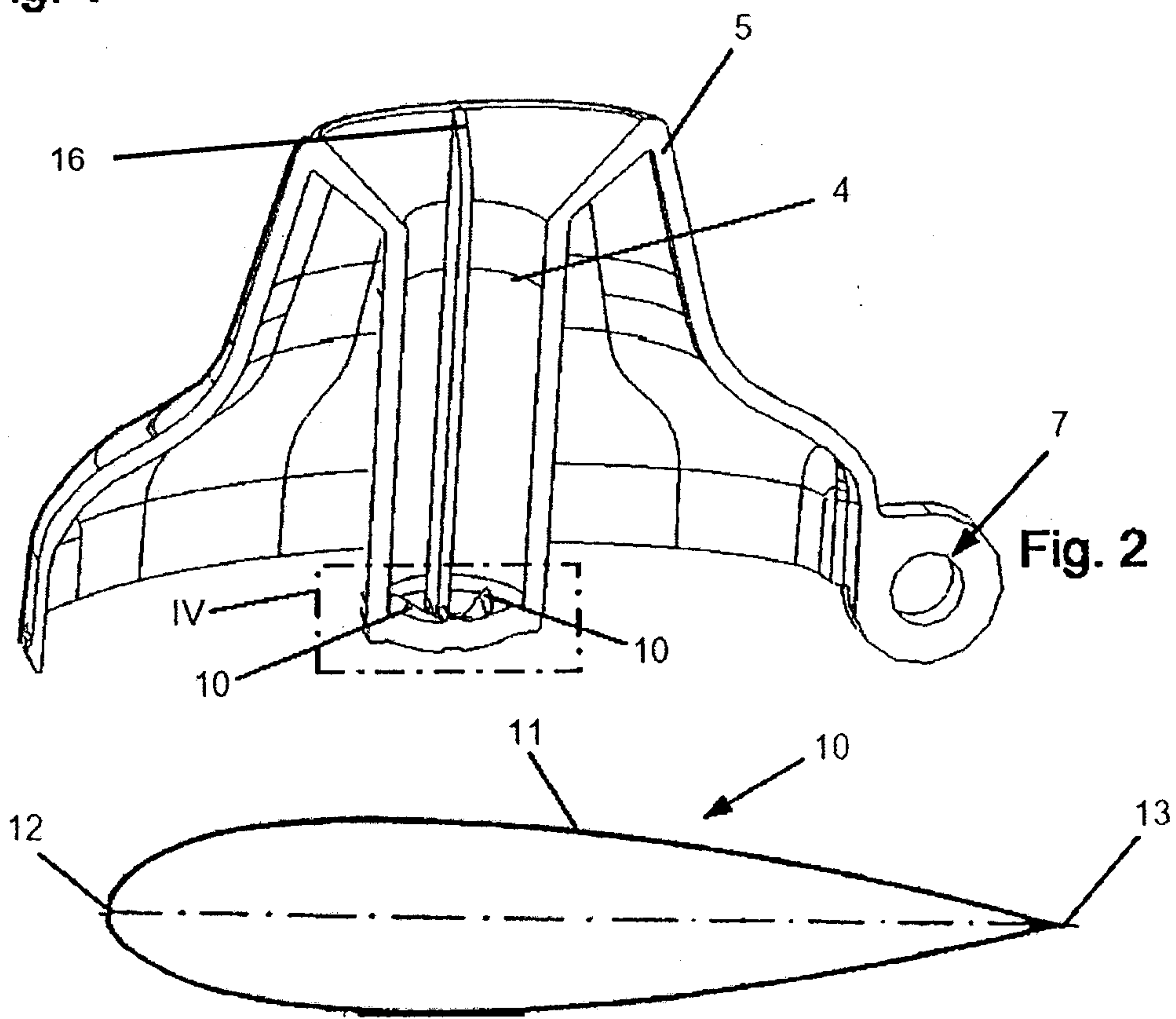


Fig. 3

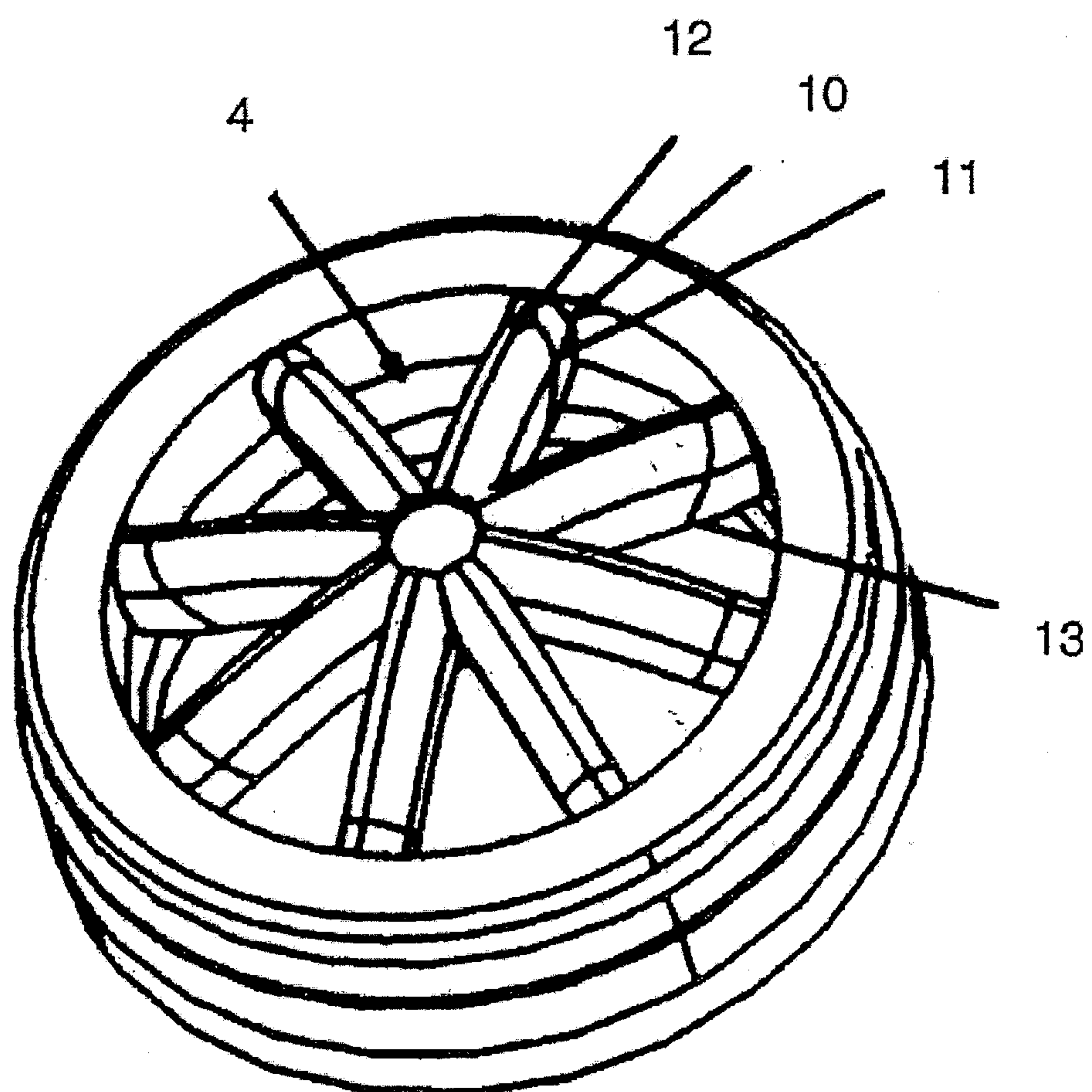


Fig. 4

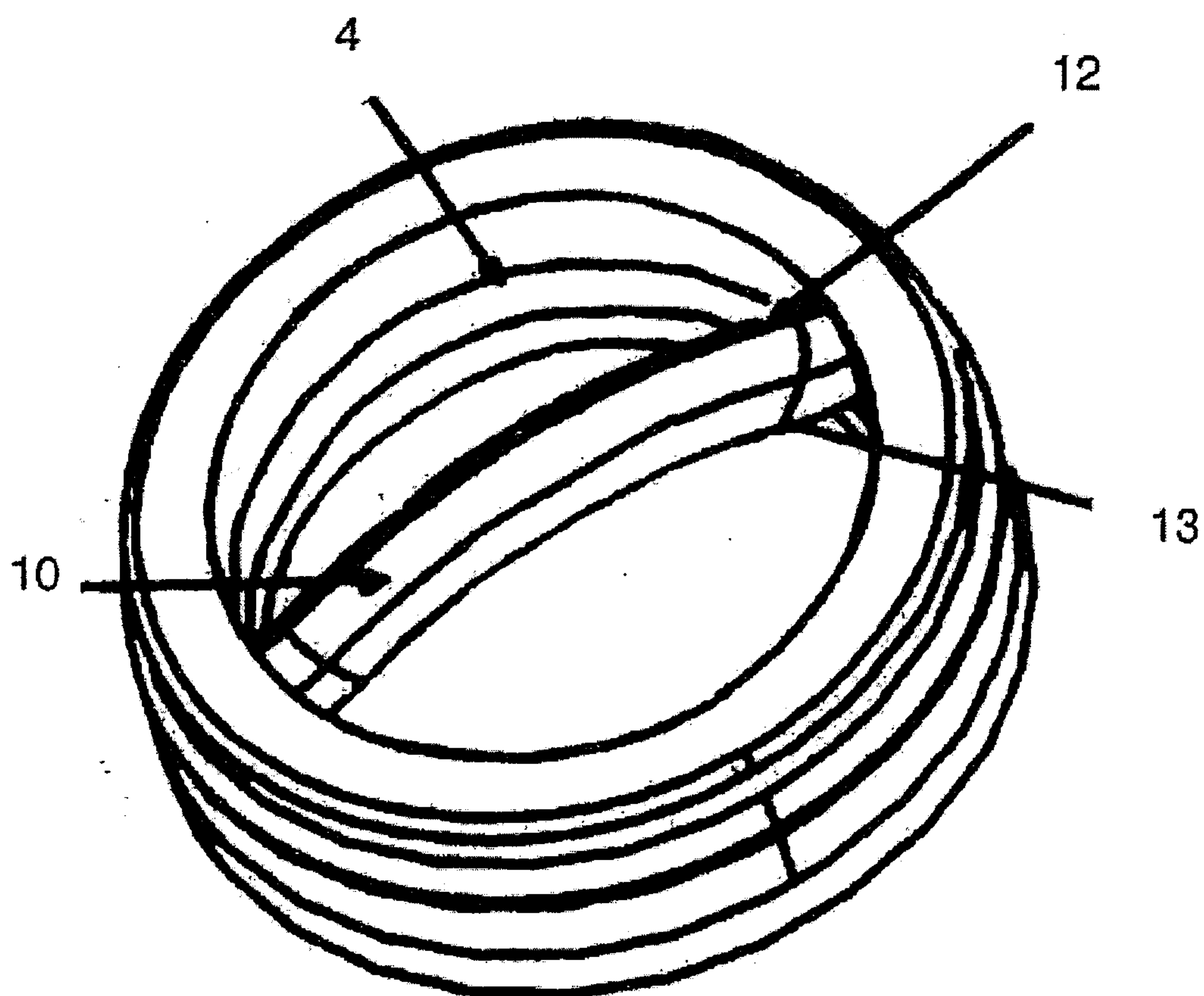


Fig. 5

