(19) Octrooicentrum Nederland

(11) **1041270**

(12) A **OCTROOIAANVRAAG**

(21) Aanvraagnummer: **1041270**

(22) Aanvraag ingediend: **13/04/2015**

(51) Int. Cl.:
E01F 9/018 (2006.01)

(41) Aanvraag ingeschreven:
14/10/2016

(43) Aanvraag gepubliceerd:
20/01/2017

(71) Aanvrager(s):
Hunter Douglas Industries B.V. te Rotterdam.

(72) Uitvinder(s):
Andrew den Bakker te Rotterdam.
John Haakmat te Rotterdam.

(74) Gemachtigde:
ir. J. de Vries te Rotterdam.

(54) **Utility pole with shear off coupling assembly.**

(57) Utility pole, having a longitudinal direction and a radial direction, and comprising a base, a column and a coupling assembly for connecting the column to the base in a separable manner. The coupling assembly comprises a recessed first end portion provided at an upper end of the base, a recessed second end portion provided at a lower end of the column, and a plurality of holding elements for coupling the first and second end portions to each other. Each holding element comprises a first formation, a second formation and a base part to interconnect said formations in the longitudinal direction. The first and second formation are arranged to fit in a recess of the first and second end portion respectively, and to be releasable therefrom in radial outward direction. The recesses of the first and second end portion are dimensioned and arranged to extend within a contour of the base and column, in radial direction.

NL A 1041270

Utility pole with shear off coupling assembly

The present invention relates to a utility pole that comprises a base for mounting into the ground, a column for carrying a utility member such as a lamp, a traffic sign, a traffic light, a camera or the like, and a coupling assembly for connecting the column to the base in a separable manner.

Background of the invention

Such utility poles are known. The coupling assembly allows the column to become separated from the base when lateral forces on the utility pole exceed a certain threshold value such as during an impact with a vehicle.

The coupling assemblies can be divided into two types:

- frangible coupling assemblies that make use of frangible and/or brittle components that break when subjected to sufficiently high lateral forces, and
- shear-off coupling assemblies that make use of detachable components that become dislodged or disengaged from each other, when subjected to sufficiently high lateral forces.

An example of a frangible coupling assembly is disclosed in EP2400060 of applicant. Base and column of the utility pole are connected to each other via a break-away sleeve that is made of a brittle material designed to break when lateral impact forces on the utility pole exceed a certain value. Another example is disclosed in EP1741832 wherein a stiff, hard and/or sharp accessory is provided inside or around a lower portion of the pole. When subject to lateral impact forces, this accessory cuts into the pole, causing it to become severed.

An advantage of these frangible coupling assemblies is that they usually comprise relatively few components that are easy to assemble. A disadvantage, however, is that their breaking behavior depends strongly on the material properties of the frangible components. These material properties may vary in different directions and often cannot be controlled accurately enough to make the pole break in a reliable, predictable manner. This may prove in particular critical with impacts occurring at low velocities, where the kinetic energy transferred to the pole may simply not be sufficient to cause the coupling to break. Shear-off coupling assemblies tend to perform better in this respect, as the impact forces only need to overcome frictional force between the various detachable components, which can be more readily controlled.

An example of a shear-off coupling is disclosed in GB1087073, featuring a pole with a base and a column that are each provided with an external flange. These flanges are secured to each other via bolt connections that extend through recesses in the flanges. The recesses are open in a radially outward direction, allowing the bolt connections to release from the recesses when the lateral forces on the pole exceed the frictional forces between the flanges and bolt connections. A disadvantage of this known coupling assembly is that the flanges an bolt connections project from the pole and may therefore cause damage or injury to the environment. Moreover, the flanges and bolt connections lie exposed to weather, dirt and other abrasive conditions, which may affect their shear-off properties, especially their reliability.

EP2014850 therefore propose to reverse the radial orientation of the flanges and recess openings so as to extend radially inward into the pole. This brings the advantage that the bolt connections can be located inside the pole, protected against external influences. However, with the reversal of the radial orientation, the release direction of the bolts is reversed as well. This is a problem, since the radial inward release directions of adjacent bolts converge, i.e. intersect, causing the bolts to collide or worse, to block each other's release. Therefore, additional measures are needed to ensure proper release. For instance, the contact surfaces between flanges and adjacent bolts need to be spaced apart in vertical direction. Also, spacers are needed to keep adjacent bolts sufficiently apart in circumferential direction. Furthermore, special arrangements are needed to stabilize the bolts in radial and circumferential direction.

A further disadvantage of both prior art shear-off coupling assemblies is that they comprise a large number of components. For instance, each bolt connection already comprises a bolt, a nut and two washers, which all need to be assembled together, making these known coupling assemblies cumbersome and expensive to manufacture and susceptible for failures, such as assembly errors.

It is an object of the present invention to provide a utility pole with a coupling assembly of the shear-off type, in which at least one of the above mentioned disadvantages of the known coupling assemblies is overcome or mitigated.

It is a further object of the present invention to provide a utility pole with a coupling assembly of the shear-off type, presenting reliable shear-off behavior, yet without compromising the utility pole's other mechanical properties, notably its bending stiffness and torsional stiffness.

It is a further object of the present invention to provide a utility pole that complies with European Standard EN12767, more preferably with the NE levels cited in this standard, even more preferably with the levels wherein at the specified speed class, the ASI is at most 0.6, and the THIV is at most 11 km/h.

European Standard EN12767 defines impact classifications and a number of impact tests, that take into account different safety levels for occupants of a vehicle, in particular the Acceleration Severity Index (ASI), i.e. the accelerations of the body of a vehicle occupant during the impact, and the Theoretical Head Impact Value (THIV), i.e. the calculated velocity with which the head of the occupant would hit the windscreen. The European Standard considers three categories of light poles: high energy absorbing (HE), meaning that most energy of the impact will be transferred from the vehicle to the pole and the velocity of the vehicle will be largely reduced if not zero after the impact, low energy absorbing (LE) and non-energy absorbing (NE).

Summary of the invention

The utility pole according to the present invention comprises a base, a column and a coupling assembly of the shear-off type. The coupling assembly comprises a first end portion provided at an upper end of the base, a second end portion provided at a lower end of the column and a plurality of holding elements for coupling the first and second end portion to each other. The first and second end portion are each provided with one or more recesses, extending in circumferential direction and having their open side facing in radial outward direction. Each holding element comprises a first formation, a second formation and an interconnecting base part. The first and second formation are configured to fit into a recess of the first and second end portion respectively. The recesses of the first and second end portion are arranged and dimensioned to extend within the contour of the base and column, in radial direction.

Thanks to the specific configuration of the first and second end portion, especially their respective first and second recesses, the holding elements can release or disengage therefrom in radial outward direction. Yet at the same time, the holding elements, or at least the first and second formation thereof, can lie within the radial contour of the utility pole, safely enclosed by the base and column, shielded from external influences. Also, since the holding elements may be largely or entirely accommodated within the radial contour of the pole, the coupling assembly may form less of a hazard to the outside world.

Release of the holding elements in radial outward direction is advantageous because the release directions of adjacent holding elements will automatically diverge, so therefore there is no need for additional provisions to prevent holding elements blocking each other's release. Also, there is no need to space the holding elements apart in circumferential direction. On the contrary, the holding elements may advantageously be mounted side by side, in abutting relationship with one another, which may help to stabilize them in circumferential and radial direction without the need for separate provisions. Accordingly, a simple yet effective coupling assembly may be obtained with a minimum of components that can be easily assembled. Moreover, said components do not or hardly project from the pole in assembled condition and therefore will have no or little exposure to external influences.

According to an aspect of the invention, the first end portion may have a single first recess, extending around the entire outer circumference or a substantial part thereof. In the first case, the single recess may for instance be ring shaped, in the second case be ring segment shaped. Such a single recess is easy to manufacture and provides ease of assembly, especially if it spans the entire circumference, as there will be no need to align said recess during assembly with a second recess of the second end portion. The first formations of the holding elements can be mounted at any desired location along the first recess. Also, the ring shape will not have any obstructions in radial outward direction so is ideal for the first formations to release from.

Alternatively, the first end portion may comprise a plurality of first recesses. These first recesses may for instance have the shape of ring segments. They may confine movement of the first formations in circumferential direction and thus help to prevent rotation of the column relative to the tube, therewith enhancing the torsional resistance of the pole. Preferably, the first recesses are arranged at regularly or evenly spaced intervals along the outer circumference. In such case, the shear-off coupling assembly can perform well in every radial direction, regardless of the impact direction.

Similar considerations as cited above for the at least one first recess apply mutatis mutandis to the at least one second recess of the second end portion. Furthermore, all combinations are possible, i.e. the first and second end portion may both be provided with a single recess, or both be provided with a plurality of recesses, or one may be provided with a single recess and the other one with a plurality of recesses.

According to an aspect of the invention, the first formations may be ring segment shaped. Such shape offers good releasability in radial outward direction. Also, it allows a number of first formations to be mounted in abutting, side by side relationship in circumferential direction. This may add to the stability of the assembly in circumferential direction, as the first formations will prevent each other from shifting in circumferential direction. It may also contribute to ease of assembly as installation may be done in an intuitive, foolproof manner. Also, the radially outward facing surfaces of the first formations may together form a cover, closing off the or each recess in which they are mounted, thus shielding their radial inward located portions and in particularly their contact surfaces against external influences such as ingress of dirt. The ring segmented first formations may for instance extend over an angle of about 15° to 180°, corresponding to a maximum of 24, respectively 2 first formations per utility pole. In general, the releasability of the first formations is served by increasing their number in circumferential direction, i.e. by reducing their ring segment angle. The number of holding elements may be varied, depending on for instance the dimensions of the pole, the expected external condition to which the pole will be exposed, as well as the expected impact conditions.

According to an aspect of the invention, the second formations may be ring segment shaped. The same considerations as listed above for the first formations apply mutatis mutandis for such ring segment shaped second formations.

According to an aspect of the invention, the base part may be ring segment shaped. The same considerations as listed above for the first formations apply mutatis mutandis for such ring segment shaped base parts.

According to an aspect of the invention, only the first or second formations may be ring segment shaped. The other ones may have a different shape, e.g. a disc shape.

According to an aspect of the invention, both the first and second formations may be ring segment shaped. The base part may be ring segment shaped as well. Alternatively, the base part may for instance be shaped as one or more rods having one end connected to the first formation and an opposite end connected to the second formation. Such rod or rods could then also form part of an anti-rotation provision, in cooperation with a suitable recess or slot in a mating surface of the first and/or second end portion, as will be described in further detail below.

According to an aspect of the invention, the first formation, second formation and base part may be integrally formed together to form a one-piece holding element, or be pre-assembled prior to its mounting such that the holding element can be mounted as a one-piece component.

Contrary to the teachings of the known shear-off assemblies, applicant has found that no clamping forces are needed to connect the column to the base. Instead, the holding elements only need to prevent separation of the column and base in longitudinal direction, which may for instance occur under influence of bending moments acting on the pole. The weight of the column itself will in most cases be sufficient to generate sufficient frictional forces between the first and second end portion to withstand lateral and torsional loads that under normal (non-impact) conditions may act on the pole. Accordingly, applicant has recognized that the holding elements do not have to be configured as clamping means, such as the complex prior art bolt connections, but instead can be configured as one-piece holding element of fixed dimensions, designed to block separation of the first and second end portion in longitudinal direction. It will be clear that with these one-piece holding elements, assembly will be much easier. Thanks to the absence of clamping forces, the coupling assembly may also perform better at low velocity impacts. This is because the impact forces will only need to overcome the frictional forces generated between the first and second end portion by the weight of the column, no frictional forces generated by an additional clamping force.

It will be clear that such one-piece holding elements may also advantageously be applied in other shear-off assemblies, without the limitations of present claim 1. Therefore, according to an aspect of the invention, a utility pole may be provided, having a base, a column and a shear-off coupling assembly for connecting the column to the base in a separable manner, wherein the coupling assembly comprises one-piece holding elements as described above, without the limitations of claim 1. More particularly, such coupling assembly may comprise a recessed first end portion provided at an upper end of the base, a recessed second end portion provided at a lower end of the column, and a plurality of one-piece holding elements, each holding element comprising a first formation configured to fit into a recess of the first end portion and be releasable therefrom in a radial direction, a second formation configured to fit into a recess of the second end portion and be releasable therefrom in a radial direction and a base part interconnecting the first and second formation in longitudinal direction.

According to an aspect of the invention, the holding element may have a substantially C-shaped cross section, with the first and second formations forming the legs of the C. Such holding element is easy to manufacture and easy to install. The holding element can simply with its first and second formation be inserted into a first and second recess of the first and second end portion respectively, with the rear side of the base part facing radially outward, forming a protective cover that closes off the recesses and shields the first and second formation against external influences.

According to an aspect of the invention, adjacent holding elements may abut each other in circumferential direction with their respective first formations, second formations and/or base parts. This may help prevent shifting of the holding elements in circumferential direction. The radial outward facing surfaces of the holding elements may together form a protective surface that shields the more inward located portions against external influences.

According to an aspect of the invention, the first formations, second formations and/or base parts of the holding elements may together span the entire circumference of the first and second end portion so as to form a closed or substantially closed ring in assembled condition. Apart from the aforementioned advantages, this may help to ensure that the shear-off assembly may perform properly in every direction, regardless of the impact direction on the pole.

According to an aspect of the invention, the first end portion may extend within the contour of the base in radial direction and the second end portion may extend within the contour of the column in radial direction. The first and second end portion may together define an annular cavity for accommodating the holding elements, wherein the holding elements do not project beyond the contour of the base and column in radial direction and preferably have a radial outer surface that lies flush with the outer surface of the base and column in assembled condition. Accordingly, the pole can have a smooth outer surface, free from potentially hazardous projections. Thus, there is less risk of a person or object getting injured/ damaged and less risk of a holding element being released prematurely by an object or person getting caught behind a projecting portion of the coupling assembly.

According to an aspect of the invention, an anti-rotation provision may be provided between contact surfaces of at least one of the holding elements and the first and/or second end portion, to prevent displacement of the holding element in circumferential

direction. This in turn may help to prevent rotation of the column with regard to the base and may thus enhance the pole's torsion stiffness.

The anti-rotation provision may have a main dimension that is much larger than its other dimensions, i.e. its directions orthogonal to said main direction. The anti-rotation provision may for instance comprise two mating profiles, such as a key and slot. The anti-rotation provision may be provided between a radial inward facing surface of the holding element and a radial outward facing surface of the first and/or second end portion. In such case, the anti-rotation provision preferably has a main direction extending in longitudinal direction of the utility pole. As mentioned above, such an anti-rotation provision may be formed by the base part itself, which may be received in a recess, slot or notch provided in a mating surface of the first and/or second end portion, more particularly in an edge portion thereof that extends between the respective first and second recesses and the free edges of the end portions.

Additionally or alternatively, the anti-rotation provision may be provided between a downward facing surface of the holding element and an upward facing surface of the first end portion, and/or between an upward facing surface of the holding element and a downward facing surface of the second end portion. In such case, the anti-rotation provision preferably has a main direction extending in radial direction. Thanks to aforementioned main directions of the anti-rotation provision, the torsional stiffness of the pole can be enhanced without compromising the releasability of the holding element in radial direction.

According to an aspect of the invention, an additional or alternative anti-rotation provision may be provided between contacting end surfaces of the first and second end portion, to prevent rotation of said portions relative to each other and enhance the torsional stiffness of the pole. Preferably, the anti-rotation provision has a main direction extending in radial direction so as not to compromise radial movement of the second end portion with respect to the first end portion. The anti-rotation provision may extend radially outward so as to extend between adjacent holding elements. Thus, circumferential movement of the holding element, first and second end portion can be prevented with a single provision.

According to an aspect of the invention, retention means may be provided to help retaining the holding elements in radial direction. Thus, accidental disengagement of the holding elements may be prevented. The retention means may for instance comprise an

adhesive or an adhesive tape, arranged between mating surfaces of the holding element and the first and/or second end portion.

Alternatively or additionally, the retention means may comprise an elongated flexible element such as for instance a string or wire, extending around the outer surface of the holding elements. In such case, the holding elements may be provided with an indentation, extending in circumferential direction along their outer surface. Such indentation may advantageously accommodate the retention means, and may for instance prevent it from being tampered with or from becoming inadvertently released, or from shifting up or downward, or from projecting radially beyond the outer contour of the pole. The indentation may extend near an upper and/or lower edge of said outer surface. In such case, the elongated retention element may be made of rubber, silicon or a similar material, so that it can additionally serve as a sealing element, to protect the interior of the pole and coupling assembly against moisture, dirt and the like that could otherwise could cause for instance corrosion and other damage to said interior. Of course, it is also possible to have one or two separate sealing elements, in addition to a retention element. These separate sealing element or elements may be mounted near the upper and/or lower outer edge of the holding element.

The properties of the retention means may be selected such that their retention strength is high enough to keep the holding elements in assembled condition, but weak enough to be broken by the impact forces. Alternatively, the retention means may serve to control, more particularly increase the threshold values at which the holding elements and pole disintegrate.

According to an aspect of the invention, the coupling assembly may comprise an even number of holding elements. This allows pairs of holding elements to be arranged at diametrically opposed positions, resulting in a symmetric force distribution on the respective holding elements during an impact which is believed to result in optimal release behavior.

According to an aspect of the invention, the first end portion may form integral part of the base. Alternatively, the first end portion may be part of a separate interface member, that can be secured to said base, for instance in an open end thereof. The latter option has the advantage that the base and end portion can be made from different wall thicknesses and/or different materials with different material properties, adapted to the respective tasks of said components in the utility pole. The first end portion and interface

member may for instance be made of metal or a metal alloy. Also, the end portion may be easier to manufacture when provided on a separate interface member.

Similar consideration apply to the second end portion mutatis mutandis, i.e. the second end portion may be part of a second interface member that in assembled condition is secured to the column, for instance in an open end thereof.

The first and second interface members may for instance be secured to the base and column respectively by means of an adhesive or epoxy, adhesive tape, welding, mechanical fastening means or any other suitable securing means, preferably strong enough to prevent movement of the interface members in longitudinal and circumferential direction of the base and column respectively.

According to an aspect of the invention, the first and second interface member may each be provided with a collar. Such collar may help to determine and/or limit the installation depth of the interface member with regard to the base and column respectively. Also, in assembled condition, the collar of the first interface member may rest on an upper edge of the base and the collar of the second interface member may support a lower edge of the column. As such, the gravitational forces of the column can to a large extend be guided directly into the base via the collars, thus bypassing the adhesive or other securing means between the interface members and the column and base respectively, which may add to their lifetime.

According to an aspect of the invention, the holding elements may be made of metal, a metal alloy or any suitable plastic.

According to an aspect of the invention, the first and second end portion, and more preferably the first and second interface member may be identical, thereby reducing the number of different components and making assembly more foolproof and easier.

According to an aspect of the invention, a separation surface of the coupling assembly may be located at a certain distance H above ground level (G). This may help the pole to disintegrate more readily and predictable. Preferably, the separation surface is located slightly below the expected impact level so as to allow the separation process to take place predominantly by purely lateral impact forces, rather than by bending forces that would be acting on the coupling assembly were the impact to take place at a much higher location than said separation surface.

Brief description of the drawings

Below, the invention will be explained with reference to some drawings, which are intended for illustration purposes only and not to limit the scope of protection as defined in the accompanying claims.

Figure 1 illustrates, in longitudinal cross sectional view, an embodiment of a utility pole of the invention showing a portion of the pole indicating the position of the shear-off coupling assembly in relation to the column, the base and the ground in which the pole is placed;

Figure 2a illustrates a detailed view of the region around the separation location of the utility pole's shear-off coupling assembly according to the embodiment of figure 1;

Figure 2b illustrates a detailed view of a holding element according to the embodiment of figure 1;

Figure 3a illustrates a perspective view of a first or second interface member with a first or second end portion according to an embodiment of the present invention;

Figure 3b illustrates a perspective view a holding element according to an embodiment of the present invention;

Figure 4 illustrates a cut-away, perspective view of a first end portion and several holding elements in connected state in the recess of the end portion according to an embodiment of the present invention; and

Figure 5 illustrates a perspective view of an embodiment of the shear-off coupling assembly according to the invention, showing a number of holding elements in connected state.

Detailed description

Figure 1 shows an embodiment of a utility pole 1 according to the invention, in longitudinal cross-sectional view. The pole has a longitudinal direction X and a lateral or radial direction R. The pole 1 comprises a base 3 (for instance a cylinder) with an outer contour B, a column 4 (for instance a cylinder) with an outer contour C, and a shear-off coupling assembly 10 for coupling the column 4 to the base 3 in a separable manner.

The base 3 is with one end inserted in the ground, so as to provide stability to the column 4 and withstand lateral loads, for instance wind load or the like. The other end of the base 3 may lie flush with ground level G but preferably projects over a limited distance h, as illustrated, so as to be visible and readily accessible for connecting column

4. To prevent sway of the utility pole, the projecting distance h of the base 3 may be limited, for instance to about 500 mm.

Figure 2a shows a more detailed view of the coupling assembly 10 of Figure 1. It comprises a first end portion 18 provided at an upper end of the base 3 and a second end portion 19 provided at the lower end of the column 4. The first and second end portions 18, 19 may be integrally formed with the base 3 and column 4 respectively. Alternatively, as best seen in Figure 1, the first and second end portions 18, 19 may be part of a separate first and second interface member 11, 12. These interface members 11, 12 may be secured to the base 3 and column 4 respectively with any suitable securing means, such as adhesive, welding, mechanical locking means, etc. The first and second interface member 11, 12 may be provided with a first, respectively second collar 8, 9 as best seen in Figures 2A and B. These collars 8, 9 may help to limit the installation depth of the first and second interface members 11, 12 into the base 3 and column 4 respectively. In assembled condition, the first collar 8 may rest upon the upper edge 5 of the base 3, and the second collar 9 may support the lower edge 6 of the column 4 so as to provide for a stable configuration. Preferably, the outer diameter of the first collar 8 does not extend beyond the contour B of the base, more preferably has an outer diameter that is equal to that of the base 3. Similar for the outer diameter of the second collar 9: it preferably does not extend beyond the contour C of the column, more preferably is equal to the outer contour of the column 4.

The first and second end portion 18, 19 each comprise a free edge 15, 16 that in connected condition are in abutment with each other. The first end portion 18 further comprises at least one first recess 17A, extending in circumferential direction in its outer surface, at a distance from the free edge 15. The recess 17A may at its lower side be bordered by aforementioned first collar 8, as illustrated. The second end portion 19 may have an identical configuration, that is, it may comprise a second recess 17B, extending in circumferential direction in its outer surface, at a distance from its free edge 16. The second recess 17B may at its upper side be bordered by the second collar 9, as illustrated in Figures 2a and 2b.

In the illustrated embodiment, the first and second recess 17A, B extend around the entire circumference of the first and second end portion 18, 19. In an alternative embodiment (not shown) the single recesses 17A,B could be replaced by a plurality of

shorter recesses, distributed along the circumference of the first and second end portion 18, 19, preferably at regularly space intervals.

The first and second recesses 17A,B are arranged to receive a plurality of holding elements 20, that is at least two holding elements 20, for connecting the end portions 18, 19 together. One possible embodiment of such a holding element 20 according to the invention is shown in Figures 2b and 3b, in cross sectional view and perspective view respectively. In this embodiment, the holding element 20 has the shape of a ring segment with a substantially C-shaped cross section. More particularly, the holding element 20 includes a base part 21 that along its upper and lower edge is provided with a first and second formation 22, 23, each extending substantially perpendicular from the base part 21 thus forming the legs of the C. The holding element 20 can be made of any suitable material such as metal, a metal alloy or a suitable plastic material.

The first and second formations 22, 23 are designed to fit in the aforementioned first and second recesses 17A,B of the first and second end portion 18, 19, as shown in Figure 2b. In use, a plurality of such holding elements 20 may be assembled into said recesses 17A,B, as shown in Figures 4 and 5. The holding elements 20 may together surround the outer circumference of the end portions 18, 19, wherein adjacent ends of the holding elements 20 may abut each other in circumferential direction. The number of holding elements 20 may depend on the angle over which the individual holding elements 20 extend in circumferential direction. This angle may for instance vary between about 15° and 180°. Accordingly, the number of holding elements 20 may for instance vary from 24 to 2. Of course other quantities are possible.

In operation, when the utility pole 1 is exposed to an impact and the associated impact forces exceed the frictional forces between the abutting free edges 15, 16 of the first and second end portion 18, 19, the second end portion 19 and column 4 will shift in lateral direction. Holding elements 20 arranged near the leading edge of the second end portion 19 will be entailed along and exit the recesses 17A,B in radial outward direction. Holding elements 20 arranged near the trailing edge of the second end portion 19 may remain with their first formation 22 engaged in the first recess 17A. However, their second formation 23 may disengage from the second recess 17B as the trailing edge of the second end portion moves away therefrom, in radial direction.

As best seen in Figures 2b and 3b, the holding element 20 may at its rear side, i.e. the side that in assembled condition faces radially outward, be provided with at least one

indentations 29. This indentation 29 may for instance extend along an upper edge of said rear side. A second indentation 29 may extend along a lower edge of said rear side. In assembled condition, the or each indentation 29 may together with the respective collars 8, 9 enclose a groove for accommodating a retention element and/or a sealing element 31. To facilitate access to said groove, the faces of the collars 8, 9 that border said groove may be chamfered, as shown in Figures 2a and 2b. The chamfer angle may for instance be about 20°.

The retention element 31 may for instance comprise a wire that may extend around the holding elements 20 so as to help retaining them in assembled condition. The sealing element 31 may for instance be made of rubber, silicone, plastic or the like and may help prevent ingress of moisture, dirt, etc. in the interior of the coupling assembly 10 and utility pole 1. Like the retention element 31, the sealing element 31 may extend around the entire circumference of the assembly. In an advantageous embodiment the retention element 31 and the sealing element 31 can be embodied in a single annular component that fulfils both tasks, i.e. retentions and sealing. Alternatively, the sealing element 31 and retention element 31 may be provided as separate components. In such case, the sealing element 31 may for instance be accommodated in one of the upper and lower grooves defined by the indentations 29 and the retention element 31 may be accommodated in the other groove. The retention element does not need to be accommodated in a groove. In an alternative embodiments (not shown) it may for instance include an adhesive tape, wound around the outer circumference of the holding elements 20 at some distance from the or each indentation 29.

The holding elements 20 and first and/or second end portion 18, 19 may further comprise one or more anti-rotation provisions to prevent displacement of the holding elements 20 and/or the end portions 18, 19 in circumferential direction and thus help increasing the torsion stiffness of the pole 1. The anti-rotation provision may comprise mating profiles between contact surfaces of at least one holding element 20 and at least one of the end portions 18, 19 and/or between the free edges 15, 16 of said end portions 18, 19.

According to one embodiment, the mating profiles may for instance include a rod 30 as shown in Figure 3b, extending between the first and second formations 22, 23 of the holding element 20, substantially parallel to its base part 21. The mating profiles may further include a longitudinal slot 28 extending in an edge portion 13, 14 of the first

and/or second end portions 18, 19, between the recesses 17A,B and free edges 15, 16, as shown in figures 3a and 4. In assembled condition, the rod 30 will be received in the slot 28 and thus prevent displacement of the holding element 20 in circumferential direction of the end portion. As a result, rotation of the base and columns 3, 4 relative to each other may be prevented as well. Thanks to the rod 30 and slot 28 having a main direction extending in longitudinal direction X of the pole 1, the anti-rotation provision will not affect the displacement freedom of the holding element 20 in radial outward direction, and thus will not compromise the shear-off performance of the coupling assembly 10.

The mating profiles may additionally or alternatively comprise one or more radial notches 32 provided in at least one of the free edges 15, 16 of the first and second end portion 18, 19, as shown in Figures 3a and 4. If several radial notches 32 are provided, these may for instance be arranged at regularly spaced intervals in circumferential direction. The mating profiles may further comprise a blocking member 33, designed to be received in the notch(es) 32. The blocking member 33 may extend beyond the outer circumference of the end portion 18, 19 into a slit or gap 34 between adjacent holding elements 20, as seen in figure 4. As a result, displacement of the holding elements 20 in circumferential direction is prevented. Alternatively or additionally, both end portions 18, 19 may be provided with one or more notches 32 in their free edges 15, 16 which may be aligned in assembled condition such that a blocking element 33 can be received in two opposed notches 32, thus preventing rotational movement of the first and second end portion 18, 19 relative to each other. This may add to the torsional stiffness of the shear-off assembly 10 and the utility pole 1.

The skilled person will appreciate that the number of holding elements 20 that can be used for connecting the first and second end portion 18, 19 may vary and may for instance range from 2 to 24, more preferably from 5 to 15, and most preferably from 7 to 13.

The holding elements 20 may but need not be of similar dimensions. The holding elements 20 may for instance extend over an angle between 15° and 180°, more preferably between 20° and 120° and most preferably between 30° and 90°.

The interface members 11, 12 and the holding elements 20 may be formed from the same material. This material may for example be an aluminum alloy having an Rp0,2 strength value of about 100-500 Mpa.

Selection of a suitable material may help to bring the overall strength of the utility pole 1 to a desired value. The strength of the various components may alternatively or additionally be controlled by proper dimensioning of the diameter and/or wall thickness.

The utility pole 1 may have a uniform strength in column 4, coupling assembly 10 and base 3. Alternatively the coupling assembly 10 can be designed to be stronger than the column and/or base of the pole. This may be desirable in order for the complete utility pole to comply with normal use requirements, i.e. resistance to wind loads or the like.

Thus, the invention has been described by reference to the embodiments discussed above. It will be recognized that these embodiments are susceptible to various modifications and alternative forms well known to those of skill in the art without departing from the scope of the invention. Accordingly, although specific embodiments have been described, these are examples only and are not limiting upon the scope of the invention.

Conclusies

1. Utiliteitsmast met een langsrichting (X) en een radiale richting (R) loodrecht op voornoemde langsrichting, welke utiliteitsmast omvat:

- een basis (3) voor inbrenging in de grond, welke basis een contour (B) heeft,
- een kolom (4) voor het dragen van een utiliteitsorgaan, welke kolom een contour (C) heeft,
- een koppelingssamenstel (10) voor het op scheidbare wijze verbinden van de kolom (4) met de basis (3), welk koppelingssamenstel omvat:
- een eerste einddeel (18) voorzien aan een boveneinde van voornoemde basis (3) en voorzien van een vrije rand (15) en ten minste een eerste uitsparing (17A) die zich in omstreksrichting in het buitenoppervlak daarvan uitstrekt,
- een tweede einddeel (19) voorzien aan een ondereinde van voornoemde kolom (4) en voorzien van een vrije rand (16) en ten minste een tweede uitsparing (17B) die zich in omtreksrichting in het buitenoppervlak daarvan uitstrekt;
- een veelvoud vasthoudelementen (20) voor het aan elkaar koppelen van de eerste en tweede einddelen (18, 19) met hun vrije randen (15, 16) tegen elkaar liggend, waarbij elk vasthoudelement (20) een eerste formatie (22) omvat, ingericht om in de ten minste ene eerste uitsparing (17A) te passen en daaruit losneembaar te zijn in radiaal buitenwaartse richting (R), een tweede formatie (23), ingericht om in de ten minste ene tweede uitsparing (17B) te passen en daaruit losneembaar te zijn in radiaal buitenwaartse richting (R), en een basisdeel (21), ingericht om de eerste en tweede formatie (22, 23) met elkaar te verbinden in de langsrichting (X), en waarbij de eerste en tweede uitsparingen (17A, 17B) gedimensioneerd en

ingericht zijn om zich uit te strekken binnen de contour (B, C) van de basis (3) en kolom (4) in radiale richting (R).

2. Utiliteitsmast volgens conclusie 1, waarbij de ten minste ene eerste uitsparing (17A) zich langs in hoofdzaak de gehele buitenomtrek van het eerste einddeel (18) uitstrekt.

3. Utiliteitsmast volgens conclusie 1, waarbij de ten minste ene eerste uitsparing (17A) één is van een veelvoud eerste uitsparingen, gerangschikt op regelmatige, bij voorkeur gelijke onderlinge intervallen langs de buitenomtrek van het eerste einddeel (18).

4. Utiliteitsmast volgens één der conclusies 1 tot 3, waarbij de ten minste ene tweede uitsparing (17B) zich langs de gehele buitenomtrek van het tweede einddeel (19) uitstrekt.

5. Utiliteitsmast volgens één der conclusies 1 tot 3, waarbij de ten minste ene tweede uitsparing (17B) één is van een veelvoud tweede uitsparingen, gerangschikt op regelmatige, bij voorkeur gelijke onderlinge intervallen langs de buitenomtrek van het tweede einddeel (19).

6. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de ten minste ene eerste uitsparing (17A) en / of de ten minste ene tweede uitsparing (17B) ringvormig is.

7. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de ten minste ene eerste uitsparing (17A) en / of de ten minste ene tweede uitsparing (17B) ringsegmentvormig is.

8. Utiliteitsmast volgens een der voorgaande conclusies, waarbij ten minste een van de eerste en tweede formaties (22, 23) van het vasthoudelement (20) ringsegmentvormig is.

9. Utiliteitsmast volgens conclusie 8, waarbij het ringsegment zich uitstrekt over een hoek tussen 15° en 180°.

10. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de eerste formatie (22), tweede formatie (23) en het basisdeel (21) integraal met elkaar gevormd zijn teneinde een eendelig vasthoudelement te vormen, of

voorgeassembleerd zijn, voorafgaand aan het installeren van het vasthoudelement in een eerste en tweede uitsparing.

11. Utiliteitsmast volgens één der voorgaande conclusies, waarbij het vasthoudelement (20) een in hoofdzaak C-vormige dwarsdoorsnede heeft, waarbij de eerste en tweede formaties (22, 23) de benen van de C vormen.

12. Utiliteitsmast volgens één der voorgaande conclusies, waarbij in samengestelde toestand naastgelegen vasthoudelementen (20) in omtreksrichting tegen elkaar liggen met hun eerste formatie, tweede formatie en / of basisdeel.

13. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de eerste formaties (22), de tweede formaties (23) en / of de basisdelen (21) van de vasthoudelementen (20) tezamen de gehele omtrek van de eerste en tweede einddelen (18, 19) omspannen om in samengestelde toestand een gesloten of in hoofzaak gesloten ring te vormen.

14. Utiliteitsmast volgens een der voorgaande conclusies, waarbij het eerste einddeel (18) zich uitstrekt binnen een contour (B) van de basis (3) in radiale richting (R).

15. Utiliteitsmast volgens een der voorgaande conclusies, waarbij het tweede einddeel (19) zich uitstrekt binnen een contour (C) van de kolom (4) in radiale richting (R).

16. Utiliteitsmast volgens één der voorgaande conclusies, waarbij de eerste en tweede einddelen (18, 19) tezamen een ringvormige holte (7) definiëren voor het opnemen van de vasthoudelementen (20) zodat dezen niet uitsteken voorbij een contour van de basis (3) en kolom (4) in radiale richting (R).

17. Utiliteitsmast volgens een der voorgaande conclusies, waarbij in samengestelde toestand een radiaal buitenwaarts gericht oppervlak van de vasthoudelementen (20) gelijk ligt met het buitenoppervlak van de basis (3) en / of de kolom (4).

18. Utiliteitsmast volgens een der voorgaande conclusies, waarbij een anti-roteervoorziening is voorzien tussen contactvlakken van ten minste één van de vasthoudelementen (20) en de eerste en / of tweede einddelen (18, 19).

19. Utiliteitsmast volgens conclusie 18, waarbij de anti-roteervoorziening twee in elkaar passende profielen omvat, zoals een spie (30) en groef (28), waarvan de hoofdrichting zich uitstrekt in radiale richting of langsrichting.

20. Utiliteitsmast volgens conclusie 18 of 19, waarbij de anti-roteermiddelen één of meer inkepingen (32) in de vrije rand (15, 16) van de eerste en / of tweede einddelen (18, 19) omvatten, en een blokkeerorgaan (33) dat is opgenomen in voornoemde inkeping (32) en zich radiaal buitenwaarts uitstrekt, tussen twee naastgelegen vasthoudelementen (20) in.

21. Utiliteitsmast volgens een der voorgaande conclusies, waarbij houdmiddelen zijn voorzien, om te helpen de vasthoudelementen (20) vast te houden in radiale richting.

22. Utiliteitsmast volgens conclusie 21, waarbij de houdmiddelen een kleefmiddel of kleefband omvatten, aangebracht tussen samenwerkende vlakken van de vasthoudelementen (20) en de eerste en tweede einddelen (18, 19).

23. Utiliteitsmast volgens conclusie 21 of 22, waarbij de houdmiddelen een langgerekt flexibel element omvatten, zoals een snaar of draad, die zich rond het buitenoppervlak van de vasthoudelementen (20) uitstrekt.

24. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de vasthoudelementen (20) zijn voorzien van een inspringing (29) die zich in omtreksrichting langs een buitenoppervlak van de vasthoudelementen uitstrekt.

25. Utiliteitsmast volgens conclusie 24, waarbij de inspringing (29) zich uitstrekt nabij een bovenrand, een onderrand of beide randen van het buitenoppervlak.

26. Utiliteitsmast volgens een der voorgaande conclusies, waarbij een even aantal vasthoudelementen (20) is voorzien.

27. Utiliteitsmast volgens één der voorgaande conclusies, waarbij in samengestelde toestand de vasthoudelementen (20) zijn aangebracht op diametraal tegenoverliggende posities langs de omtrek van de eerste en tweede einddelen (18, 19).

28. Utiliteitsmast volgens een der voorgaande conclusies, waarbij het eerste einddeel (18) deel uitmaakt van een eerste interface-orgaan (11) dat in samengestelde toestand is bevestigd aan de basis (3), bijvoorbeeld in een open einde daarvan.

29. Utiliteitsmast volgens een der voorgaande conclusies, waarbij het tweede einddeel (19) deel uitmaakt van een tweede interface-orgaan (12) dat in samengestelde toestand is bevestigd aan de kolom (4), bijvoorbeeld in een open einde daarvan.

30. Utiliteitsmast volgens conclusie 28, respectievelijk 29, waarbij het eerste, respectievelijk tweede interface-orgaan (11, 12) is bevestigd aan de basis (3), respectievelijk de kolom (4) door middel van een kleefmiddel of epoxy.

31. Utiliteitsmast volgens conclusies 28, respectievelijk 29 of 30, waarbij het eerste, respectievelijk tweede interface-orgaan (11, 12) is voorzien van een eerste, respectievelijk tweede kraag (8, 9).

32. Utiliteitsmast volgens conclusie 31, waarbij in samengestelde toestand de eerste kraag (8) op een bovenrand van de basis (3) rust en de tweede kraag (9) een onderrand van de kolom (4) ondersteunt.

33. Utiliteitsmast volgens conclusie 28, respectievelijk 29 of een der conclusies 30-32, waarbij de eerste en tweede interface-organen (11, 12) gemaakt zijn van metaal of een metaallegering.

34. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de vasthoudelementen (20) zijn gemaakt van metaal, een metaallegering of een geschikte kunststof.

35. Utiliteitsmast volgens een der voorgaande conclusies, waarbij de eerste en tweede einddelen (18, 19), en meer bij voorkeur de eerste en tweede interface-organen (11, 12) identiek zijn.

36. Utiliteitsmast volgens een der voorgaande conclusies, waarbij een scheidingsvlak van het koppelingssamenstel zich in samengestelde toestand op een verticale afstand H boven het maaiveld (G) bevindt.

Fig 1

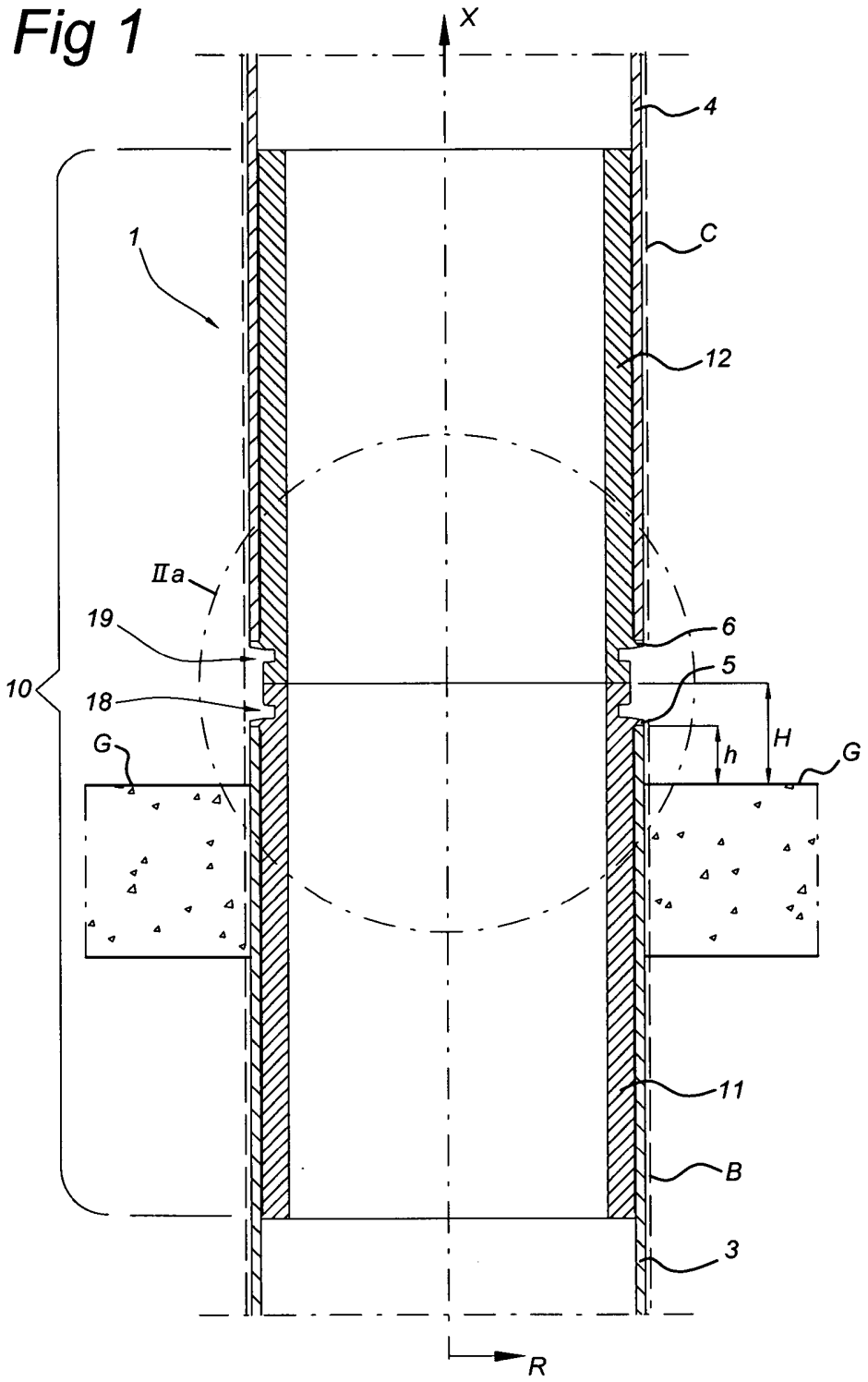


Fig 2a

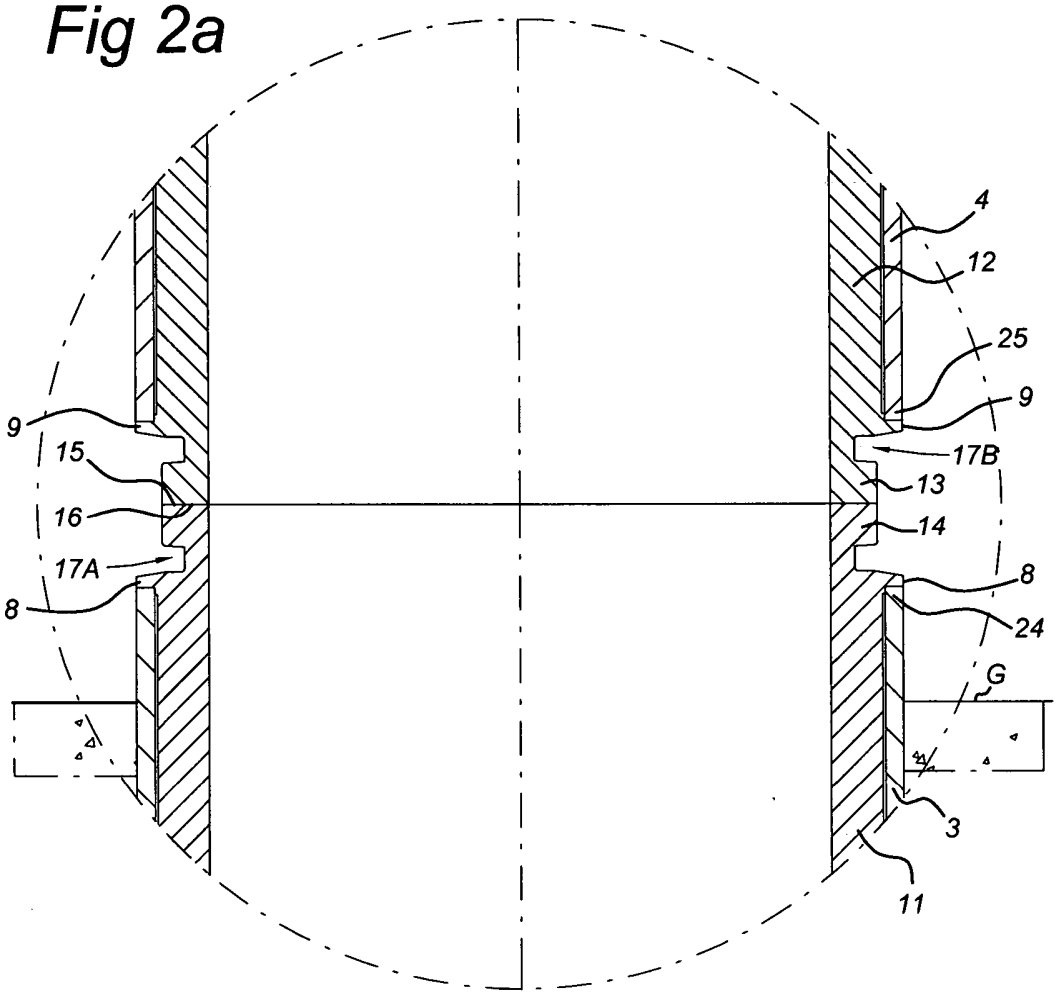

4
12
25
9
17B
13
14
8
24
G
3
11
9
15
16
17A
8

Fig 2b

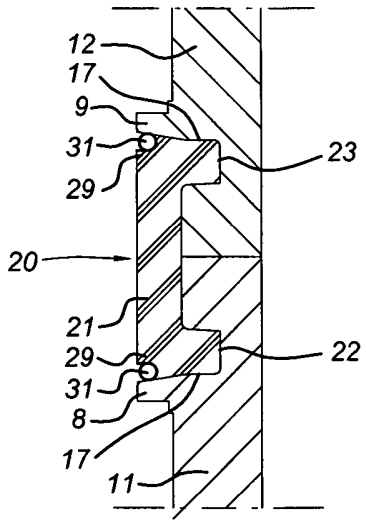

12
17
9
31
29
23
20
21
29
22
31
8
17
11

Fig 3a

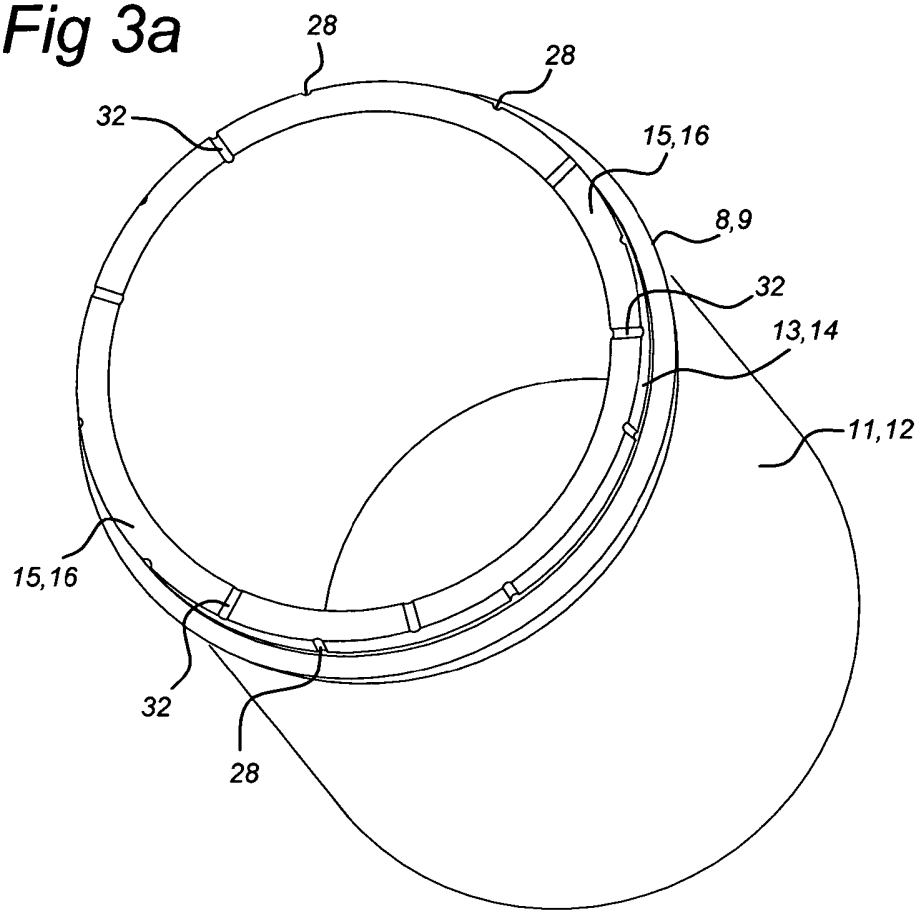


Fig 3b

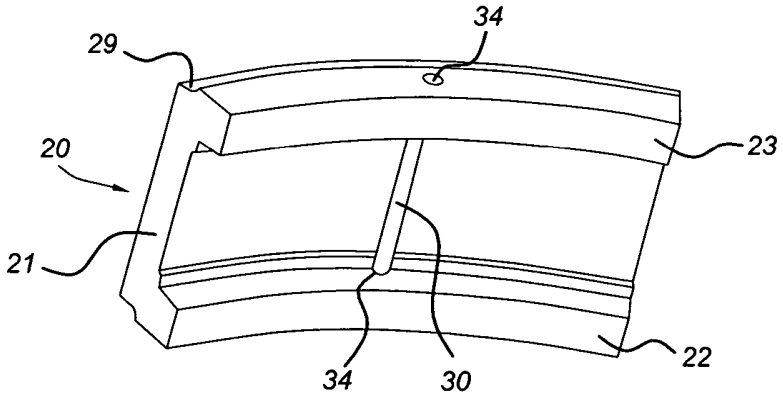


Fig 4

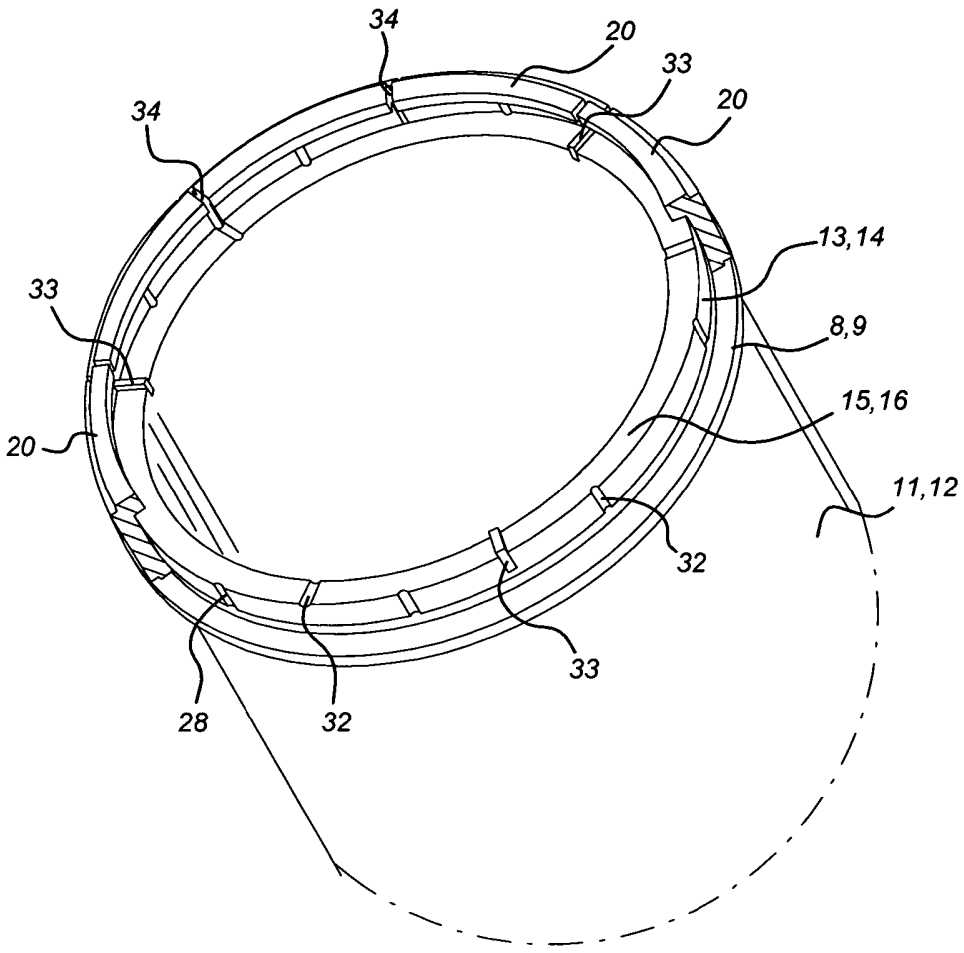
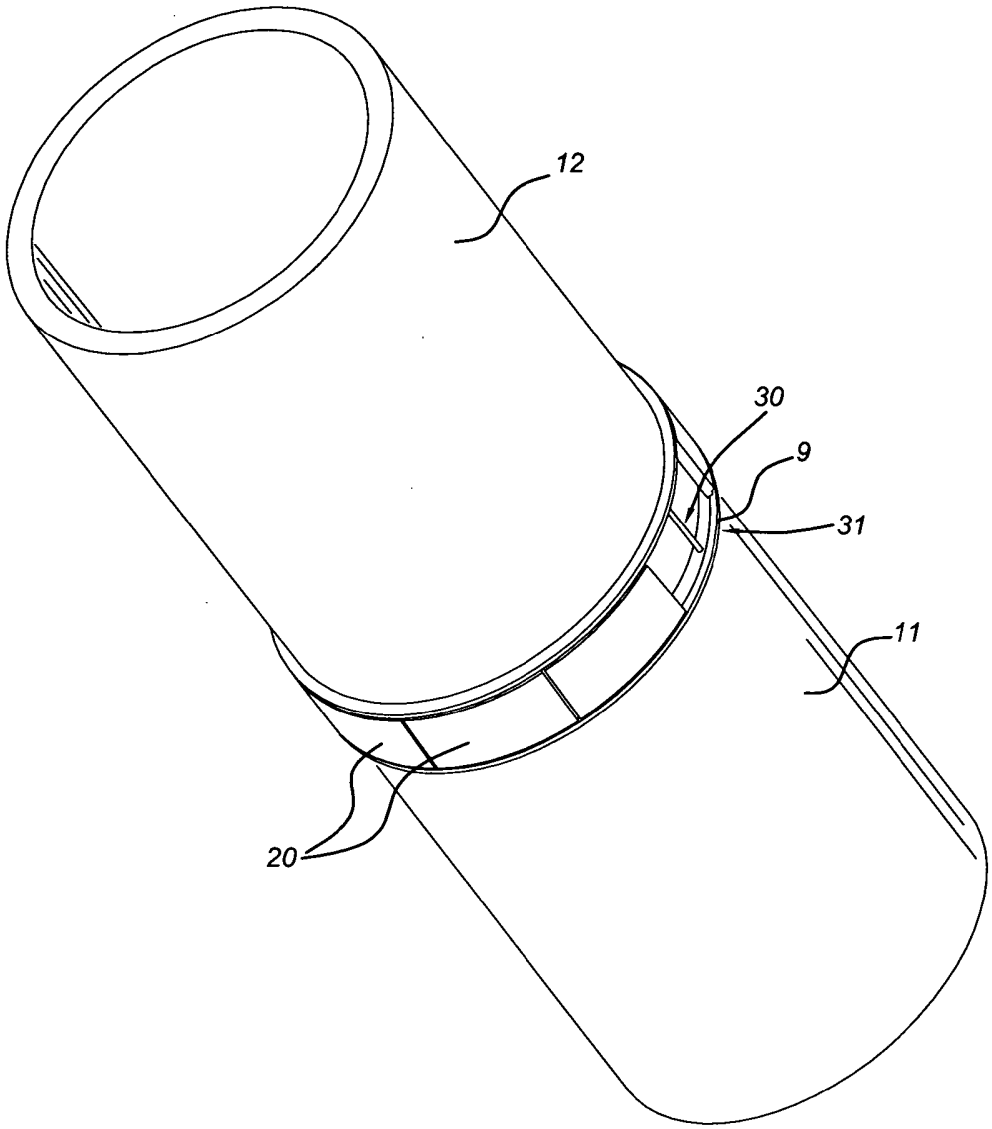


Fig 5



Abstract

Utility pole, having a longitudinal direction and a radial direction, and comprising a base, a column and a coupling assembly for connecting the column to the base in a separable manner. The coupling assembly comprises a recessed first end portion provided at an upper end of the base, a recessed second end portion provided at a lower end of the column, and a plurality of holding elements for coupling the first and second end portions to each other. Each holding element comprises a first formation, a second formation and a base part to interconnect said formations in the longitudinal direction. The first and second formation are arranged to fit in a recess of the first and second end portion respectively, and to be releasable therefrom in radial outward direction. The recesses of the first and second end portion are dimensioned and arranged to extend within a contour of the base and column, in radial direction.

Rijksdienst voor Ondernemend Nederland

RAPPORT BETREFFENDE HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK

Octrooiaanvrage 1041270

Classificatie van het onderwerp[1]: E01F9/018	Onderzochte gebieden van de techniek[1]: E01F; E04H
Computerbestanden: EPODOC, WPI	Omvang van het onderzoek: Volledig
Datum van de onderzochte conclusies: 29 mei 2015	Niet onderzochte conclusies:

Van belang zijnde literatuur

Categorie[2]	Vermelding van literatuur met aanduiding, voor zover nodig, van speciaal van belang zijnde tekstgedeelten of figuren.	Van belang voor conclusie(s) nr.:
A	US 2006/0024131 A (WIEGAND KENNETH E et al.) 2 februari 2006 *samenvatting; figuren*	1 - 36
	- - -	
D, A	EP 2014850 A (SAPA PROFILES NL B V) 14 januari 2009 *samenvatting; figuren*	1 - 36
	- - - - -	

Datum waarop het onderzoek werd voltooid: 17 augustus 2015	De bevoegde ambtenaar: ir. B.L. van Soest **Octrooicentrum Nederland,** **onderdeel van Rijksdienst voor Ondernemend Nederland**

[1] Gedefinieerd volgens International Patent Classification (IPC).
[2] Verklaring van de categorie-aanduiding: zie apart blad.

Categorie van de vermelde literatuur:

X: op zichzelf van bijzonder belang zijnde stand van de techniek

Y: in samenhang met andere geciteerde literatuur van bijzonder belang zijnde stand van de techniek

A: niet tot de categorie X of Y behorende van belang zijnde stand van de techniek

O: verwijzend naar niet op schrift gestelde stand van de techniek

P: literatuur gepubliceerd tussen voorrangs- en indieningsdatum

T: niet tijdig gepubliceerde literatuur over theorie of principe ten grondslag liggend aan de uitvinding

E: octrooiliteratuur gepubliceerd op of na de indieningsdatum van de onderhavige aanvrage en waarvan de indieningsdatum of de voorrangsdatum ligt voor de indieningsdatum van de onderhavige aanvrage.

D: in de aanvrage genoemd

L: om andere redenen vermelde literatuur

&: lid van dezelfde octrooifamilie; corresponderende literatuur

AANHANGSEL BEHORENDE BIJ HET RAPPORT BETREFFENDE HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK, UITGEVOERD IN OCTROOIAANVRAGE NR. 1041270

Het aanhangsel bevat een opgave van elders gepubliceerde octrooiaanvragen of octrooien (zogenaamde leden van dezelfde octrooifamilie), die overeenkomen met octrooigeschriften genoemd in het rapport. De opgave is samengesteld aan de hand van gegevens uit het computerbestand van het Europees Octrooibureau per 19 augustus 2015

De juistheid en volledigheid van deze opgave wordt noch door het Europees Octrooibureau, noch door NL Octrooicentrum gegarandeerd; de gegevens worden verstrekt voor informatiedoeleinden.

In het rapport genoemd octrooi-geschrift		datum van publicatie	overeenkomend(e) geschrift(en)		datum van publicatie
US 2006024131	A	02-02-2006	(Geen)		
EP 2014850	A	14-01-2009	NL 2000744	C	13-01-2009

Rijksdienst voor Ondernemend Nederland

SCHRIFTELIJKE OPINIE

Octrooiaanvrage 1041270

Indieningsdatum: 13 april 2015	Voorrangsdatum:
Classificatie van het onderwerp[1]: E01F9/018	Aanvrager: Hunter Douglas Industries B.V.

Deze schriftelijke opinie bevat een toelichting op de volgende onderdelen:

☑ Onderdeel I	Basis van de schriftelijke opinie
☐ Onderdeel II	Voorrang
☐ Onderdeel III	Vaststelling nieuwheid, inventiviteit en industriële toepasbaarheid niet mogelijk
☐ Onderdeel IV	De aanvraag heeft betrekking op meer dan één uitvinding
☑ Onderdeel V	Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid
☐ Onderdeel VI	Andere geciteerde documenten
☐ Onderdeel VII	Overige gebreken
☐ Onderdeel VIII	Overige opmerkingen

De bevoegde ambtenaar:
ir. B.L. van Soest
Octrooicentrum Nederland,
onderdeel van Rijksdienst voor Ondernemend Nederland

[1] Gedefinieerd volgens International Patent Classification (IPC).

Schriftelijke Opinie

Octrooiaanvrage **1041270**

Onderdeel I Basis van de schriftelijke opinie

Deze schriftelijke opinie is opgesteld op basis van de op 29 mei 2015 ingediende conclusies.

Onderdeel V Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid

1. Verklaring

Nieuwheid	Ja : Conclusie(s) 1 - 36 Nee : Conclusie(s)
Inventiviteit	Ja : Conclusie(s) 1 - 36 Nee : Conclusie(s)
Industriële toepasbaarheid	Ja : Conclusie(s) 1 - 36 Nee : Conclusie(s)

2. Literatuur en toelichting

In het rapport van het onderzoek worden de volgende documenten genoemd:
D1: US 2006/0024131 A (WIEGAND KENNETH E et al.)
D2: EP 2014850 A (SAPA PROFILES NL B V)
Voor zover nodig worden deze documenten in de volgende alinea's besproken.

Uit D1 is een utiliteitsmast ('roadside post') bekend, omvattende een basis ('lower post segment 102'), een kolom ('upper post segment 110') en een koppelingssamenstel ('breakaway coupling') voor het op scheidbare wijze verbinden van de kolom met de basis. Het koppelingssamenstel omvat een eerste einddeel ('lower shear plate 104') voorzien aan een boveneinde van de basis, en een tweede einddeel ('upper shear plate 108') voorzien aan een ondereinde van de kolom. Verder is het koppelingssamenstel voorzien van een veelvoud vasthoudelementen ('shear clips 112') voor het aan elkaar koppelen van de eerste en tweede einddelen. De einddelen strekken zich in radiale richting buiten de contour van de basis en de kolom uit.

De mast volgens conclusie 1 van de aanvrage verschilt van de uit D1 bekende mast ten minste doordat:
- zich in omtreksrichting in het buitenoppervlak van het eerste einddeel een eerste uitsparing uitstrekt;
- zich in omtreksrichting in het buitenoppervlak van het tweede einddeel een tweede uitsparing uitstrekt;
- elk vasthoudelement een eerste formatie omvat, ingericht om in de eerste uitsparing te passen en daaruit losneembaar te zijn;
- elk vasthoudelement een tweede formatie omvat, ingericht om in de tweede uitsparing te passen en daaruit losneembaar te zijn; en doordat
- de eerste en tweede uitsparingen gedimensioneerd en ingericht zijn om zich uit te strekken binnen de contour van de basis en de kolom in radiale richting.

Schriftelijke Opinie

Octrooiaanvrage **1041270**

Met de verschilkenmerken wordt volgens de aanvrage bereikt dat de utiliteitsmast geen uitstekende delen heeft die schade kunnen toebrengen aan de omgeving. Bovendien wordt een hogere bedrijfszekerheid bereikt doordat er geen uitstekende delen blootgesteld zijn aan weer, vuil en andere corrosie bevorderende condities.

Op grond hiervan is conclusie 1 nieuw en inventief ten opzichte van D1.

D2 wordt besproken in de beschrijvingsinleiding van de aanvrage. Hieruit is een utiliteitsmast bekend waarmee weliswaar de hierboven genoemde voordelen reeds worden bereikt maar die niet voorzien is van uitsparingen in het buitenoppervlak van einddelen zoals in conclusie 1 van de aanvrage beschreven, noch van vasthoudelementen met formaties die in de uitsparingen passen. Zoals uiteengezet in de aanvrage is in het geval een voertuig tegen de mast volgens D2 botst de ontkoppeling van het koppelingssamenstel niet bedrijfszeker, of er moeten extra maatregelen genomen zijn om een betrouwbare ontkoppeling te garanderen.

Conclusie 1 is daarom nieuw en inventief ten opzichte van D2.

De conclusies 2 - 36 zijn vanwege hun afhankelijkheid van conclusie 1 eveneens nieuw en inventief.