direction with respect to the frame, and/or transversely with respect to the longitudinal axis of the frame. Thus, the gripping devices may be pivotable out of the radial or transverse in accordance with the direction in which the wedge assemblies are activated. The frame has opposite ends in axial direction, in such a way that the gripping devices are positioned on the end which faces in the clamping direction of the wedge assemblies.

In view of the above, according to a first aspect of the present invention, there is provided a clamp system for a slender object, such as a pile or pipe and the like, said clamp system comprising: a frame defining a longitudinal axis, wherein the object and the frame are to be arranged around one another in such a way that the longitudinal axis of the frame is generally parallel to the longitudinal axis of the object; clamping means for clamping the object with respect to the frame, the clamping means comprising: at least one gripping device which is rotatably connected to the frame according to an axis of rotation which is oriented transversely with respect to the longitudinal axis of the frame, said gripping device having a gripping state for clamping said object with respect to the frame and an idle state, and- at least one stop which defines an end position of the gripping device, said gripping device in gripping state and positioned in said end position preventing the object from displacing with respect to the frame in a first axial direction along the longitudinal axis of the frame, in which first axial direction the gripping device is held pressed against the stop, and said gripping device allowing the object to displace with respect to the frame in a second axial direction opposite the first axial direction; and a wedge type clamp having wedge assemblies associated with the frame for providing frictional engagement with said object as a result of a relative displacement of the wedge type clamp with respect to the object according to the longitudinal axis, characterized in that the at least one gripping device is arranged with respect to the wedge assemblies in such a way that during said relative displacement of the object and the wedge type clamp said gripping device is transferred from the gripping state, in which the object is held with respect to the frame by the gripping devices, into the idle state so as to establish said frictional engagement between the wedge assemblies and the object.

The invention is furthermore related to a gripping device for a clamp body system as described before, comprising a piston/cylinder device which is transferrable

between an active position in which the piston extends with respect to the cylinder, and an inactive position in which the piston is retracted with respect to the cylinder, as well as a base for mounting onto the frame and onto which base the piston/cylinder device is connected through a pivot the pivot axis of which is oriented transverse with respect to the longitudinal direction of the piston/cylinder device.

~~Also~~According to a second aspect of the present invention, there is provided, ~~the invention is related to~~ a method for lifting a slender object by means of the clamp system as described ~~before~~herein, wherein the wedge assemblies and the at least one gripping devices are oriented inwardly with respect to the frame for engagement with the external surface of the object. The method comprises~~ing~~ the steps of: fitting the frame around a lying object, activating the wedge assemblies so as to engage the internal surface of the lying object, activating one or more gripping devices so as to grip the external surface of the lying object, lifting the object gripped by the gripping device(s) and transferring said object towards an upright position, during the process of transferring the object to the upright position, displacing the object with respect to the frame so as to provide or increase frictional engagement between the wedge assemblies thereof and the object, and during the process of transferring the object to the upright position, transferring the gripping device(s) from the gripping state into the idle state.

~~- fitting the clamp around a lying object,~~

~~- activating the gripping devices so as grip the external surface of the lying object,~~

~~- lifting the object gripped by the gripping devices and transferring said object towards an upright position,~~

~~- during the process of transferring the object to the upright position, displacing the object with respect to the frame so as to activate or further activate the wedge assemblies,~~

~~- and during the process of transferring the object to the upright position, transferring the gripping devices from the gripping state into the idle state.~~

~~Alternatively, the method may comprise the steps of:~~According to a third aspect of the present invention, there is provided a method for lifting a hollow slender object by means of the clamp system as described herein, wherein the wedge assemblies and the at least one gripping device are oriented outwardly with respect to the frame for engagement with the internal surface of the hollow object. The method comprises the

steps of: introducing the frame in the lying object, activating the wedge assemblies so as to engage the internal surface of the lying object, activating one or more gripping devices so as to grip the internal surface of the lying object, lifting the object gripped by the gripping device(s) and transferring said object towards an upright position, during the process of transferring the object to the upright position, displacing the object with respect to the frame so as to provide or increase frictional engagement between the wedge assemblies thereof and the object, and during the process of transferring the object to the upright position, transferring the gripping device(s) from the gripping state into the idle state.

~~- introducing the frame in the lying object.~~

~~- activating one or more gripping devices so as to grip the internal surface of the lying object.~~

~~- lifting the object gripped by the gripping device(s) and transferring said object towards an upright position.~~

~~during the process of transferring the object to the upright position, displacing the object with respect to the frame so as to activate or further activate the wedge assemblies thereof.~~

~~and during the process of transferring the object to the upright position, transferring the gripping device(s) from the gripping state into the idle state.~~

In particular, ~~this~~the methods may comprise the step of:

- during the process of transferring the object to the upright position, transferring the gripping devices from the gripping state into the idle state by making the gripping devices rotate about the respective pivot axis thereof.

Also, ~~this~~the methods may comprise the steps of:

- displacing the object with respect to the clamp under the influence of gravity as a result of transferring the object towards the upright position,

- during the step of displacing the object with respect to the clamp, pivoting the gripping device out of the gripping position into the idle position.

The invention will now be described further with reference to the embodiment of the clamp system as shown in the drawings.

Figure 1 shows a view in perspective from below on a first embodiment of the clamp system.

Figure 2 shows a view in perspective of a gripping device for the clamp system of figure 1.

Figures 3-5 show several stages of the process of lifting and upending an object.

Figure 6 shows part of the clamp system of figure 1 as applied on a lying object as according to figure 3.

Figure 7 shows part of the clamp system of figure 1 as applied on an upended object as according to figure 5.

Figure 8 shows a partial view in longitudinal section of a second embodiment of the clamp system.

The first embodiment of the clamp system as shown in figure 1 consists of the wedge type clamp which has generally been denoted by reference numeral 1, as well as the series 2 of gripping devices 3. The wedge type clamp 1 has an annular frame 4 which consists of two frame halves 5, 6 which are connected to each other through the hinge 7 and an actuator means 8 at one end. By energizing the actuator 8, the frame halves 5, 6 can be swung around the hinge 7 between an open position and the closed

Claims

1. Clamp system for a slender object (16), such as a pile or pipe and the like, said clamp system comprising:

a frame (4) defining a longitudinal axis, wherein the object and the frame (4) are to be arranged around one another in such a way that the longitudinal axis of the frame (4) is generally parallel to the longitudinal axis of the object (16);

~~as well as~~ clamping means (2) for clamping the object (16) with respect to the frame (4), ~~characterized in that~~ the clamping means comprising:

_____- at least one gripping device (3) which is rotatably connected to the frame (4) according to an axis of rotation which is oriented transversely with respect to the longitudinal axis of the frame (4), said gripping device (3) having a gripping state for clamping said object (16) with respect to the frame (4) and an idle state, and

_____- at least one stop (25) which defines an end position of the gripping device (3), said gripping device (3) in gripping state and positioned in said end position preventing the object (16) from displacing with respect to the frame (4) in a first axial direction along the longitudinal axis of the frame (4), in which first axial direction the gripping device (3) is held pressed against the stop (25), and said gripping device (3) allowing the object (16) to displace with respect to the frame in a second axial direction opposite the first axial direction; and

a wedge type clamp (1) having wedge assemblies (11) associated with the frame for providing frictional engagement with said object as a result of a relative displacement of the wedge type clamp with respect to the object according to the longitudinal axis, characterized in that the at least one gripping device is arranged with respect to the wedge assemblies in such a way that during said relative displacement of the object and the wedge type clamp (1) said gripping device (3) is transferred from the gripping state, in which the object (1) is held with respect to the frame (4) by the gripping devices, into the idle state so as to establish said frictional engagement between the wedge assemblies (11) and the object (16).

2. Clamp system according to claim 1, wherein a gripping device (3) is mounted to the frame (4) by means of a respective pivot (22) and which gripping device (3) is displaceable between an active position which is radially oriented with respect to the

longitudinal axis of the frame (4) and an inactive position slanted with respect to the radially oriented active position.

3. Clamp system according to claim 2, wherein the stop (25) is provided on the frame (4) and/or a base or mounting (21).

4. Clamp system according to claim 3, wherein a gripping device (3) is biased toward the stop (25), such as by an elastic pretension.

5. Clamp system according to any of the preceding claims for introduction in a hollow object (16), wherein the gripping device (3) is carried out for gripping the internal surface of the hollow object (16).

6. Clamp system according to any of claims 1-4, wherein the frame (4) delimits a passage (9) for accommodating the object (16) and the gripping device is carried out for gripping the external surface of the object.

7. Clamp system according to claim 6, wherein the frame (4) comprises frame halves (5, 6) which are connected to each other through a hinge (7) the hinge axis of which is generally parallel to the longitudinal axis of the frame (4), said frame halves (5, 6) being transferrable between an active position closed onto each other around the object, and an open position in which the frame (4) can be positioned on the object (16).

8. Clamp system according to claim 7, wherein closure means (8) are provided on the frame halves (5, 6) for holding said frame halves pressed onto each other respectively for giving said frame halves free.

~~9. Clamp system according to any of the preceding claims, comprising a wedge type clamp (1) having wedge assemblies (11) associated with the frame for providing frictional engagement with said object as a result of a relative displacement of the wedge type clamp with respect to the object according to the longitudinal axis, characterized in that a gripping device is arranged with respect to the wedge assemblies~~

~~clamp (1) said gripping device (3) is transferred from the gripping state, in which the object (1) is held with respect to the frame (4) by the gripping devices, into the idle state so as to establish said frictional engagement between the wedge assemblies (11) and the object (16).~~

~~10~~9. Clamp system according to ~~claim 9 when dependent on~~ claim 5, wherein the wedge assemblies (11) and ~~a~~ the at least one gripping device (3) are oriented outwardly with respect to the frame (4) for engagement with the internal surface of the hollow object (16).

~~11~~10. Clamp system according to ~~claim 9 when dependent on~~ claim 6, wherein the wedge assemblies (11) and ~~a~~ the at least one gripping device (3) are oriented inwardly with respect to the frame (4) for engagement with the external surface (3) of the object (16).

~~12~~11. Clamp system according to any one of claim~~s~~ 1~~-~~9~~-10~~, wherein ~~a~~ the at least one gripping device (3) is positioned at a distance in axial direction from the wedge assemblies (11).

~~13~~12. Clamp system according to any of the preceding claims ~~9-12~~, wherein ~~a~~ the at least one gripping device (3) is pivotable out of the radial position in accordance with the direction of relative displacement of the object with respect to the frame (4) which causes frictional engagement between the wedge assemblies and the frame (4).

~~14~~13. Clamp system according to any of the preceding ~~of~~ claims ~~9-13~~, wherein the frame (4) has opposite axial ends and ~~a~~ the at least one gripping device (3) is positioned on the end which faces in the clamping direction of the wedge assemblies (11).

~~15~~14. Clamp system according to any of the preceding claims, wherein a plurality of gripping devices (3) is provided, said gripping devices being spaced around, and being oriented transversally with respect to, the longitudinal axis of the frame (4).

~~16. Gripping device (3), such as for a clamp system according to any of the preceding claims, comprising an actuator, such as a piston/cylinder device (17), which is transferrable between an active position, e.g. in which the piston (19) extends with respect to the cylinder (18), and an inactive position, e.g. in which the piston is retracted with respect to the cylinder, as well as a mounting or base (21) for mounting onto the frame (4) and onto which base the actuator (17) is connected through a pivot (22) the pivot axis of which is oriented transverse with respect to the direction of extension/retraction of the actuator (17).~~

~~17. Gripping device (3) according to claim 16, wherein the mounting or base (21) has a stop means (25) which defines a first or gripping position of the actuator (17), from which first position the actuator is pivotable to a second or free position.~~

~~18. Gripping device (3) according to claim 16 or 17, wherein biasing means (24) are provided for biasing the actuator (17) towards the stop means (25).~~

~~19~~15. Method for lifting a hollow slender object (16) by means of the clamp system according to claim ~~10~~9 or to any of claims ~~12~~11-~~15~~14 when dependent on claim ~~10~~9, comprising the steps of:

- introducing the frame (4) in the lying object (16),

- activating the wedge assemblies (11) so as to engage the internal surface of the lying object (16),

- activating one or more gripping devices (3) so as to grip the internal surface of the lying object (16),

- lifting the object gripped by the gripping device(s) and transferring said object towards an upright position,

- during the process of transferring the object to the upright position, displacing the object with respect to the frame (4) so as to provide or increase frictional engagement between the wedge assemblies (11) thereof and the object (16),

- and during the process of transferring the object to the upright position, transferring the gripping device(s) from the gripping state into the idle state.

~~20~~16. Method for lifting a slender object (16) by means of the clamp system according to claim ~~11~~10 or any of claims ~~12~~11-~~15~~14 when dependent on claim ~~11~~10, comprising the steps of:

- fitting the frame (4) around a lying object (16),
- activating the wedge assemblies (11) so as to engage the internal surface of the lying object (16),
- activating one or more gripping devices (3) so as to grip the external surface (30) of the lying object (16),
- lifting the object gripped by the gripping device(s) and transferring said object towards an upright position,
- during the process of transferring the object to the upright position, displacing the object with respect to the frame (4) so as to provide or increase frictional engagement between the wedge assemblies (11) thereof and the object (16),
- and during the process of transferring the object to the upright position, transferring the gripping device(s) from the gripping state into the idle state.

~~21~~17. Method according to claim ~~19~~15 or ~~20~~16, comprising the step of:

- during the process of transferring the object (16) to the upright position, transferring one or more gripping devices (3) from the gripping state into the idle state by making the gripping device(s) rotate about the respective tangentially oriented axis of rotation thereof.

~~22~~18. Method according to claim ~~19~~15, ~~20~~16 or ~~21~~17, comprising the steps of:

- displacing the object (16) with respect to the clamp under the influence of gravity as a result of transferring the object towards the upright position,
- during the step of displacing the object with respect to the wedge type clamp (1), pivoting the gripping device(s) (3) out of the gripping position into the idle position.