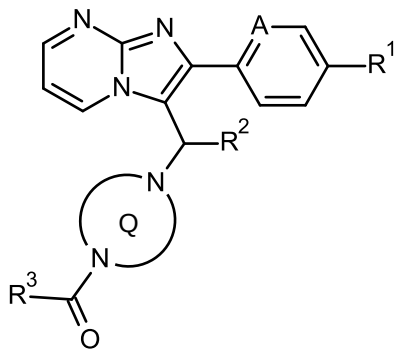
Claims

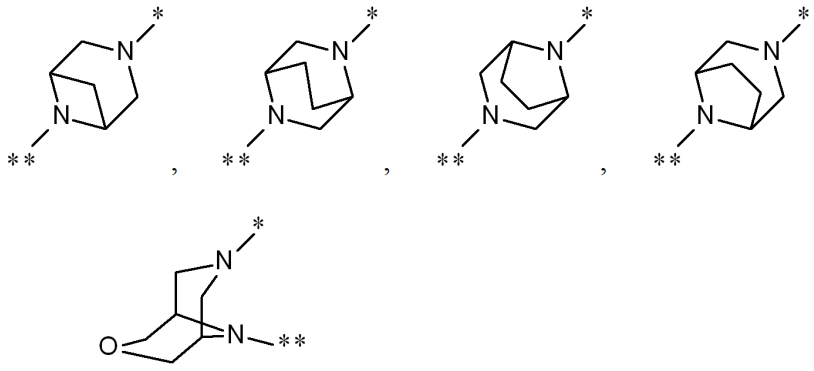
1. Compound of the formula (I)



(I)

in which

the ring Q represents a diazaheterobicyclic system of the formula



in which * denotes the bond to the adjacent CHR^2 group and ** the bond to the carbonyl group,

A represents CH or N,

R^1 represents halogen, cyano, $(C_1\text{-}C_4)$-alkyl, cyclopropyl or cyclobutyl

where $(C_1\text{-}C_4)$-alkyl may be up to trisubstituted by fluorine and cyclopropyl and cyclobutyl may be up to disubstituted by fluorine,

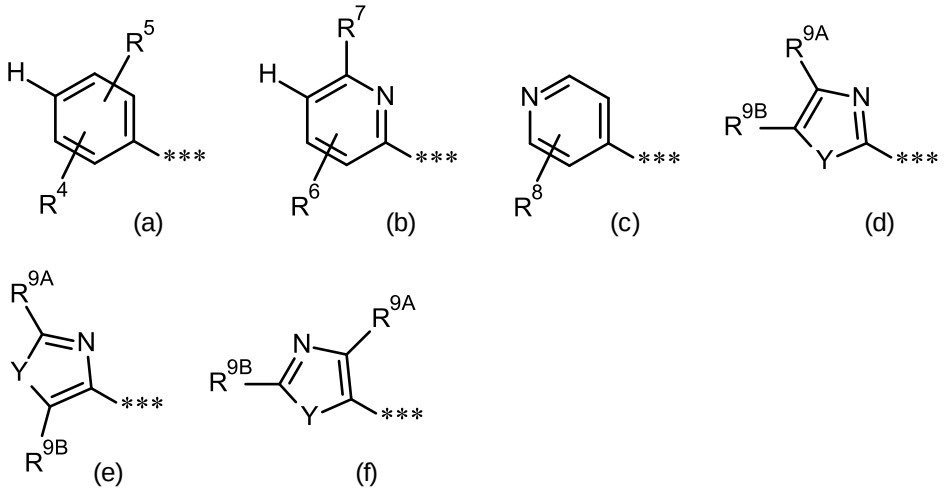
R^2 represents hydrogen or methyl,

and

R^3 represents (C_4-C_6)-cycloalkyl in which a ring CH_2 group may be replaced by -O-,

or

R^3 represents a phenyl group of the formula (a), a pyridyl group of the formula (b) or (c) or an azole group of the formula (d), (e) or (f)



in which *** marks the bond to the adjacent carbonyl group and

R^4 represents hydrogen, fluorine, chlorine, bromine or methyl,

R^5 represents hydrogen, fluorine, chlorine, bromine, cyano, (C_1-C_3)-alkyl or (C_1-C_3)-alkoxy,

where (C_1-C_3)-alkyl and (C_1-C_3)-alkoxy may each be up to trisubstituted by fluorine,

R^6 represents hydrogen, fluorine, chlorine, bromine or methyl,

R^7 represents hydrogen, (C_1-C_3)-alkoxy, cyclobutyloxy, oxetan-3-yloxy, tetrahydrofuran-3-yloxy, tetrahydro-2*H*-pyran-4-yloxy, mono-(C_1-C_3)-alkylamino, di-(C_1-C_3)-alkylamino or (C_1-C_3)-alkylsulfanyl,

where (C_1-C_3)-alkoxy may be up to trisubstituted by fluorine,

R^8 represents hydrogen, fluorine, chlorine, bromine, (C_1-C_3)-alkyl or (C_1-C_3)-alkoxy,

R^{9A} and R^{9B} are identical or different and independently of one another represent hydrogen, fluorine, chlorine, bromine, $(C_1$-$C_3)$-alkyl, cyclopropyl or $(C_1$-$C_3)$-alkoxy

where $(C_1$-$C_3)$-alkyl and $(C_1$-$C_3)$-alkoxy may each be up to trisubstituted by fluorine,

and

Y represents O or S,

or

R^3 represents an $-OR^{10}$ or $-NR^{11}R^{12}$ group in which

R^{10} represents $(C_1$-$C_6)$-alkyl, $(C_4$-$C_6)$-cycloalkyl or [$(C_3$-$C_6)$-cycloalkyl]methyl,

R^{11} represents hydrogen or $(C_1$-$C_3)$-alkyl

and

R^{12} represents $(C_1$-$C_6)$-alkyl, $(C_3$-$C_6)$-cycloalkyl, phenyl or benzyl,

where $(C_1$-$C_6)$-alkyl may be up to trisubstituted by fluorine,

and

where phenyl and the phenyl group in benzyl may be up to trisubstituted by identical or different radicals selected from the group consisting of fluorine, chlorine, methyl, ethyl, trifluoromethyl, methoxy, ethoxy, trifluoromethoxy and (trifluoromethyl)sulfanyl,

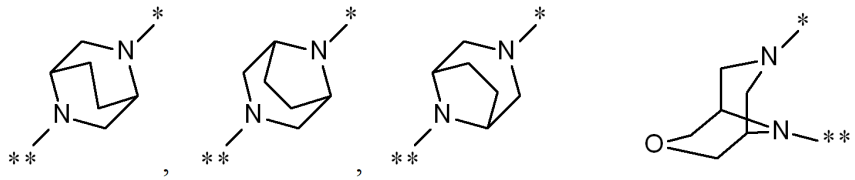
or

R^{11} and R^{12} are attached to one another and, together with the nitrogen atom to which they are bonded, form a pyrrolidine, piperidine, morpholine or thiomorpholine ring,

and the salts, solvates and solvates of the salts thereof.

2. Compound of the formula (I) according to Claim 1 in which

the ring Q represents a diazaheterobicyclic system of the formula



in which * denotes the bond to the adjacent CHR^2 group and ** the bond to the carbonyl group,

A represents CH,

R^1 represents fluorine, chlorine, bromine, methyl, isopropyl, *tert*-butyl, cyclopropyl or cyclobutyl,

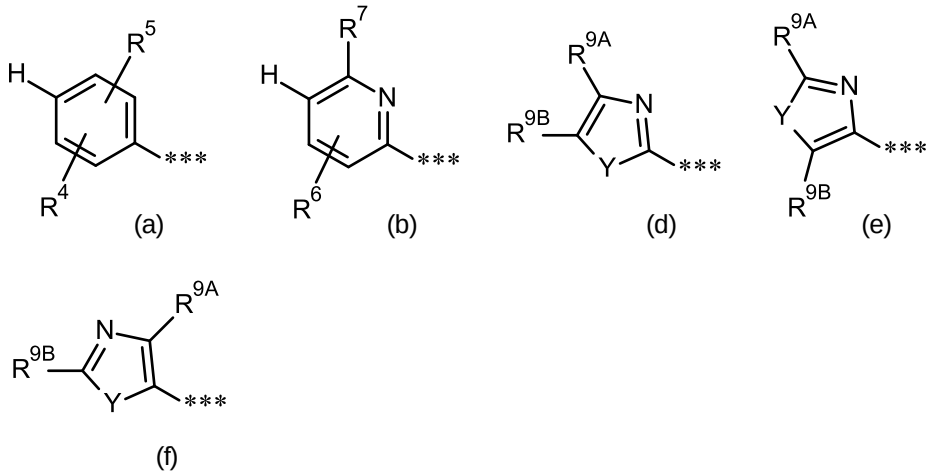
R^2 represents hydrogen,

and

R^3 represents cyclobutyl, cyclopentyl or cyclohexyl

or

R^3 represents a phenyl group of the formula (a), a pyridyl group of the formula (b) or an azole group of the formula (d), (e) or (f)



in which *** marks the bond to the adjacent carbonyl group and

R^4 represents hydrogen, fluorine or chlorine,

R^5 represents fluorine, chlorine, cyano, (C_1-C_3)-alkyl, (C_1-C_3)-alkoxy or trifluoromethoxy,

R^6 represents hydrogen, fluorine, chlorine, bromine or methyl,

R^7 represents (C_1-C_3)-alkoxy, cyclobutyloxy or (C_1-C_3)-alkylsulfanyl,

where (C_1-C_3)-alkoxy may be up to trisubstituted by fluorine,

R^{9A} and R^{9B} are identical or different and independently of one another represent hydrogen, chlorine, bromine, (C_1-C_3)-alkyl or cyclopropyl,

where (C_1-C_3)-alkyl may be up to trisubstituted by fluorine,

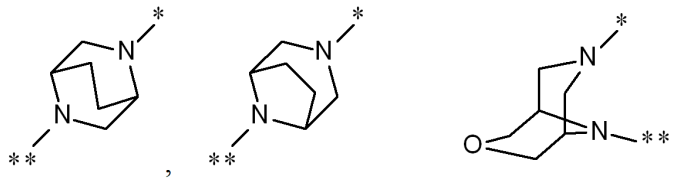
and

Y represents O or S,

and the salts, solvates and solvates of the salts thereof.

3. Compound of the formula (I) according to Claim 1 or 2 in which

the ring Q represents a diazaheterobicyclic system of the formula



in which * denotes the bond to the adjacent CHR^2 group and ** the bond to the carbonyl group,

A represents CH,

R^1 represents chlorine, bromine, isopropyl or cyclopropyl,

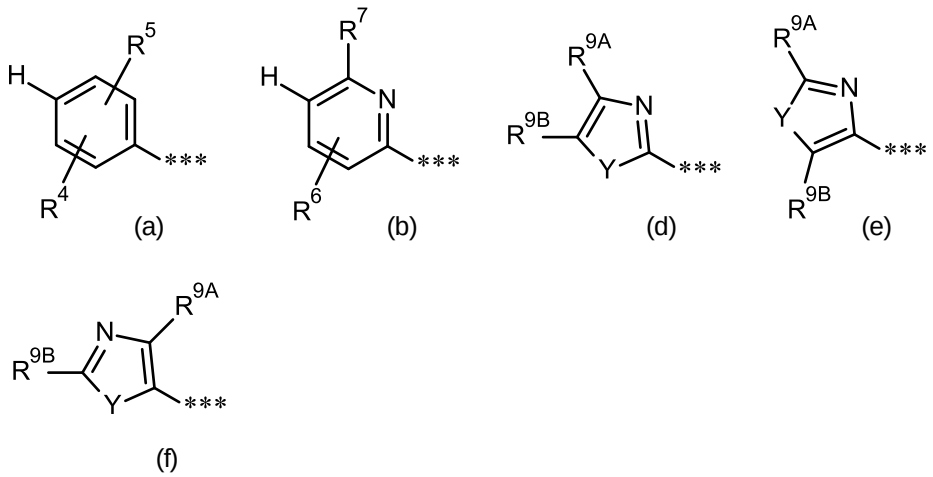
R^2 represents hydrogen,

and

R^3 represents cyclopentyl or cyclohexyl,

or

R^3 represents a phenyl group of the formula (a), a pyridyl group of the formula (b) or an azole group of the formula (d), (e) or (f)



in which *** marks the bond to the adjacent carbonyl group and

R^4 represents hydrogen, fluorine or chlorine,

R^5 represents fluorine, chlorine, methyl, isopropyl, methoxy or ethoxy,

R^6 represents hydrogen, fluorine, chlorine, bromine or methyl,

R^7 represents methoxy, difluoromethoxy, trifluoromethoxy, isopropoxy, cyclobutyloxy or methylsulfanyl,

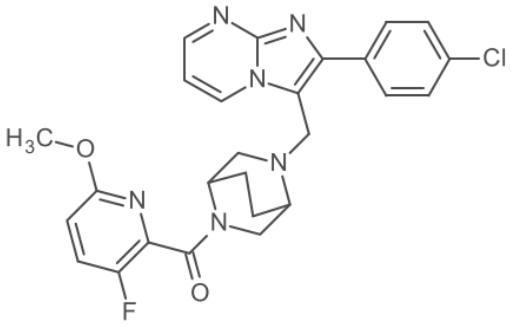
R^{9A} and R^{9B} are identical or different and independently of one another represent hydrogen, methyl, trifluoromethyl, ethyl, isopropyl or cyclopropyl,

and

Y represents O or S,

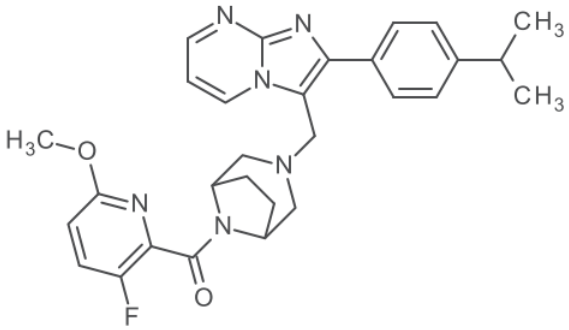
and the salts, solvates and solvates of the salts thereof.

4. Compound of the formula (I) according to Claim 1, which is (5-{[2-(4-Chlorophenyl)imidazo[1,2-a]pyrimidin-3-yl]methyl}-2,5-diazabicyclo[2.2.2]oct-2-yl)(3-fluoro-6-methoxypyridin-2-yl)methanone (enantiomer 2) of the formula



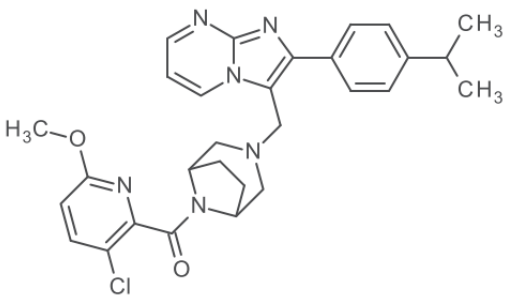
.

5. Compound of the formula (I) according to Claim 1, which is (3-Fluoro-6-methoxypyridin-2-yl)(3-{[2-(4-isopropylphenyl)imidazo[1,2-a]pyrimidin-3-yl]methyl}-3,8-diazabicyclo[3.2.1]oct-8-yl)methanone of the formula



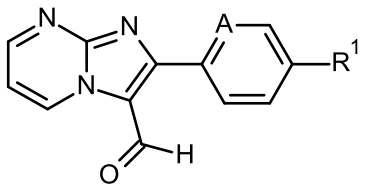
.

6. Compound of the formula (I) according to Claim 1, which is (3-Chloro-6-methoxypyridin-2-yl)(3-{[2-(4-isopropylphenyl)imidazo[1,2-a]pyrimidin-3-yl]methyl}-3,8-diazabicyclo[3.2.1]oct-8-yl)methanone of the formula



.

7. Process for preparing a compound of the formula (I) as defined in Claims 1 to 3 in which the radical R^2 represents hydrogen, characterized in that a compound of the formula (II)

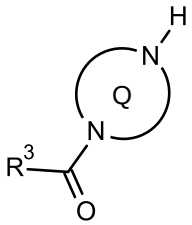


(II)

in which A and R^1 have the definitions given in Claims 1 to 3

is reacted in the presence of a suitable reducing agent either

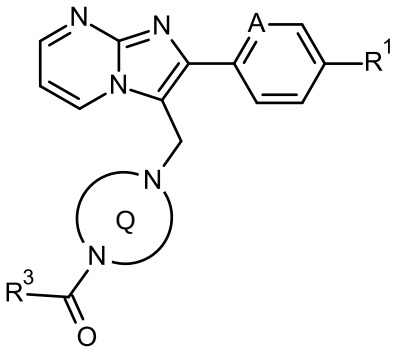
[A] with a compound of the formula (III)



(III)

in which R^3 and the ring Q have the definitions given in Claims 1 to 3

to give a compound of the formula (I-A)

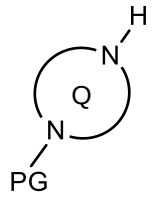


(I-A)

in which A, R^1, R^3 and the ring Q have the meanings given above

or

[B] with a protected diazaheterobicyclic system of the formula (IV)



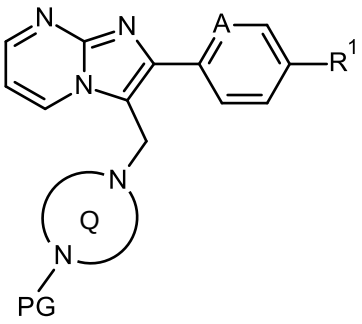
(IV)

in which the ring Q has the definition given in Claims 1 to 3

and

PG represents a suitable amino protecting group, for example *tert*-butoxycarbonyl, benzyloxycarbonyl or (9*H*-fluoren-9-ylmethoxy)carbonyl

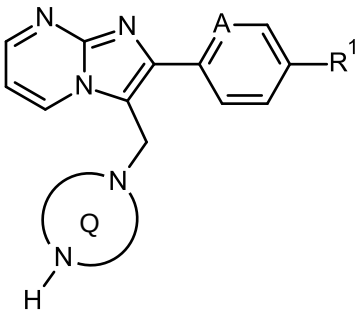
at first to give a compound of the formula (V)



(V)

in which A, PG, R^1 and the ring Q have the meanings given above,

then the protecting group PG is cleaved and the resulting compound of the formula (VI)

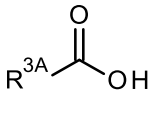


(VI)

in which A, R^1 and the ring Q have the meanings given above

is then reacted, depending on the specific definition of the R^3 radical,

[B-1] with a carboxylic acid of the formula (VII)

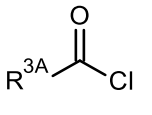


(VII)

in which

R^{3A} represents (C_4-C_6)-cycloalkyl in which a ring CH_2 group may be replaced by -O-, or is a phenyl group of the formula (a), a pyridyl group of the formula (b) or (c) or an azole group of the formula (d), (e) or (f), as described in Claims 1 to 3,

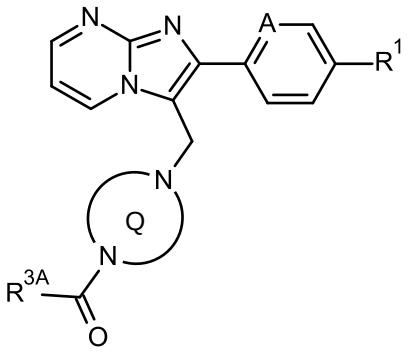
with activation of the carboxylic acid function in (VII), or is reacted with the corresponding acid chloride of the formula (VIII)



(VIII)

in which R^{3A} has the meaning given above

to give a compound of the formula (I-B)

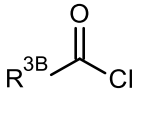


(I-B)

in which A, R^1, R^{3A} and the ring Q have the meanings given above

or

[B-2] with a chloroformate or carbamoyl chloride of the formula (IX)



(IX)

in which

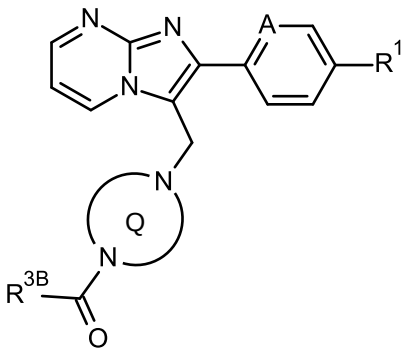
R^{3B} represents the $-OR^{10}$ or $-NR^{11A}R^{12}$ group in which

R^{10} and R^{12} have the definitions specified in Claims 1 to 3

and

R^{11A} has the definition of R^{11} specified in Claims 1 to 3, but is not hydrogen,

to give a compound of the formula (I-C)

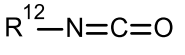


(I-C)

in which A, R^1, R^{3B} and the ring Q have the meanings given above

or

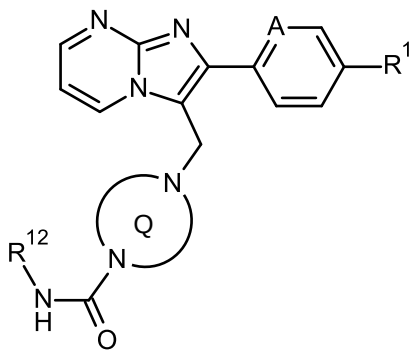
[B-3] with an isocyanate of the formula (X)



(X)

in which R^{12} has the definition specified in Claims 1 to 3

to give a compound of the formula (I-D)



(I-D)

in which A, R^1, R^{12} and the ring Q have the meanings given above

and the compounds of the formulae (I-A), (I-B), (I-C) and (I-D) thus obtained are optionally separated into their enantiomers and/or diastereomers and/or optionally converted with the appropriate (*i*) solvents and/or (*ii*) acids to the solvates, salts and/or solvates of the salts thereof.

8. Use of a compound as defined in any of Claims 1 to 6 in the manufacture of a medicament for the treatment and/or prevention of respiratory disorders, sleep-related respiratory disorders, obstructive sleep apnoeas, central sleep apnoeas, snoring, cardiac arrhythmias, neurodegenerative disorders, neuroinflammatory disorders and neuroimmunological disorders.

9. Medicament comprising a compound as defined in any of Claims 1 to 6 in combination with one or more inert, nontoxic, pharmaceutically suitable excipients.

10. Medicament comprising a compound as defined in any of Claims 1 to 6 in combination with one or more further active compounds selected from the group consisting of respiratory stimulants, psychostimulating compounds, serotonin reuptake inhibitors, noradrenergic, serotonergic and tricyclic antidepressants, sGC stimulators, mineralocorticoid receptor antagonists, antiinflammatory drugs, immunomodulators, immunosuppressives and cytotoxic drugs.

11. Medicament according to Claim 9 or 10 for use in the treatment and/or prevention of respiratory disorders, sleep-related respiratory disorders, obstructive sleep apnoeas,

central sleep apnoeas, snoring, cardiac arrhythmias, neurodegenerative disorders, neuroinflammatory disorders and neuroimmunological disorders.