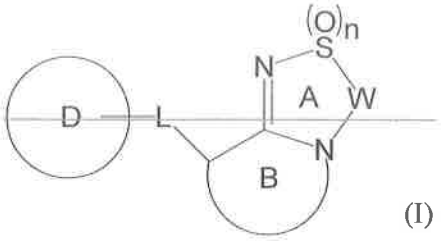
CLAIMS

1. A compound represented by the formula (I):



(I)

wherein

ring A is an optionally substituted 5 – 7-membered heterocycle,

ring B is an optionally substituted 5 – 8-membered heterocycle having, as a ring-constituting atom besides carbon atom, one nitrogen atom, and optionally further having 1 to 3 hetero atoms selected from a nitrogen atom, an oxygen atom and a sulfur atom,

ring D is an optionally substituted non-aromatic hydrocarbon ring, an optionally substituted non-aromatic heterocycle, an optionally substituted aromatic hydrocarbon ring, or an optionally substituted aromatic heterocycle,

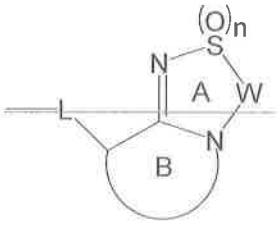
W is optionally substituted C_{1-3} alkylene, or optionally substituted C_{2-3} alkenylene,

L is a bond, or a spacer having the main chain having an atom number of 1 – 8, and

n is 0, 1 or 2,

provided when

a partial structural formula represented by the formula (I):



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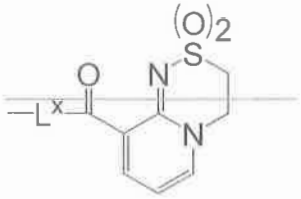
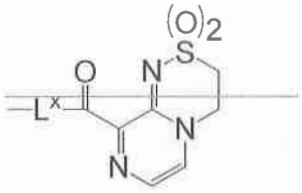


or



wherein L^a is a bond or a spacer having the main chain having an atom number of 1 - 7, one or both of ring A and ring B has(have) substituent(s),

excluding the following compounds;

2,2,2-trichloro-N-(7,7-diphenyl-6,7-dihydro-5H-pyrrolo[2,1-c][1,2,4]thiadiazol-3-ylidene)acetamide,

{4-(acetylamino)-8-[(3-{2-[4-(acetylamino)-2,2-dioxido-7-(sulfonatomethyl)-6H-pyrazolo[5,1-c][1,2,4]thiadiazin-8-yl]ethenyl}-5,5-dimethylcyclohex-2-en-1-yl)methylidene]-2,2-dioxido-8H-pyrazolo[5,1-c][1,2,4]thiadiazin-7-yl}methanesulfonic acid,

3-tert-butyl-5-[(7-tert-butyl-2,2-dioxido-3,4-dihydro-6H-pyrazolo[5,1-c][1,2,4]thiadiazin-8-yl)diazenyl]-1H-pyrazole-4-carbonitrile,

ethyl 2-[(4-{[(2-butoxy-4-octylphenyl)sulfonyl]amino}-3-ethyl-7-methyl-2,2-dioxido-6H-pyrazolo[5,1-c][1,2,4]thiadiazin-8-yl)diazenyl]benzoate, and

7-methyl-4,8-diphenyl-6H-pyrazolo[5,1-c][1,2,4]thiadiazine 2,2-dioxide,

or a salt thereof.

2. The compound according to claim 1, wherein ring A and ring B are each an optionally substituted 6-membered ring,

ring B has, as a ring-constituting atom besides carbon atom, one nitrogen atom, and optionally further has 1 to 3 nitrogen atoms,

L is a bond, -O-, -O-CH_2-, -CH_2-O-, -CO-NH-, -CO-N(C_{1-6} alkyl)-, -S-, -SO-, -SO_2-, C_{1-6} alkylene, C_{2-6} alkenylene or C_{2-6} alkynylene,

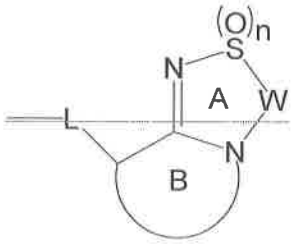
or a salt thereof.

3. The compound according to claim 2, wherein W is optionally substituted -CH_2-CH_2-, and

n is 2,

or a salt thereof.

4. The compound according to claim 2, wherein the partial structural formula represented by the formula (I):



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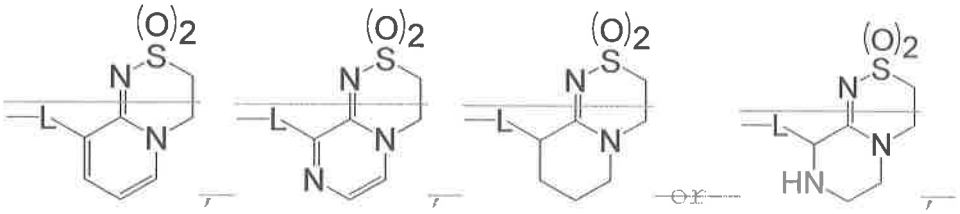


, , or ,

ring B is optionally substituted by substituent(s) selected from

a halogen atom;

hydroxy;

C_{1-6} alkyl optionally substituted by a halogen atom;

C_{1-6} alkoxy; and

C_{1-6} alkyl-carbonyl,

or a salt thereof.

5. The compound according to claim 2, wherein L is a bond, or a salt thereof.

6. The compound according to claim 2, wherein ring D is an

optionally substituted 3-8-membered monocyclic non-aromatic hydrocarbon ring, an optionally substituted 6-14-membered aromatic hydrocarbon ring, an optionally substituted 6-14-membered non-aromatic hydrocarbon ring, an optionally substituted 5-6-membered monocyclic aromatic heterocycle, an optionally substituted 3-8-membered monocyclic non-aromatic heterocycle, an optionally substituted 8-14-membered condensed aromatic heterocycle or an optionally substituted 6-14-membered condensed non-aromatic heterocycle, or a salt thereof.

7. The compound according to claim 2, wherein ring D is

optionally substituted C_{3-7} cycloalkane,

optionally substituted C_{6-14} arene,

optionally substituted dihydronaphthalene,

optionally substituted tetrahydronaphthalene,

optionally substituted dihydroinden,

optionally substituted thiophene,

optionally substituted azetidine,

optionally substituted piperidine,

optionally substituted furan,

optionally substituted pyridine,

optionally substituted pyrazole,

optionally substituted 1,2,4-oxadiazole,

optionally substituted dihydrobenzodioxin,

optionally substituted dihydrobenzofuran,

optionally substituted benzodioxole,

optionally substituted benzofuran,

optionally substituted indole,

optionally substituted quinoline,

optionally substituted benzimidazole,

optionally substituted benzothiazole,

optionally substituted indazole, or

optionally substituted dibenzothiophene,

or a salt thereof.

8. The compound according to claim 2, wherein ring D is C_{3-7} cycloalkane, C_{5-14} arene, dihydronaphthalene, tetrahydronaphthalene, dihydroinden, thiophene, azetidine, piperidine, furan, pyridine, pyrazole, 1,2,4-oxadiazole, dihydrobenzodioxin, dihydrobenzofuran, benzodioxole, benzofuran, indole, quinoline, benzimidazole, benzothiazole, indazole or dibenzothiophene, optionally substituted by 1 - 4 substituents selected from

(1) a halogen atom;

(2) cyano;

(3) hydroxy;

(4) oxo;

(5) C_{1-6} alkyl optionally substituted by substituent(s) selected from 1) a halogen atom, 2) phenyl optionally substituted by substituent(s) selected from a halogen atom and C_{1-6} alkyl and 3) C_{1-6} alkoxycarbonyl;

(6) C_{3-7} cycloalkyl optionally substituted by C_{1-6} alkoxycarbonyl or phenyl;

(7) C_{1-6} alkyl-carbonyl;

(8) phenyl-carbonyl optionally substituted by C_{1-6} alkoxy;

(9) C_{2-6} alkenyl substituted by phenyl;

(10) phenyl optionally substituted by 1 to 3 substituents selected from a halogen atom, C_{1-6} alkyl, C_{3-7} cycloalkyl and C_{1-6} alkoxy;

(11) pyrazole optionally substituted by 1 to 3 substituents selected from C_{1-6} alkyl optionally substituted by a halogen atom, and C_{3-7} cycloalkyl;

(12) pyrrolidine;

(13) dihydrobenzofuran;

(14) morpholine;

(15) oxetane substituted by a halogen atom;

(16) sulfanyl substituted by a halogen atom or C_{1-6} alkyl;

(17) C_{1-6} alkylsulfonyloxy substituted by a halogen atom;

(18) di-C_{1-6}-alkylcarbamoyl;

(19) 4,4,5,5-tetramethyl-1,3,2-dioxaborolane;

(20) C_{1-5} alkoxy optionally substituted by substituent(s) selected from a halogen atom, C_{3-7} cycloalkyl, phenyl optionally substituted by a halogen atom, tetrahydrofuran and tetrahydropyran;

(21) C_{3-7} cycloalkyloxy optionally substituted by C_{1-6} alkyl, oxo or C_{2-6} alkylenedioxy;

(22) C_{3-7} cycloalkenyloxy optionally substituted by C_{1-6} alkyl;

(23) phenyloxy optionally substituted by 1 to 3 substituents selected from a halogen atom, cyano, hydroxy, C_{1-6} alkyl optionally substituted by a halogen atom, and C_{1-6} alkoxy optionally substituted by a halogen atom;

(24) pyridyloxy optionally substituted by a halogen atom, or C_{1-6} alkyl optionally substituted by a halogen atom;

(25) silyloxy substituted by C_{1-6} alkyl;

(26) tetrahydrofuranyloxy;

(27) tetrahydropyranyloxy; and

(28) dihydrobenzofuranyloxy,

or a salt thereof.

9. The compound according to claim 2, wherein ring D is benzene optionally substituted by 1 - 3 substituents selected from

(1) a halogen atom;

(2) cyano;

(3) hydroxy;

(4) C_{1-6} alkyl optionally substituted by substituent(s) selected from 1) a halogen atom, 2) phenyl optionally substituted by substituent(s) selected from a halogen atom and C_{1-6} alkyl and 3) C_{1-6} alkoxycarbonyl;

(5) C_{3-7} cycloalkyl optionally substituted by C_{1-6} alkoxycarbonyl or phenyl;

(6) C_{1-6} alkyl-carbonyl;

(7) phenyl-carbonyl optionally substituted by C_{1-6} alkoxy;

(8) C_{2-6} alkenyl substituted by phenyl;

(9) phenyl optionally substituted by a halogen atom or C_{1-6}

alkyl;

(10) pyrazole optionally substituted by 1 to 3 substituents selected from C_{1-6} alkyl optionally substituted by a halogen atom, and C_{3-7} cycloalkyl;

(11) pyrrolidine;

(12) dihydrobenzofuran;

(13) morpholine;

(14) oxetane substituted by a halogen atom;

(15) sulfanyl substituted by a halogen atom or C_{1-6} alkyl;

(16) C_{1-6} alkylsulfonyloxy substituted by a halogen atom;

(17) di-C_{1-6} alkylcarbamoyl;

(18) 4,4,5,5-tetramethyl-1,3,2-dioxaborolane;

(19) C_{1-6} alkoxy optionally substituted by substituent(s) selected from a halogen atom, C_{3-7} cycloalkyl, phenyl optionally substituted by a halogen atom, tetrahydrofuran and tetrahydropyran;

(20) C_{3-7} cycloalkyloxy optionally substituted by C_{1-6} alkyl, oxo or C_{2-6} alkylenedioxy;

(21) C_{3-7} cycloalkenyloxy optionally substituted by C_{1-6} alkyl;

(22) phenyloxy optionally substituted by substituent(s) selected from a halogen atom, cyano, hydroxy, C_{1-6} alkyl optionally substituted by a halogen atom, and C_{1-6} alkoxy optionally substituted by a halogen atom;

(23) pyridyloxy optionally substituted by a halogen atom, or C_{1-6} alkyl optionally substituted by a halogen atom;

(24) silyloxy substituted by C_{1-6} alkyl;

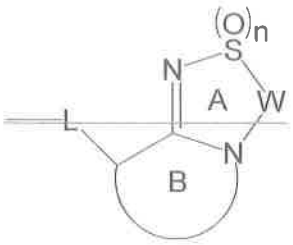
(25) tetrahydrofuranyloxy;

(26)tetrahydropyranyloxy; and

(27) dihydrobenzofuranyloxy,

or a salt thereof.

10. The compound according to claim 2, wherein the partial structural formula represented by the formula (I):



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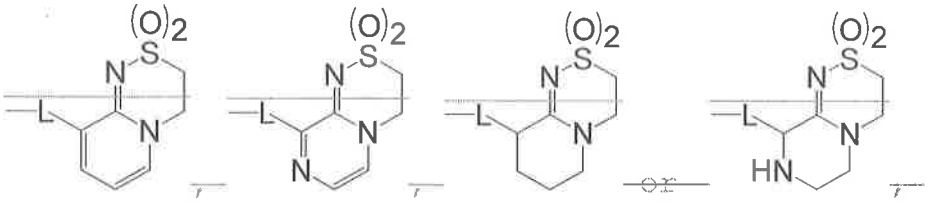


ring B is optionally substituted by substituent(s) selected from

a halogen atom;

hydroxy;

C_{1-6} alkyl optionally substituted by a halogen atom;

C_{1-6} alkoxy; and

C_{1-6} alkyl-carbonyl,

ring D is C_{3-7} cycloalkane, C_{6-14} arene, dihydronaphthalene, tetrahydronaphthalene, dihydroinden, thiophene, azetidine, piperidine, furan, pyridine, pyrazole, 1,2,4-oxadiazole, dihydrobenzodioxin, dihydrobenzofuran, benzodioxole, benzofuran, indole, quinoline, benzimidazole, benzothiazole, indazole or dibenzothiophene, each optionally substituted by 1-4 substituents selected from

(1) a halogen atom;

(2) cyano;

(3) hydroxy;

(4) oxo;

(5) optionally substituted C_{1-6} alkyl;

(6) optionally substituted C_{3-7} cycloalkyl;

(7) substituted carbonyl;

(8) substituted C_{2-6} alkenyl;

(9) optionally substituted C_{6-14} aryl;

(10) optionally substituted C_{7-16} aralkyl;

(11) optionally substituted pyrazole

~~(12) pyrrolidine;~~

~~(13) dihydrobenzofuran;~~

~~(14) morpholine;~~

~~(15) substituted oxetane;~~

~~(16) substituted sulfanyl;~~

~~(17) substituted C_{1-6} alkylsulfonyloxy;~~

~~(18) di-C_{1-6} alkyl-carbamoyl;~~

~~(19) substituted dioxaborolane ;~~

~~(20) optionally substituted C_{1-6} alkoxy;~~

~~(21) C_{3-7} cycloalkyloxy;~~

~~(22) optionally substituted C_{3-7} cycloalkenyloxy;~~

~~(23) optionally substituted C_{6-14} aryloxy;~~

~~(24) optionally substituted C_{7-16} aralkyloxy;~~

~~(25) optionally substituted pyridyloxy;~~

~~(26) substituted silyloxy;~~

~~(27) tetrahydrofuranyloxy;~~

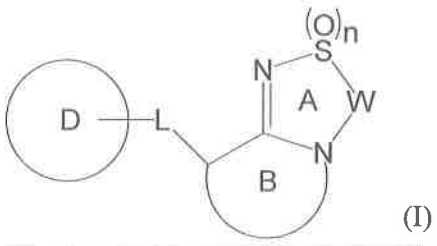
~~(28) tetrahydropyranyloxy; and~~

~~(29) dihydrobenzofuranyloxy, and~~

~~L is a bond, -O-, -O-CH_2-, -CH_2-O-, -CO-NH-, -CO-N(C_{1-6} alkyl)-, -S-, -SO-, -SO_2-, C_{1-6} alkylene, C_{2-6} alkenylene or C_{2-6} alkynylene,~~

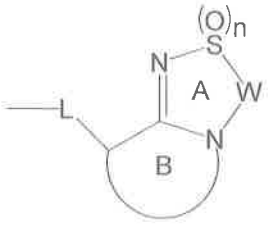
~~or a salt thereof.~~

111. A~~The~~ compound represented by the formula (I):~~according to claim 2,~~



(I)

wherein the partial structural formula represented by the formula (I):



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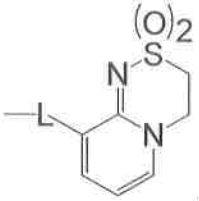

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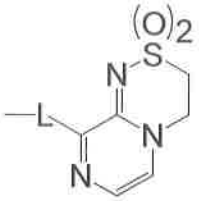

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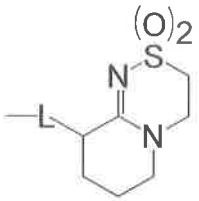

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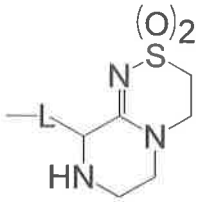


,

ring B is optionally substituted by substituent selected from

a halogen atom;

hydroxy;

C_{1-6} alkyl optionally substituted by a halogen atom;

C_{1-6} alkoxy; and

C_{1-6} alkyl-carbonyl,

ring D is C_{3-7} cycloalkane, C_{6-14} arene, dihydronaphthalene, tetrahydronaphthalene, dihydroinden, thiophene, azetidine, piperidine, furan, pyridine, pyrazole, 1,2,4-oxadiazole, dihydrobenzodioxin, dihydrobenzofuran, benzodioxole, benzofuran, indole, quinoline, benzimidazole, benzothiazole, indazole or dibenzothiophene, optionally substituted by 1 - 4 substituents selected from

(1) a halogen atom;

(2) cyano;

(3) hydroxy;

(4) oxo;

(5) C_{1-6} alkyl optionally substituted by substituent(s) selected from 1) a halogen atom, 2) phenyl optionally substituted by substituent(s) selected from a halogen atom and C_{1-6} alkyl and 3) C_{1-6} alkoxycarbonyl;

(6) C_{3-7} cycloalkyl optionally substituted by C_{1-6} alkoxycarbonyl or phenyl;

(7) C_{1-6} alkyl-carbonyl;

(8) phenyl-carbonyl optionally substituted by C_{1-6} alkoxy;

(9) C_{2-6} alkenyl substituted by phenyl;

(10) phenyl optionally substituted by 1 to 3 substituents selected from a halogen atom, C_{1-6} alkyl, C_{3-7} cycloalkyl and C_{1-6} alkoxy;

(11) pyrazole optionally substituted by 1 to 3 substituents selected from C_{1-6} alkyl optionally substituted by a halogen atom, and C_{3-7} cycloalkyl;

(12) pyrrolidine;

(13) dihydrobenzofuran;

(14) morpholine;

(15) oxetane substituted by a halogen atom;

(16) sulfanyl substituted by a halogen atom or C_{1-6} alkyl;

(17) C_{1-6} alkylsulfonyloxy substituted by a halogen atom;

(18) di-C_{1-6} alkylcarbamoyl;

(19) 4,4,5,5-tetramethyl-1,3,2-dioxaborolane;

(20) C_{1-6} alkoxy optionally substituted by substituent(s) selected from a halogen atom, C_{3-7} cycloalkyl, phenyl optionally substituted by a halogen atom, tetrahydrofuran and tetrahydropyran;

(21) C_{3-7} cycloalkyloxy optionally substituted by C_{1-6} alkyl, oxo or C_{2-6} alkylenedioxy;

(22) C_{3-7} cycloalkenyloxy optionally substituted by C_{1-6} alkyl;

(23) phenyloxy optionally substituted by 1 to 3 substituents selected from a halogen atom, cyano, hydroxy, C_{1-6} alkyl optionally substituted by a halogen atom, and C_{1-6} alkoxy optionally substituted by a halogen atom;

(24) pyridyloxy optionally substituted by a halogen atom, or C_{1-6} alkyl optionally substituted by a halogen atom;

(25) silyloxy substituted by C_{1-6} alkyl;

(26) tetrahydrofuranyloxy;

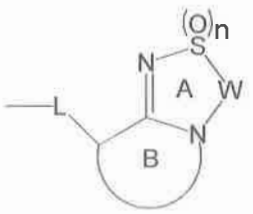
(27) tetrahydropyranyloxy; and

(28) dihydrobenzofuranyloxy,

L is a bond, -O-, -O-CH_2-, -CH_2-O-, -CO-NH-, -CO-N(C_{1-6} alkyl)-, -S-, -SO-, -SO_2-, C_{1-6} alkylene, C_{2-6} alkenylene or C_{2-6} alkynylene,

or a salt thereof.

2~~12~~. The compound according to claim 1~~2~~, wherein the partial structural formula represented by the formula (I):



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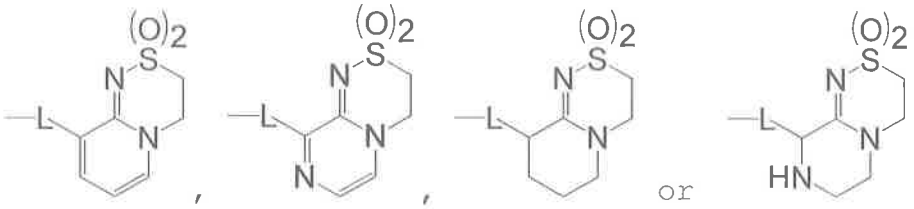


or

ring B is optionally substituted by substituent selected from a halogen atom, hydroxy, C_{1-6} alkyl and C_{1-6} alkoxy,

ring D is C_{3-7} cycloalkane, benzene, naphthalene, pyridine or thiophene optionally substituted by 1 to 3 substituents selected from

(1) a halogen atom;

(2) hydroxy;

(3) C_{1-6} alkyl optionally substituted by substituent selected from 1) a halogen atom, and 2) phenyl optionally substituted by substituent selected from a halogen atom and C_{1-6} alkyl;

(4) C_{3-7} cycloalkyl;

(5) phenyl-carbonyl;

(6) C_{2-6} alkenyl substituted by phenyl;

(7) phenyl optionally substituted by a halogen atom or C_{1-6} alkyl;

(8) pyrrolidine;

(9) dihydrobenzofuran;

(10) C_{1-6} alkylsulfonyloxy substituted by a halogen atom;

(11) C_{1-6} alkoxy optionally substituted by substituent selected from a halogen atom, C_{3-7} cycloalkyl, phenyl substituted by a halogen atom, tetrahydrofuran and tetrahydropyran;

(12) C_{3-7} cycloalkyloxy optionally substituted by C_{1-6} alkyl;

(13) C_{3-7} cycloalkenyloxy optionally substituted by C_{1-6} alkyl;

(14) phenyloxy optionally substituted by 1 to 3 substituents selected from a halogen atom, cyano, hydroxy, C_{1-6} alkyl optionally substituted by a halogen atom, and C_{1-6} alkoxy;

(15) pyridyloxy substituted by a halogen atom, or C_{1-6} alkyl substituted by a halogen atom;

(16) tetrahydrofuranyloxy;

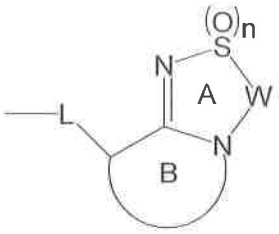
(17) tetrahydropyranyloxy; and

(18) dihydrobenzofuranyloxy, and

L is a bond, -O-, -O-CH_2-, -CO-NH-, C_{1-6} alkylene, or C_{2-6} alkynylene,

or a salt thereof.

~~313~~. The compound according to claim ~~12~~, wherein the partial structural formula represented by the formula (I):



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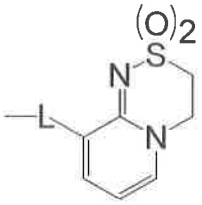

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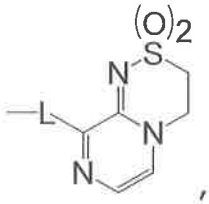


,

ring B is optionally substituted by C_{1-6} alkyl,

ring D is benzene optionally substituted by 1 to 3 substituents selected from

(1) a halogen atom;

(2) hydroxy;

(3) C_{1-6} alkyl optionally substituted by substituent selected from 1) a halogen atom, and 2) phenyl optionally substituted by substituent selected from a halogen atom and C_{1-6} alkyl;

(4) C_{3-7} cycloalkyl optionally substituted by C_{1-6} alkoxycarbonyl or phenyl;

(5) phenyl-carbonyl;

(6) C_{2-6} alkenyl substituted by phenyl;

(7) phenyl optionally substituted by a halogen atom or C_{1-6} alkyl;

(8) pyrrolidine;

(9) dihydrobenzofuran;

(10) C_{1-6} alkylsulfonyloxy substituted by a halogen atom;

(11) C_{1-6} alkoxy optionally substituted by substituent selected from a halogen atom, C_{3-7} cycloalkyl, phenyl substituted by a

halogen atom, tetrahydrofuran and tetrahydropyran;
(12) C_{3-7} cycloalkyloxy optionally substituted by C_{1-6} alkyl;
(13) C_{3-7} cycloalkenyloxy optionally substituted by C_{1-6} alkyl;
(14) phenyloxy optionally substituted by 1 to 3 substituents selected from a halogen atom, cyano, hydroxy, C_{1-6} alkyl optionally substituted by a halogen atom, and C_{1-6} alkoxy;
(15) pyridyloxy substituted by a halogen atom, or C_{1-6} alkyl substituted by a halogen atom;
(16) tetrahydrofuranyloxy;
(17) tetrahydropyranyloxy; and
(18) dihydrobenzofuranyloxy, and
L is a bond,
or a salt thereof.

4~~14~~. The compound according to claim 1, which is 9-(4-p~~P~~henoxyphenyl)-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

5~~15~~. The compound according to claim 1, which is 9-[4-(4-m~~M~~ethylphenoxy)phenyl]-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

6~~16~~. The compound according to claim 1, which is 9-[4-(c~~C~~yclohexyloxy)phenyl]-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

7~~17~~. The compound according to claim 1, which is 9-[4-(c~~C~~yclohexyloxy)phenyl]-7-methyl-3,4-dihydropyrazino[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

8. The compound according to claim 1, which is 9-{4-[difluoro(phenyl)methyl]phenyl}-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

9. The compound according to claim 1, which is 9-[4-(3,4-

dimethylphenoxy)phenyl]-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

10. The compound according to claim 1, which is 9-[4-(2,3-dihydro-1-benzofuran-6-yloxy)phenyl]-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

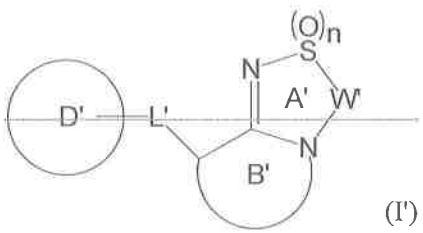
11. The compound according to claim 1, which is 9-[4-(3-methylphenoxy)phenyl]-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

12. The compound according to claim 1, which is 7-chloro-9-{4-[(5-chloropyridin-2-yl)oxy]phenyl}-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

13. The compound according to claim 1, which is 7-chloro-9-(4-{[2-(trifluoromethyl)pyridin-4-yl]oxy}phenyl)-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

14. The compound according to claim 1, which is 9-{4-[difluoro(4-methylphenyl)methyl]phenyl}-3,4-dihydropyrido[2,1-c][1,2,4]thiadiazine 2,2-dioxide or a salt thereof.

15~~18~~. A medicament containing a compound according to any one of claims 1-14 ~~represented by the formula (I'):~~



(I')

~~wherein~~

~~ring A' is an optionally substituted 5 - 7-membered heterocycle,~~

~~ring B' is an optionally substituted 5 - 8-membered heterocycle having, as a ring-constituting atom besides carbon atom, one nitrogen atom, and optionally further having 1 to 3 hetero atoms selected from a nitrogen atom, an oxygen atom and a sulfur atom,~~

~~ring D' is an optionally substituted non-aromatic hydrocarbon ring, an optionally substituted non-aromatic heterocycle, an optionally substituted aromatic hydrocarbon ring, or an optionally substituted aromatic heterocycle,~~

~~W' is optionally substituted C_{1-3} alkylene, or optionally substituted C_{2-3} alkenyl,~~

~~L' is a bond, or a spacer having the main chain having an atom number of 1 - 8, and~~

~~n is 0, 1 or 2~~

or a pharmaceutically acceptable salt thereof.

16~~19~~. The medicament according to claim 15~~18~~, which is an AMPA receptor potentiator.

17~~20~~. The medicament according to claim 16~~18~~, which is a prophylactic or therapeutic agent for depression, stress insomnia, sleep apnea syndrome, schizophrenia, Alzheimer's disease or attention deficit hyperactivity disorder.

~~21. A method for the prophylaxis or treatment of depression, stress insomnia, sleep apnea syndrome, schizophrenia, Alzheimer's disease or attention deficit hyperactivity disorder, comprising administering an effective amount of a compound represented by the formula (I') or a salt thereof to a mammal.~~

18~~22~~. Use of a compound according to any one of claims 1-14~~represented by the formula (I')~~ or a pharmaceutically acceptable salt thereof for the production of a prophylactic or

therapeutic drug for depression, stress insomnia, sleep apnea syndrome, schizophrenia, Alzheimer's disease or attention deficit hyperactivity disorder.

~~23. Use of a compound represented by the formula (I') or a salt thereof for the prophylaxis or treatment of depression, stress insomnia, sleep apnea syndrome, schizophrenia, Alzheimer's disease or attention deficit hyperactivity disorder.~~