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(54) A TELESCOPIC BOOM, AND A CRANE AND A VEHICLE PROVIDED WITH THE TELESCOPIC BOOM

(57) A telescopic boom (2), for a crane (4), comprising a main section (6) and at least a first telescopic boom section (8). The first telescopic boom section (8) is telescopically mounted in the main section (6) and axially movable in relation to the main section (6). The main section (6) is structured to be mounted to a crane boom (10) of said crane (4), to be articulated around a first horizontal axis A1 in relation to said crane boom (10). The telescopic boom (2) further comprises an elongated connecting arrangement (12) comprising a set of hoses for supply of hydraulic oil, said connecting arrangement (12) is routed from a first point (14) located on the inside of the main section (6), between an inner surface (16) of the main section (6) and an outer surface (18) of the first telescopic boom section (8), to a second point (20) located on the inside of the first telescopic boom section (8), by a guiding arrangement (22) provided at a first end (24) of the first telescopic boom section (8). The guiding arrangement (22) comprises a first roller member (26) and a second roller member (28), and is mounted such that said first roller member (26) is arranged in relation to a first side (30) of the first end (24) of the first telescopic boom section (8), and said second roller member (28) is arranged in relation to a second side (32), opposite to the first side (30), of the first end (24) of the first telescopic boom section (8), and wherein said first and the second roller members are mounted to have their axes A2 of rotation parallel to each other and essentially perpendicular to said first horizontal axis A1 to guide the connecting arrangement (12) from/to between said inner surface (16) of the main section (6) and said outer surface (18) of the first telescopic boom section (8) to/from the inside of the first telescopic boom section (8).

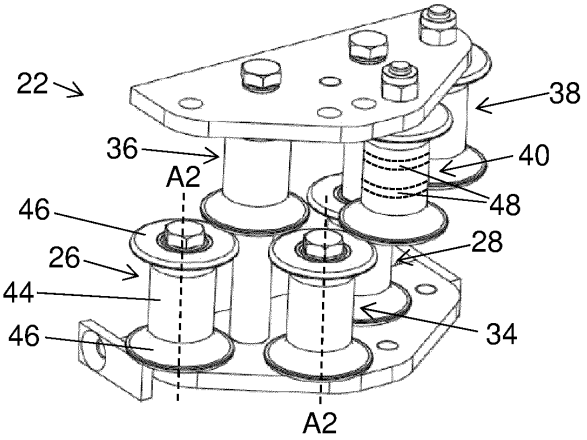

FIG. 9

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Description

[0001] To all whom it may concern.

Technical field

[0002] The present disclosure relates to a telescopic boom for a crane, in particular with a main section and at least one telescopic section movable inside and relative to the main section.

Background

[0003] The invention relates to a telescopic boom for a crane where a connection arrangement comprising hoses is routed inside the telescopic boom to a tool arranged at the end of the telescopic boom. The tool may be a grapple to grab logs for a forestry application, or a hydraulic hook, or any other tool.

[0004] When the telescopic boom is to be extended by axially moving various sections of the telescopic boom in relation to each other, the hoses needed for operating the tool must be adapted to follow the relative movement.

[0005] Various telescopic booms are known, and some prior art documents will be briefly discussed below.

[0006] EP0239302B1 discloses a multistage telescopic boom in which a set of rollers are provided for supporting flexible cables and hoses that pass over it.

[0007] EP2135836A1 discloses an extendable telescopic articulated arm of a crane. A chain passes over a sprocket from the exterior side of the articulated arm to interior of the articulated arm.

[0008] An object of the present invention is to achieve an improved telescopic boom where a connecting arrangement, including hoses for hydraulic oil, is arranged within the boom in a space-saving and secure manner.

Summary

[0009] The above-mentioned object is achieved by the present invention according to the independent claims.

[0010] Preferred embodiments are set forth in the dependent claims.

[0011] According to a first aspect, the present invention relates to a telescopic boom, for a crane, comprising a main section and at least a first telescopic boom section. The first telescopic boom section is telescopically mounted in the main section and axially movable in relation to the main section under the effect of a movement member which is configured to act between the first telescopic boom section and the main section.

The main section is structured to be mounted to a crane boom of said crane, to be articulated around a first horizontal axis A1 in relation to said crane boom. The telescopic boom further comprises an elongated connecting arrangement comprising a set of hoses for supply of hydraulic oil, said connecting arrangement is routed from a first point located on the inside of the main section, between an inner surface of the main section and an outer surface of the first telescopic boom section, to a second point located on the inside of the first telescopic boom section, by a guiding arrangement provided at a first end of the first telescopic boom section.

The guiding arrangement comprises a first roller member and a second roller member, and is mounted such that said first roller member is arranged in relation to a first side of the first end of the first telescopic boom section, and said second roller member is arranged in relation to a second side, opposite to the first side, of the first end of the first telescopic boom section. The first and the second roller members are mounted to have their axes A2 of rotation parallel to each other and essentially perpendicular to the first horizontal axis A1 to guide the connecting arrangement from/to between said inner surface of the main section and said outer surface of the first telescopic boom section to/from the inside of the first telescopic boom section.

[0012] According to a second aspect, the present invention relates to a crane provided with a telescopic boom, as described above.

[0013] According to a third aspect, the present invention relates to a vehicle provided with a crane, as described above.

[0014] According to one embodiment, the main section and said first telescopic boom section have cross-sections with a plurality of portions arranged symmetrically with reference to a vertical symmetry line S, and wherein, during normal operation, said inner and outer surfaces of said main section, and of said first telescopic boom section, respectively, have orientations that correspond to vertical portions of said cross-section. It is advantageous to route the connecting arrangement along essentially vertically oriented portions of the inner and outer surfaces as more space is available along these vertical portions compared to horizontal portions due to the geometry of cross-section.

According to still another embodiment, the main section and the telescopic boom section have essentially rectangular cross-sections, the length of the vertical portions of said rectangular cross-sections, i.e. vertically oriented during normal operation, are longer than the other portions, and wherein said guiding arrangement is mounted such that said connecting arrangement are routed along said vertical portions.

[0015] According to a further embodiment, the guiding arrangement comprises a third roller member arranged essentially between said first and second roller members and having an axis of rotation A2 being parallel to the axes of rotation A2 of said first and second roller members. Preferably, the third roller member is arranged a predetermined distance in the distal direction from said first end of said first telescopic boom section compared to the positions of said first and second roller members, such that the positions of said axes of rotations A2 of said first, second, and third roller members form an essentially isosceles triangle where a line between the po-

sitions of the axes of the first and second roller members is the base of the triangle, and the position of the third roller member axis is at the tip of the triangle. By this embodiment a smooth bending curve of the hoses guided by the roller members is achieved, which is advantageous both with regard to less frictional movement, and also to prevent wear of the hoses.

[0016] According to a further embodiment, each of said roller members is spool-like having a main body to be in contact with said connecting arrangement. The main body has a cylindrical extension along the axis of rotation A2 and has a circular cross-section, and is provided with essentially circular enlargements at each end to keep said connecting arrangement on said main body. The connecting arrangement will then be vertically stacked at the spool-like roller members, which enables the hoses to be routed along the vertical sides between the main section and the first telescopic boom section in a space-saving manner.

[0017] Thus, the present invention addresses a new way to route the hoses within a telescopic boom system. The telescopic boom according to the invention may be applied to any boom of a crane, not only the second boom of the crane as disclosed herein. So-called crane jibs are telescopic booms that may be attached to e.g. the final extension of the second boom of a loader crane and the telescopic boom according to the invention could further be applied to such a crane jib as an example.

[0018] Generally, the present invention is directed to how a connecting arrangement, e.g. a set of hoses, is routed through the telescopic boom extension system. The hoses are routed inside the telescopic boom thanks to the guiding arrangement mounted to a first end of the first telescopic boom.

The guiding arrangement comprises multiple small size rollers, to save space. At least two rollers are needed (one at each side) but three is preferred. Even a higher number of rollers may be applied, e.g. four, five or six.

[0019] According one embodiment, the guiding arrangement comprises two sets of roller members, with three roller members in each set of roller members. The different sets of rollers are then arranged at different levels.

The guiding arrangement enables the hoses to be guided along the preferably vertical sides of the boom instead of along the horizontal surfaces on top of the boom as is commonly applied.

Brief description of the drawings

[0020]

Figure 1 is a schematic illustration of a vehicle provided with a crane where the telescopic boom according to the present invention is arranged.

Figure 2 is a schematic illustration of a crane where the telescopic boom according to the present invention is arranged.

Figure 3 is a side view of a telescopic boom according to the present invention.

Figure 4 is a view from above of a telescopic boom according to the present invention.

Figure 5 is a side view of a telescopic boom according to the present invention, where the first telescopic boom section is in an extended state.

Figure 6 is a view from above of a telescopic boom according to the present invention, where the first telescopic boom section is in an extended state.

Figure 7 is a cross-sectional view schematically illustrating an embodiment of the telescopic boom.

Figure 8 is a schematic illustration of a guiding arrangement according to the present invention.

Figure 9 is a perspective view of a guiding arrangement according to one embodiment of the present invention.

Figure 10 is a view from above of a guiding arrangement according to one embodiment of the present invention.

Figure 11 is a schematic illustration showing exemplary positions of roller members according to one embodiment of the present invention.

Detailed description

[0021] The telescopic boom will now be described in detail with references to the appended figures. Throughout the figures the same, or similar, items have the same reference signs. Moreover, the items and the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention.

[0022] Figure 1 is a perspective view of a vehicle 50 provided with a crane 4. The crane 4 conventionally comprises a crane column 3, a crane boom 10 and a telescopic boom 2. A tool 5, e.g. a hook or as in figure 2 a grapple to grab logs for a forestry application, is attached to the final boom extension of the first telescopic boom section in figure 1.

[0023] With references to figures 3-7 a telescopic boom 2 for a crane 4 is provided, comprising a main section 6 and at least a first telescopic boom section 8.

The first telescopic boom section 8 is telescopically mounted in the main section 6 and axially movable in relation to the main section 6 under the effect of a movement member which is configured to act between the first telescopic boom section 8 and the main section 6. The movement member (not shown in the figures) comprises e.g. one or many chains structured to mechanically control the relative movement of the main section and the at least one first telescopic boom section. In addition, or as an alternative, the movement member comprises one or many hydraulic cylinders. The first telescopic section is typically moved by a hydraulic cylinder, and the second telescopic section may be connected to the first section so that they move concurrently. As an alternative, there may be one hydraulic cylinder for each telescopic section.

[0024] The main section 6 is structured to be mounted to the crane boom 10 of said crane 4 (see figures 1 and 2), to be articulated about a first horizontal axis A1 in relation to the crane boom 10. The first horizontal axis A1 is truly horizontal when the vehicle is operated on horizontal ground. The telescopic boom 2 further comprises an elongated connecting arrangement 12 comprising a set of hoses for supply of hydraulic oil, e.g. for operating various functions of the tool. The connecting arrangement 12 are depicted as hoses in figure 3-6, in these figures an example of the internal guiding of the hoses inside the telescopic boom 2 has been illustrated. The connecting arrangement 12 is routed from a first point 14 located on the inside of the main section 6, between an inner surface 16 of the main section 6 and an outer surface 18 of the first telescopic boom section 8, to a second point 20 located on the inside of the first telescopic boom section 8, by a guiding arrangement 22 provided at a first end 24 of the first telescopic boom section 8. The connecting arrangement, i.e. the hoses, has a fixed length, and its ends are attached to the first point 14 at the inside of the main section 6 and to the second point 16 at the inside of the first telescopic boom section 8, respectively, such that it is firmly stretched during all operating states of the telescopic boom, i.e. from a state where the first telescopic boom section is essentially entirely inside the main section to a completely extended state.

[0025] Various variations of the guiding arrangement 22 are illustrated in figures 8-11. The guiding arrangement 22 comprises a first roller member 26 and a second roller member 28. The guiding arrangement 22 is mounted such that the first roller member 26 is arranged in relation to a first side 30 of the first end 24 of the first telescopic boom section 8 and the second roller member 28 is arranged in relation to a second side 32, opposite to the first side 30, of the first end 24 of the first telescopic boom section 8. Furthermore, the first and the second roller members are mounted to have their axes of rotation A2 (see figures 3 and 9) parallel to each other and essentially perpendicular to the first horizontal axis A1 (see figures 1 and 4) to guide the connecting arrangement 12 from/to between said inner surface 16 of the main section 6 and said outer surface 18 of the first telescopic boom section 8 to/from the inside of the first telescopic boom section 8.

[0026] In the operating state illustrated in figures 3 and 4 the first telescopic boom section 8 is essentially within the main section 6, and in the operating state illustrated in figures 5 and 6 the first telescopic boom section 8 and a second telescopic boom 9 are in an extended state. The second telescopic boom 9 is thus arranged inside the first telescopic boom section 8 and is axially movable in relation to both the main section and the first telescopic boom section. In the illustrated example the connecting arrangement 12 is routed from between the inner surface of the main section and the outer surface of the first telescopic boom section to inside the second telescopic boom section.

[0027] According to one embodiment the main section 6 and the first telescopic boom section 8 have cross-sections with a plurality of portions arranged symmetrically with reference to a vertical symmetry line S (see figure 7). During normal operation, the inner and outer surfaces 16, 18 of the main section 6, and of the first telescopic boom section 8, respectively, have orientations that correspond to vertical portions of the cross-section.

[0028] In a further embodiment, the main section 6 and the telescopic boom section 8 have essentially rectangular cross-sections, which is illustrated in figure 7. The length of the vertical portions of the rectangular cross-sections, i.e. portions vertically oriented during normal operation, are longer than the other portions, i.e. the horizontal portions. The guiding arrangement 22 is mounted such that the connecting arrangement 12 are routed along the sides of the boom section corresponding to said vertical portions.

[0029] The guiding arrangement will now be discussed more in detail with references to figures 8-11.
In figure 8 is illustrating a guiding arrangement comprising two roller members, the first roller member 26 and the second roller member 28.

[0030] In figures 9 and 10 one embodiment of guiding arrangement 22 is shown, that comprises a third roller member 34 arranged essentially between the first and second roller members 26, 28 and having an axis of rotation A2 being parallel to the axes of rotation A2 of the first and second roller members. This embodiment is advantageous as the bending radius of the connecting arrangement, i.e. the hoses, will be large enough in order to avoid too sharp bends which might increase the forces required to move the first telescopic section in relation to the main section. In addition, the hoses may then be subjected to larger wear.

[0031] As seen in figures 9 and 10 the third roller member 34 is arranged a predetermined distance in the distal direction from the first end 24 of the first telescopic boom section 8 compared to the positions of the first and second roller members 26, 28, such that the positions of the axes of rotations A2 of said first, second, and third roller members form an essentially isosceles triangle where a line between the positions of the axes of the first and second roller members is the base of the triangle, and the position of the third roller member axis is at the tip of the triangle. The triangle is illustrated in figure 11. The reason for this triangular set-up of the positions of the roller member is, as discussed above, to achieve a smooth bend of the connecting arrangement.
Preferably, the angle v between the legs of the triangle having equal lengths is in the range of 60-120 degrees.

[0032] According to another embodiment, illustrated in figure 9, the guiding arrangement 22 comprises at least two further roller members, a fourth 36, a fifth 38, and optionally a sixth 40, roller member. The at least two further roller members having a similar configuration as the

first, second, and optionally third, roller members, and are arranged at a plane above a plane where the first and second roller members are arranged. The at least two further roller members are structured to guide the connecting arrangement 12 from/to between said inner surface 16 of the main section 6 and said outer surface 18 of the first telescopic boom section 8 to/from the inside of the first telescopic boom section 8. The guiding arrangement 22 may in a similar way comprise additional planes of rollers.

[0033] The number of roller members may be higher than three. For example, four, five, six, or a higher number of roller members may be provided at the guiding arrangement. The roller members may then be arranged such that their axes of rotations are arranged along a semicircle, thereby providing a smooth bend for the connecting arrangement.

[0034] As seen in figure 9, each of the roller members is spool-like having a main body 44 to be in contact with the connecting arrangement 22. The main body 44 has a cylindrical extension along the axis of rotation A2. It has a circular cross-section, and is provided with essentially circular enlargements 46 at each end to keep the connecting arrangement 22 on the main body 44.

[0035] Advantageously, the connecting arrangement 12 comprises two hoses, which is illustrated in figure 7 where two connecting arrangements 12 are shown, each comprising two hoses.

[0036] According to another embodiment, the roller members are structured to vertically stack the set of hoses. This may e.g. be achieved by providing grooves 48 on the main body of the roller members to support vertical hose stacking. These grooves 48 are schematically shown on one of the roller members in figure 9.

[0037] The connecting arrangement 12 may further comprise a set of electrical cables (not shown in the figures). The electrical cables may e.g. be configured to supply various sensors with energy and also to transmit control signals, and sensor signals, to/from various units arranged along the telescopic boom and at the tool.

[0038] The present invention also relates to a crane 4 comprising the telescopic boom as described above, and to a vehicle 50 comprising the crane 4.

[0039] The present invention is not limited to the above-described preferred embodiments. Various alternatives, modifications and equivalents may be used. Therefore, the above embodiments should not be taken as limiting the scope of the invention, which is defined by the appending claims.

Claims

1. A telescopic boom (2), for a crane (4), comprising a main section (6) and at least a first telescopic boom section (8), wherein:

- the first telescopic boom section (8) is telescopically mounted in the main section (6) and axially movable in relation to the main section (6) under the effect of a movement member which is configured to act between the first telescopic boom section (8) and the main section (6),
- the main section (6) is structured to be mounted to a crane boom (10) of said crane (4), to be articulated around a first horizontal axis A1 in relation to said crane boom (10), the telescopic boom (2) further comprises an elongated connecting arrangement (12) comprising a set of hoses for supply of hydraulic oil, said connecting arrangement (12) is routed from a first point (14) located on the inside of the main section (6), between an inner surface (16) of the main section (6) and an outer surface (18) of the first telescopic boom section (8), to a second point (20) located on the inside of the first telescopic boom section (8), by a guiding arrangement (22) provided at a first end (24) of the first telescopic boom section (8),

characterized in that the guiding arrangement (22) comprises a first roller member (26) and a second roller member (28), and is mounted such that said first roller member (26) is arranged in relation to a first side (30) of the first end (24) of the first telescopic boom section (8), and said second roller member (28) is arranged in relation to a second side (32), opposite to the first side (30), of the first end (24) of the first telescopic boom section (8), and wherein said first and the second roller members are mounted to have their axes A2 of rotation parallel to each other and essentially perpendicular to said first horizontal axis A1 to guide the connecting arrangement (12) from/to between said inner surface (16) of the main section (6) and said outer surface (18) of the first telescopic boom section (8) to/from the inside of the first telescopic boom section (8).

2. The telescopic boom (2) according to claim 1, wherein said main section (6) and said first telescopic boom section (8) have cross-sections with a plurality of portions arranged symmetrically with reference to a vertical symmetry line S, and wherein, during normal operation, said inner and outer surfaces (16, 18) of said main section (6), and of said first telescopic boom section (8), respectively, have orientations that correspond to vertical portions of said cross-section.

3. The telescopic boom (2) according to any of claims 1 and 2, wherein said main section (6) and said telescopic boom section (8) have essentially rectangular cross-sections, and during normal operation, the length of the vertically oriented portions of said rectangular cross-sections are longer than the other portions, and wherein said guiding arrangement (22)

is mounted such that said connecting arrangement (12) are routed along sides of the boom section (6,8) corresponding to said vertical portions.

4. The telescopic boom (2) according to any of claims 1-3, wherein said guiding arrangement (22) comprises a third roller member (34) arranged essentially between said first and second roller members (26, 28) and having an axis of rotation A2 being parallel to the axes of rotation A2 of said first and second roller members.

5. The telescopic boom (2) according to claim 4, wherein said third roller member (34) is arranged a predetermined distance in the distal direction from said first end (24) of said first telescopic boom section (8) compared to the positions of said first and second roller members (26, 28), such that the positions of said axes of rotations A2 of said first, second, and third roller members form an essentially isosceles triangle where a line between the positions of the axes of the first and second roller members is the base of the triangle, and the position of the third roller member axis is at the tip of the triangle.

6. The telescopic boom (2) according to claim 5, wherein the angle v between the legs of the triangle having equal lengths is in the range of 60-120 degrees.

7. The telescopic boom (2) according to any of claims 1-6, wherein said guiding arrangement (22) comprises at least two further roller members, a fourth (36), a fifth (38), and optionally a sixth (40), roller member, and wherein said at least two further roller members having a similar configuration as said first, second, and optionally third, roller members, and are arranged at a plane above a plane where said first and second roller members are arranged, and said at least two further roller members are structured to guide the connecting arrangement (12) from/to between said inner surface (16) of the main section (6) and said outer surface (18) of the first telescopic boom section (8) to/from the inside of the first telescopic boom section (8).

8. The telescopic boom (2) according to any of claims 1-7, wherein each of said roller members is spool-like having a main body (44) to be in contact with said connecting arrangement (22), the main body (44) has a cylindrical extension along the axis of rotation A2 and has a circular cross-section, and is provided with essentially circular enlargements (46) at each end to keep said connecting arrangement (22) on said main body (44).

9. The telescopic boom (2) according to any of claims 1-8, wherein said connecting arrangement (22) comprises two hoses.

10. The telescopic boom (2) according to any of claims 1-9, wherein said roller members are structured to vertically stack said set of hoses.

11. The telescopic boom (2) according to any of claims 1-10, wherein said roller members are provided with grooves (48) to support vertical hose stacking.

12. The telescopic boom (2) according to any of claims 1-11, wherein said connecting arrangement (12) further comprises a set of electrical cables.

13. A crane (4) comprising the telescopic boom according to any of claims 1-12.

14. A vehicle (50) comprising a crane (4) according to claim 13.

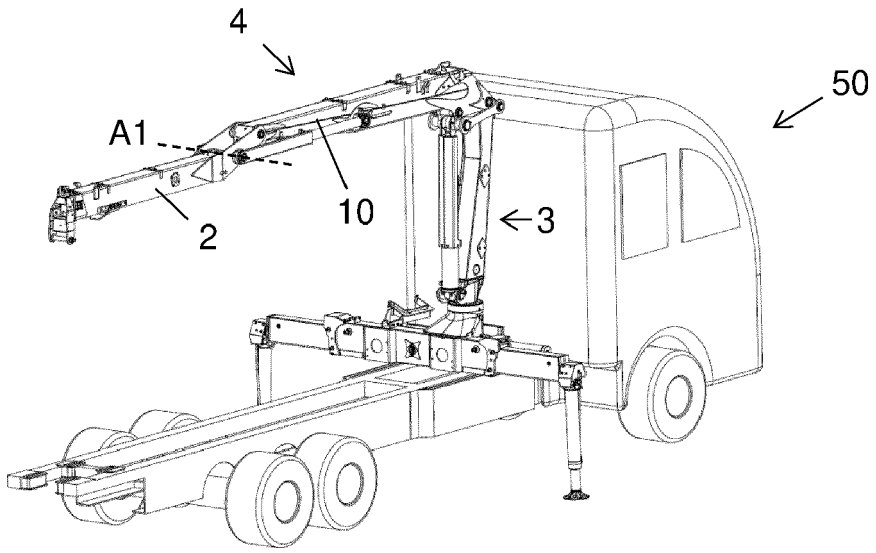

FIG. 1

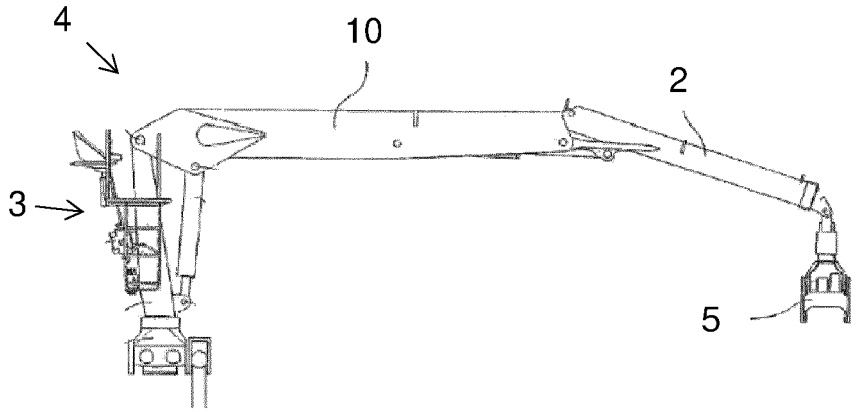

FIG. 2

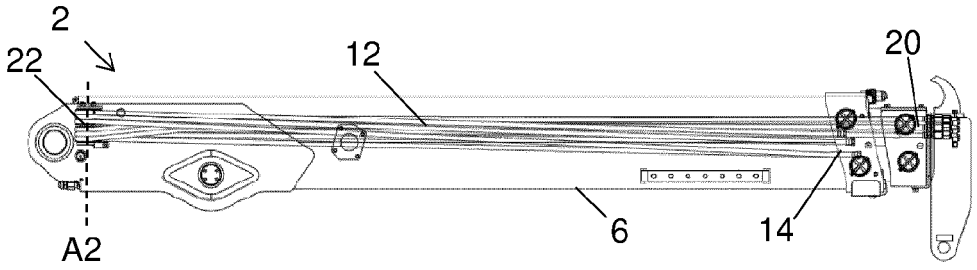

FIG. 3

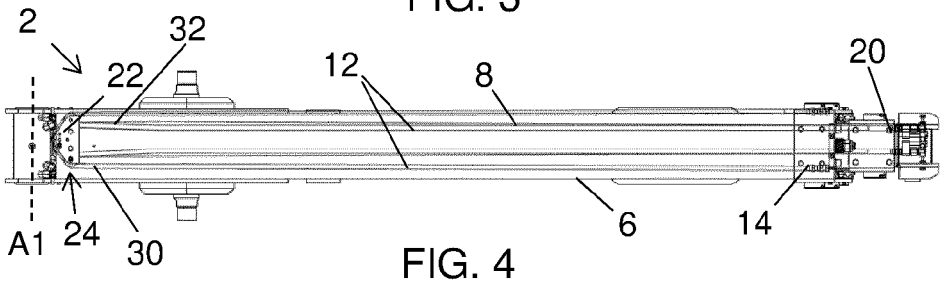

FIG. 4

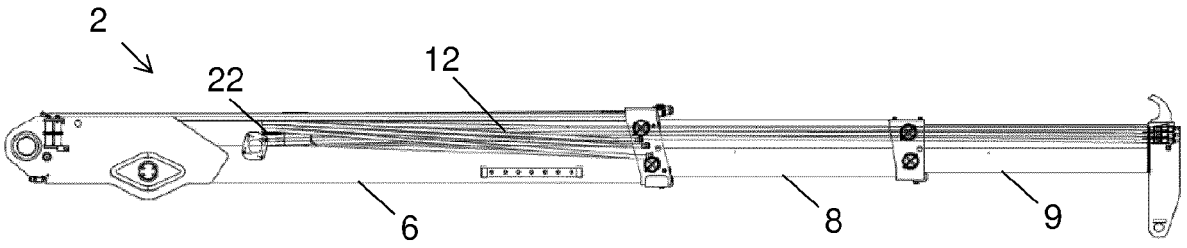

FIG. 5

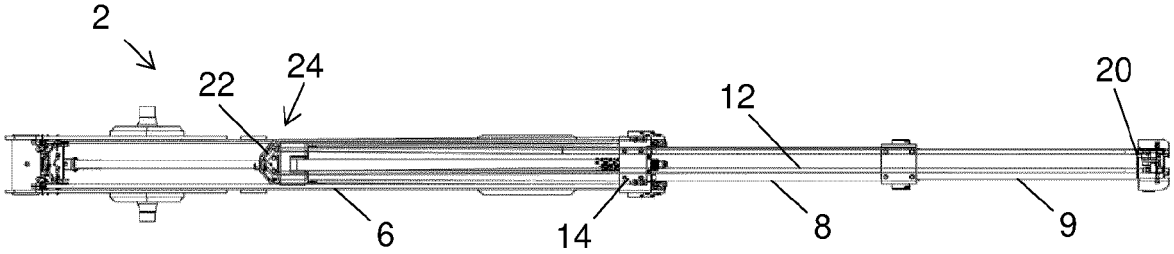

FIG. 6

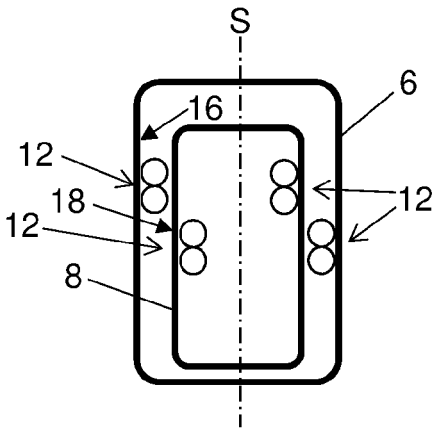

FIG. 7

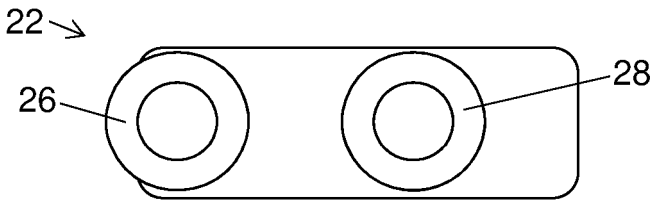

FIG. 8

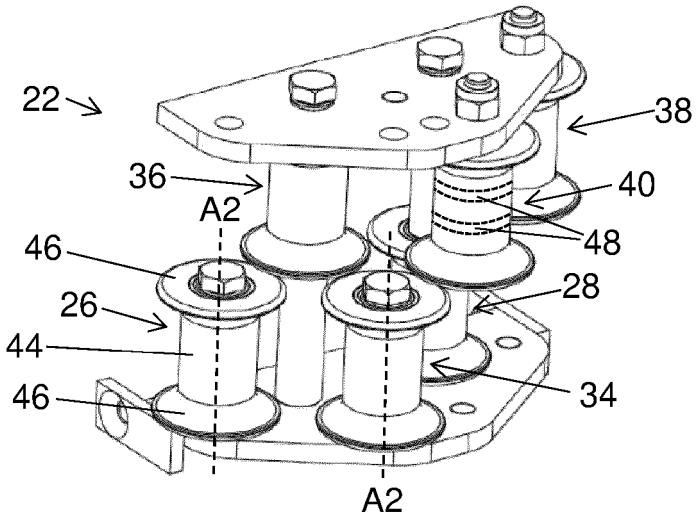

FIG. 9

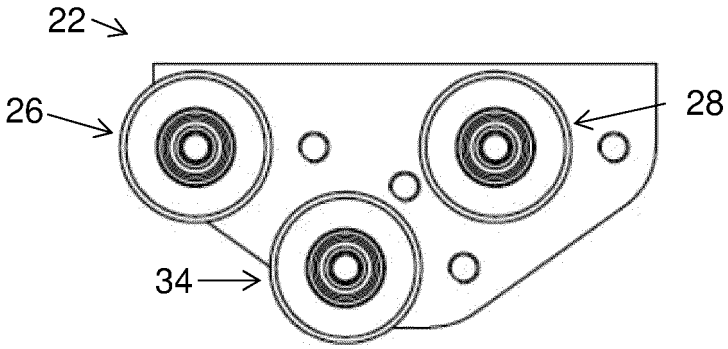

FIG. 10

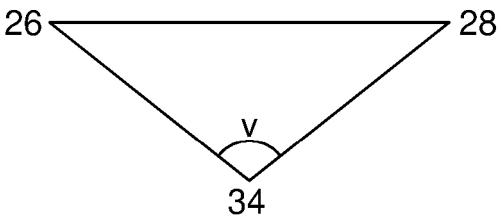

FIG. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 0030

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 0 239 302 B1 (KIDDE INC [US]) 2 December 1992 (1992-12-02) * abstract * * figures *	1-14	INV. B66C13/14 B66C23/70 B66C23/68
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