Claims

1. A work machine suspension device for conducting lifting work of lifting up a structure member included in a work machine by lifting equipment, the work machine suspension device comprising:

an attachment part to be attached to the lifting equipment in the lifting work; and

a plurality of retention devices supported by the attachment part,

wherein each of the plurality of retention devices includes:

a proximal end portion connected to the attachment part;

a first leg portion that is supported by the proximal end portion and includes a first leg portion main body that is disposed below the proximal end portion;

a second leg portion that is supported by the proximal end portion and includes a second leg portion main body disposed below the proximal end portion, the second leg portion main body being disposed at an interval in a horizontal direction from the first leg portion main body; and

a support member supported by the first leg portion main body so as to be movable between an entry allowed position and a retention position,

the entry allowed position being a position where the support member retracts from the second leg portion main body to allow a retained portion as a part of the structure member to enter between the first leg portion main body and the second leg portion main body, and

the retention position being a position where the retained portion is retained on the support member while the support member is supported by the first leg portion main body and the second leg portion main body~~.~~,

wherein each of the plurality of retention devices further includes an upper pressing member that is interposed between the proximal end portion and the support member so as to be supported by at least one of the proximal end portion, the first leg portion, and the second leg portion, the upper pressing member having an opposing surface opposed to an upper portion of the retained portion that is retained on the support member.

2. The work machine suspension device according to claim 1, wherein

the attachment part includes a base member that supports the plurality of retention devices, and

the plurality of retention devices are fixed to the base member so as to be capable of hanging from the base member at intervals from each other in a horizontal direction.

3. The work machine suspension device according to claim 1 or 2, wherein

each of the plurality of retention devices further includes:

a support member moving mechanism that operates so as to move the support member between the entry allowed position and the retention position; and

a drive part that drives the support member moving mechanism.

4. The work machine suspension device according to any one of claims 1 to 3, wherein the support member has a contact surface in contact with the retained portion that is retained on the support member, the contact surface having a shape corresponding to a

shape of the retained portion.

5. The work machine suspension device according to any one of claims 1 to 4, wherein each of the plurality of retention devices further includes a restricting portion configured to be switched between a restriction state of restricting movement of the support member from the retention position and an allowable state of allowing the support member to move from the retention position to the entry allowed position.

~~6. The work machine suspension device according to any one of claims 1 to 5, wherein each of the plurality of retention devices further includes an upper pressing member that is interposed between the proximal end portion and the support member so as to be supported by at least one of the proximal end portion, the first leg portion, and the second leg portion, the upper pressing member having an opposing surface opposed to an upper portion of the retained portion that is retained on the support member.~~

~~7.~~6. The work machine suspension device according to any one of claims 1 to 5 ~~claim 6~~, wherein each of the plurality of retention devices further includes an upper pressing member moving mechanism that operates so as to move the upper pressing member in an up-down direction relative to the proximal end portion.

~~8.~~7. The work machine suspension device according to any one of claims 1 to 6 ~~claim 6 or 7~~, wherein the opposing surface of the upper pressing member has a shape corresponding to a shape of the upper portion of the retained portion.

~~9.~~8. The work machine suspension device according to any one of claims 1 to ~~8~~ 7, wherein each of the plurality of retention devices further includes:

a first side pressing member that is interposed between the first leg portion main body and the second leg portion main body so as to be supported by at least one of the first leg portion main body and the proximal end portion, and has a first opposing surface opposed to a first side portion of the retained portion that is retained on the support member; and

a second side pressing member that is interposed between the first leg portion main body and the second leg portion main body so as to be supported by at least one of the second leg portion main body and the proximal end portion, and has a second opposing surface opposed to a second side portion of the retained portion that is retained on the support member.

~~10.~~9. The work machine suspension device according to claim ~~9~~ 8, wherein each of the plurality of retention devices further includes a side pressing member moving mechanism that operates so as to change a horizontal distance between the first opposing surface and the second opposing surface by conducting at least one of relative movement of the first side pressing member with respect to the first leg portion main body and relative movement of the second side pressing member with respect to the second leg portion main body.

~~11.~~10. The work machine suspension device according to claim ~~9~~ 8 or ~~10~~ 9, wherein

the first opposing surface has a shape corresponding to a shape of the first side portion of the retained portion that is retained on the support member, and

the second opposing surface has a shape corresponding to a shape of the second side portion of the retained portion that is retained on the support member.

~~12.~~11. The work machine suspension device according to any one of claims 1 to ~~11~~ 10, wherein each of the plurality of retention devices further includes an up-down moving mechanism that operates so as to move the first leg portion main body and the second leg portion main body in the up-down direction relative to the proximal end portion.

~~13.~~12. The work machine suspension device according to any one of claims 1 to ~~12~~ 11, wherein each of the plurality of retention devices further includes a side moving mechanism that operates so as to change a horizontal distance between the first leg portion main body and the second leg portion main body by moving at least one of the first leg portion main body and the second leg portion main body relative to the proximal end portion.

~~14.~~13. The work machine suspension device according to any one of claims 1 to ~~13~~ 12, wherein each of a lower end portion of the first leg portion and a lower end portion of the second leg portion has such an inclined surface that makes a distance in a horizontal direction between the lower end portions increase downward.

~~15.~~14. A retention device to be attached to a structure member included in a work machine for conducting lifting work of lifting up the structure member by lifting equipment, the retention device comprising:

a proximal end portion;

a first leg portion that is supported by the proximal end portion and includes a first leg portion main body that is disposed below the proximal end portion;

a second leg portion that is supported by the proximal end portion and includes a second leg portion main body disposed below the proximal end portion, the second leg portion main body being disposed at an interval in a horizontal direction from the first leg portion main body; and

a support member supported by the first leg portion main body so as to be movable between an entry allowed position and a retention position,

the entry allowed position being a position where the support member retracts from the second leg portion main body to allow a retained portion as a part of the structure member to enter between the first leg portion main body and the second leg portion main body, and

the retention position being a position where the retained portion is retained on the support member while the support member is supported by the first leg portion main body and the second leg portion main body~~.~~,

the retention device further comprises

an upper pressing member that is interposed between the proximal end portion and the support member so as to be supported by at least one of the proximal end portion, the first leg portion, and the second leg portion,

the upper pressing member having an opposing surface opposed to an upper portion of the retained portion that is retained on the support member.

~~16.~~15. The retention device according to claim ~~15~~ 14, further comprising:

a support member moving mechanism that operates so as to move the support member between the entry allowed position and the retention position; and

a drive part that drives the support member moving mechanism.

~~17.~~16. The retention device according to claim ~~15~~ 14 or ~~16~~ 15, wherein

the support member has a contact surface in contact with the retained portion that is retained on the support member,

the contact surface having a shape corresponding to a shape of the retained portion.

~~18.~~17. The retention device according to any one of claims ~~15~~ 14 to ~~17~~ 16, further comprising a restricting portion configured to be switched between a restriction state of restricting movement of the support member from the retention position and an allowable state of allowing the support member to move from the retention position to the entry allowed position.

~~19. The retention device according to any one of claims 15 to 18, further comprising~~

~~an upper pressing member that is interposed between the proximal end portion and the support member so as to be supported by at least one of the proximal end portion, the first leg portion, and the second leg portion,~~

~~the upper pressing member having an opposing surface opposed to an upper portion of the retained portion that is retained on the support member.~~

~~20.~~18. The retention device according to any one of claims 14 to 17 ~~claim 19~~, further comprising an upper pressing member moving mechanism that operates so as to move the upper pressing member in an up-down direction relative to the proximal end portion.

~~21.~~19. The retention device according to any one of claims ~~15~~ 14 to ~~20~~ 18, further comprising:

a first side pressing member that is interposed between the first leg portion main body and the second leg portion main body so as to be supported by at least one of the first leg portion main body and the proximal end portion, and has a first opposing surface opposed to a first side portion of the retained portion that is retained on the support member; and

a second side pressing member that is interposed between the first leg portion main body and the second leg portion main body so as to be supported by at least one of the second leg portion main body and the proximal end portion, and has a second opposing surface opposed to a second side portion of the retained portion that is retained on the support member.

~~22.~~20. The retention device according to claim ~~21~~ 19, further comprising a side pressing member moving mechanism that operates so as to change a horizontal distance between

the first opposing surface and the second opposing surface by conducting at least one of relative movement of the first side pressing member with respect to the first leg portion main body and relative movement of the second side pressing member with respect to the second leg portion main body.

~~23.~~21. The retention device according to any one of claims ~~15~~ 14 to ~~22~~ 20, further comprising an up-down moving mechanism that operates so as to move the first leg portion main body and the second leg portion main body in the up-down direction relative to the proximal end portion.

~~24.~~22. The retention device according to any one of claims ~~15~~ 14 to ~~23~~ 21, further comprising a side moving mechanism that operates so as to change a horizontal distance between the first leg portion main body and the second leg portion main body by moving at least one of the first leg portion main body and the second leg portion main body relative to the proximal end portion.

~~25.~~23. A method for suspending a structure member by using the work machine suspension device according to any one of claims 1 to ~~14~~ 13 to lift up the structure member, the method comprising:

a step of disposing the support member of each of the plurality of retention devices at the entry allowed position;

a step of moving each of the plurality of retention devices downward relative to the retained portion to cause the corresponding retained portion to enter between the first leg portion main body and the second leg portion main body;

a step of moving the support member of each of the plurality of retention devices from the entry allowed position to the retention position; and

a step of suspending the structure member by lifting up the attachment part of the work machine suspension device by the lifting equipment~~.~~,

wherein the opposing surface of the upper pressing member is opposed to the upper portion of the retained portion that is retained on the support member.