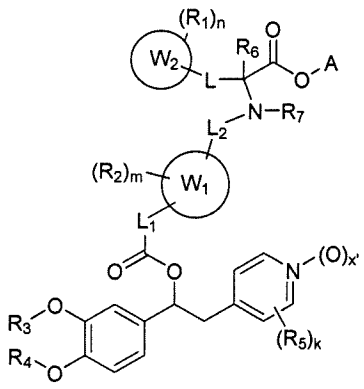
CLAIMS

1. A compound of general formula (I)



(I)

wherein

each R_1 is hydrogen or is independently selected in the group consisting of: halogen, (C_1-C_4) alkyl, (C_1-C_4) alkoxy, (C_1-C_4) haloalkyl, hydroxy, $-SO_2NR^IR^{II}$, -CN, $-NR^ISO_2R^{III}$, $-NR^IR^{II}$, $-(CO)NR^IR^{II}$ and $-NR^I(CO)R^{III}$, and wherein said (C_1-C_4) alkyl is optionally substituted by one or more groups selected from (C_3-C_7) cycloalkyl, hydroxy and $-NR^IR^{II}$ and wherein said (C_1-C_4) alkoxy is optionally substituted by one or more halogens or groups (C_3-C_7) cycloalkyl wherein,

R^I is hydrogen or (C_1-C_6) alkyl;

R^{II} is hydrogen or (C_1-C_6) alkyl;

R^{III} is hydrogen or (C_1-C_6) alkyl;

n is an integer ranging from 1 to 3;

each R_2 is hydrogen;

m is an integer ranging from 1 to 3;

R_3 and R_4 are different or the same and are independently selected from the group consisting of: H and (C_1-C_6) alkyl;

each R_5 is selected from the group consisting of: CN, NO_2, CF_3 and halogen atoms;

k is 0 or an integer ranging from 1 to 3;

x' is 0 or 1;

L_1 is a bond;

W_1 is selected from a divalent arylene and heteroarylene group;

L_2 is a group selected from: a bond and -(CH_2)-;

W_2 is an aryl group;

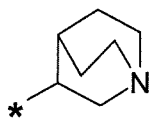
L is a bond;

R_6 is $(C_1$-$C_4)$ alkyl, wherein said $(C_1$-$C_4)$ alkyl is optionally substituted by one or more groups selected from $(C_1$-$C_4)$ alkoxyl and hydroxyl, or, in alternative, when R_6 is $(C_1$-$C_4)$ alkyl, W_2 is a phenyl ring, one of R_1 is an alkyl in ortho position with respect to L, both R_1 and R_6 may be connected to form with W_2 a condensed ring radical selected from 1H-cyclopropabenzene-1,1-diyl, indane-1,1-diyl (also named as 2,3-dihydro-1H-indene-1,1-diyl), indane-2,2-diyl (also named as 2,3-dihydro-1H-indene-2,2-diyl), 1,2,3,4-tetrahydronaphthalene-1,1-diyl, and 1,2,3,4-tetrahydronaphthalene-2,2-diyl;

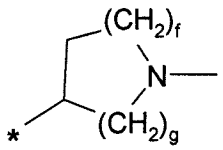
R_7 is selected from hydrogen and $(C_1$-$C_4)$ alkyl optionally substituted by hydroxy or -$NR_{11}R_{12}$ and wherein R_{11} and R_{12} are independently selected from hydrogen, $(C_1$-$C_4)$ alkyl, or, together with the nitrogen atom they are linked to may form a saturated heterocycloalkyl group having an additional heteroatom selected from O, S and NH;

A is a nitrogen containing group which is selected from:

- a group (a) which is –$(CH_2)_2$-NR_8R_9 wherein R_8 and R_9 are independently hydrogen or $(C_1$-$C_4)$ alkyl; and
- a group (b) which is a saturated monocyclic heterocyclic ring system (ii) or a bicyclic heterocyclic ring (i)



(i)



(ii)

and wherein

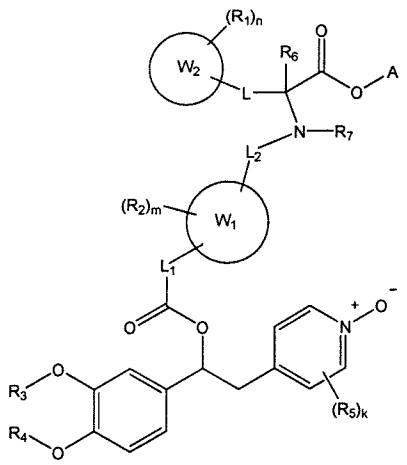
f = 1, 2 or 3;

g =1, 2 or 3;

and the asterisk (*) represents the point of attachment to the oxygen atom of formula (I);

deuterated derivative, and pharmaceutically acceptable salts, or solvates thereof.

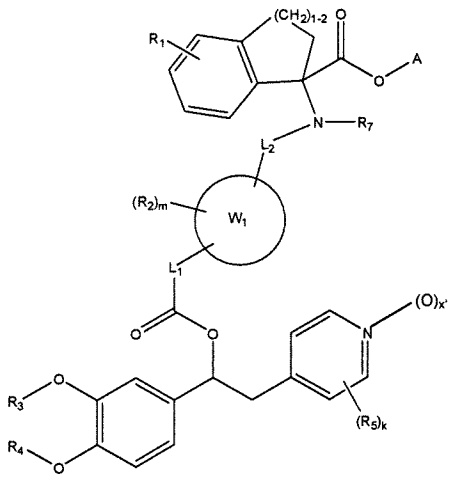
2. A compound according to claim 1 wherein x' is 1, represented by the formula (IA)



(IA)

wherein R_1, R_2, R_3, R_4, R_5, R_6, R_7, L, L_1, W_1, L_2, W_2, A, m, n, and k are as described above, deuterated derivative and pharmaceutically acceptable salt and solvate thereof.

3. A compound according to claim 1 wherein W_2 is a phenyl ring and one of R_1, in ortho position with respect to L, and R_6 may be connected to form a ring radical, represented by the general formula (IB)



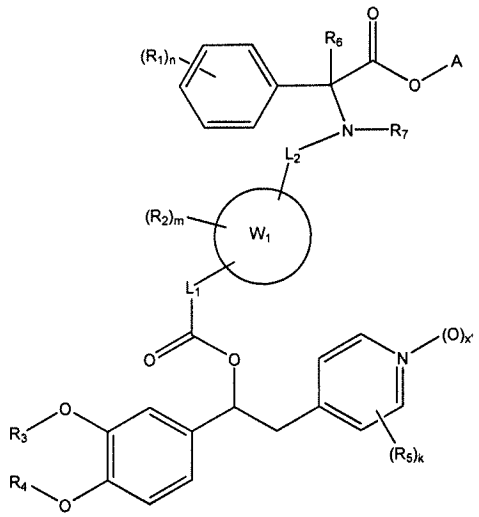
(IB)

wherein R_1, R_2, R_3, R_4, R_5, R_7, A, L_1, W_1, L_2, m, k and x' are as defined above for compounds of formula (I), deuterated derivative and pharmaceutically acceptable

salt and solvate thereof.

4. A compound according to claim 3 wherein W_1 is a divalent group selected from thiophene-2,5-diyl, thiophene-2,4-diyl, phenylene-1,4-diyl, phenylene-1,3-diyl and phenylene-1,2-diyl, L_2 is $-(CH_2)-$, R_7 is H and R_1, R_2, R_3, R_4, R_5, A, m and k are as defined above for compounds of formula (I), deuterated derivative and pharmaceutically acceptable salt and solvate thereof.

5. A compound according to claim 1 wherein W_2 is a phenyl ring represented by the general formula (IC):

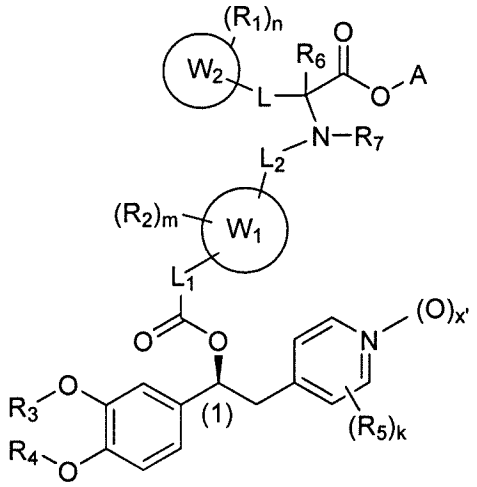


(IC)

wherein R_6 is selected from methyl, ethyl, hydroxymethyl, 1-hydroxyethyl, 2-hydroxyethyl and methoxymethyl, and R_1, R_2, R_3, R_4, R_5, R_7, A, L_1, W_1, L_2, m, n, k and x' are as defined above for compounds of formula (I), pharmaceutically acceptable salt and solvate thereof.

6. A compound according to claim 5 wherein W_1 is a divalent group selected from thiophene-2,5-diyl, thiophene-2,4-diyl, phenylene-1,4-diyl, phenylene-1,3-diyl and phenylene-1,2-diyl, L_2 is $-(CH_2)-$, R_7 is H or methyl, R_6 is selected from methyl, ethyl, hydroxymethyl, 1-hydroxyethyl, 2-hydroxyethyl and methoxymethyl, and R_1, R_2, R_3, R_4, R_5, A, m, n, k and x' are as defined above for compounds of formula (I), pharmaceutically acceptable salt and solvate thereof.

7. A compound according to any one of claims 1 to 6, represented by formula (I)' wherein the absolute configuration of carbon (1) is that shown herebelow



(I)'

wherein R_1, R_2, R_3, R_4, R_5, R_6, R_7, L_1, W_1, L_2, W_2, L, A, n, m, k and x' are as defined above for compounds of formula (I), and pharmaceutically acceptable salt and solvate thereof.

8. A compound according to claim 1 which is selected in the list consisting of:

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate formate salt

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 4-[[[1-methyl-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]benzoate

[(3R)-quinuclidin-3-yl] 1-[[4-[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethoxy] carbonylphenyl] methylamino]indane-1-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(3R)-quinuclidin-3-yl]oxycarbonylindan-1-yl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl]5-[[[1-methyl-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl]5-[[[1-phenyl-1-[(3R)-quinuclidin-3-yl]oxycarbonyl-propyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 4-[[[1-methyl-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]benzoate

Single diastereoisomer of [(3R)-quinuclidin-3-yl] 1-[[4-[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethoxy] carbonylphenyl] methylamino]indane-1-carboxylate

Single diastereoisomer of [(3R)-quinuclidin-3-yl] 1-[[4-[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethoxy] carbonylphenyl] methylamino]indane-1-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(3R)-quinuclidin-3-yl]oxycarbonylindan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(3R)-quinuclidin-3-yl]oxycarbonylindan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-methyl-2-[(3R)-1-oxidoquinuclidin-1-ium-3-yl]oxy-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(2-dimethylaminoethyloxycarbonyl)indan-1-yl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(1-methyl-4-piperidyl)oxycarbonyl]indan-1-yl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl]-5-[[[1-(hydroxymethyl)-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]-methyl-amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl]-5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(methoxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(2-dimethylaminoethyloxycarbonyl)indan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(2-dimethylaminoethyloxycarbonyl)indan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(1-methyl-4-piperidyl)oxycarbonyl]indan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-[(1-methyl-4-piperidyl)oxycarbonyl]indan-1-yl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-phenyl-1-[(3R)-quinuclidin-3-yl]oxycarbonyl-propyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-phenyl-1-[(3R)-quinuclidin-3-yl]oxycarbonyl-propyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-[(1-methyl-4-piperidyl)oxy]-2-oxo-1-phenyl-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]-methyl-amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]-methyl-amino]methyl]thiophene-2-carboxylate

Single diastereoisomer of [(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)ethyl] 5-[[[1-(methoxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate

and a pharmaceutically acceptable salt or solvate thereof.

9. A pharmaceutical composition comprising a compound as defined in any one of claims 1 to 8, in admixture with one or more pharmaceutically acceptable carrier.

10. A pharmaceutical composition according to claim 9 further comprising another active ingredient.

11. A compound according to any one of claims 1 to 8, for use as a medicament.

12. A compound according to any one of claims 1 to 8, for use in the prevention and/or treatment of a disease of the respiratory tract characterized by airway obstruction.

13. A compound for use as defined in claim 12 wherein the disease of the respiratory tract is selected from asthma and COPD.

14. Use of a compound according to any one of claims 1 to 8 in the manufacture of a medicament for the prevention and/or treatment of a disease of the respiratory tract characterized by airway obstruction.

15. The use according to claim 14 wherein the disease of the respiratory tract is selected from asthma and COPD.