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Remarks:

In accordance with Article 14(2), second sentence EPC the applicant has filed a text with which it is intended to bring the translation into conformity with the original text of the application.

(54) **Telescopic boom assembly**

(57) Telescopic boom assembly (15c) with at least two boom parts (20, 21), comprising an outer boom part (20) and an inner boom part (21) which is movable in the longitudinal direction inside the outer boom part (20). A channel (30) is defined between the outer wall structure (21 c) of the inner boom part and the inner wall structure (20c) of the outer boom part, extending in the longitudinal direction inside the boom assembly (15c). A flexible energy transmission chain (24) is placed in the channel (30), inside which chain hoses, cables or the like are placed

and which can be folded up and folded out when the inner boom part (21) moves inside the outer boom part (20). Furthermore, the boom assembly comprises at least one support (22) moving with the inner end (21 a) of the inner boom part and supporting the inner end (21 a) of the inner boom part to the inner wall structure (20c). The telescopic boom assembly (15c) can be placed in an articulated hoist boom or in a movable working machine, particularly a forest machine.

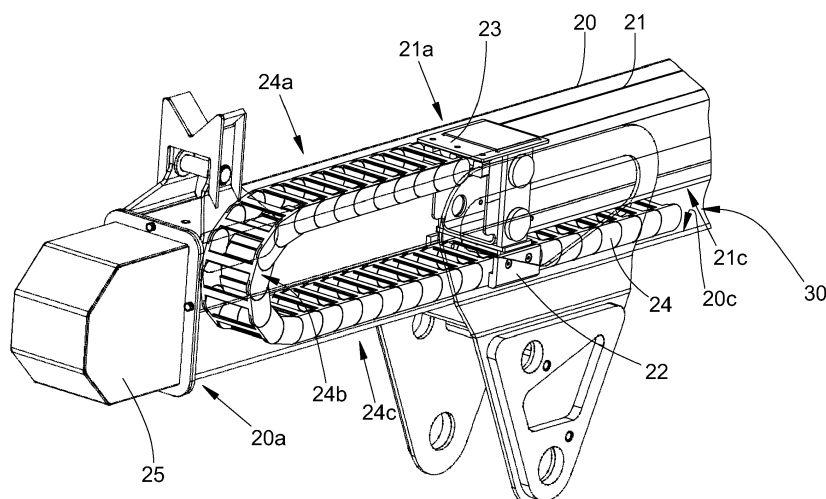


Fig. 3

Description

Field of the invention

[0001] The invention relates to a telescopic boom assembly with at least two boom parts. The invention also relates to an articulated hoisting boom. The invention further relates to a movable working machine with an articulated hoisting boom, particularly a forest machine.

Background of the invention

[0002] It is known that various boom systems are used, comprising a boom assembly which is telescopic and comprises boom parts movable with respect to each other. Flexible hoses or cables are used for conveying hydraulic or electric energy from one boom part to another, for example from a stationary boom part to a movable boom part. Boom assemblies are utilized by various articulated hoisting booms placed in e.g. various working machines. One example of a working machine is a forest machine with an articulated hoisting boom.

[0003] For harvesting, all-terrain mobile forest machines are provided, such as harvesters or forwarders. Mounted on its boom system, the forest machine comprises apparatuses for processing tree trunks, for example a felling head which is intended for cutting and felling a standing tree trunk only, wherein it is a so-called felling head, or a harvester head which is intended for cutting, felling, delimbing, and sawing a standing tree trunk into pieces of desired length. Apparatuses are also known which collect energy wood or clear trees or bushes and are mounted on the boom system of a forest machine or another all-terrain mobile working machine. The sawn trunks are collected by another known all-terrain mobile forest machine, such as a forwarder. The forwarder comprises a grapple mounted on its boom assembly for loading, and the trunks are transported in its load space.

[0004] The harvester head, the grapple, and the other apparatuses are mounted by means of e.g. joints at the end of the boom assembly of the forest machine. The forest machine moves independently on the terrain by means of wheels or a crawler. Both the boom system and the apparatuses mounted on it are provided with actuators, such as cylinders and motors, as well as electrically controlled members, such as valves, to which the hydraulic or electric energy is transferred by means of e.g. flexible hoses or cables, and possibly also by means of rigid pipes. The hydraulic or electric energy is produced in apparatuses in the chassis of the forest machine, and the boom system is also mounted on the chassis.

[0005] According to the state of the art, the hoses or cables are fastened to the boom system of the working machine. In many cases, the boom system comprises a telescopic boom assembly with boom parts movable relative to each other. Flexible hoses or cables are used for conveying hydraulic or electric energy from one boom part to another, for example from a stationary boom part

to a movable boom part. The hoses and/or cables can be placed at least partly inside the telescopic boom assembly, as in for example documents US 5,718,345 or EP 1507735 B1, which also utilize an energy transmission chain.

Summary of the invention

[0006] A telescopic boom assembly according to the invention, comprising at least two boom parts, is presented in claim 1.

[0007] In the present solution, the hoses and/or cables intended for the transmission of hydraulic energy and/or electric energy are placed at least partly inside the telescopic boom assembly where they are sheltered.

[0008] The articulated hoisting boom and the boom assembly of the forest machine are often moved close to standing trees and their branches, or close to trunks which are processed by implements connected to the boom assembly. When the hoses or cables are sheltered inside the boom assembly, the risk of breaking a hose or cable is reduced to a considerable extent.

[0009] The presented solution is a telescopic boom assembly with at least two boom parts, comprising an outer boom part and an inner boom part. The inner boom part is movable in the longitudinal direction inside the outer boom part. The inner boom part has an outer wall structure, and the outer boom part has an inner wall structure facing the outer wall structure. A channel is defined between the outer wall structure and the inner wall structure, extending in the longitudinal direction inside the boom assembly.

[0010] Said boom assembly also comprises a flexible energy transmission chain, inside which the hoses, cables or the like are placed. The energy transmission chain is movable, and it can be folded up and folded out when the inner boom part moves inside the outer boom part. The energy transmission chain comprises a first section which is movable with the inner end of the inner boom part and is followed by a curved second section which, in turn, is followed by a third section placed in said channel and extending in the longitudinal direction inside the boom assembly.

[0011] Furthermore, said boom assembly comprises one or more supports moving with the inner end of the inner boom part and supporting the inner end of the inner boom part to the inner wall structure. The support is placed in the lateral direction with respect to the energy transmission chain, and furthermore, said support delimits one or more openings, through which the third section of the energy transmission chain extends when the inner boom part is moving inside the outer boom part. In an example, said opening is also delimited by the inner wall structure of the outer boom part. Two openings can be provided, placed on both sides of the support.

[0012] The energy transmission chain supports and protects the hoses and/or cables. The energy transmission chain guides the position of the hose or cable, keep-

ing it, for example, curved, and prevents its uncontrolled transverse movement e.g. when the boom assembly is moving in the lateral direction and is stopped. A number of, for example, two energy transmission chains can be provided in parallel.

[0013] In an example, the energy transmission chain consists of several successive links fastened to each other in an articulated manner like a chain. The hoses or cables extend through the links, from one link to another.

[0014] In an example, the boom assembly also comprises a guide which supports the third section of the energy transmission chain in the lateral direction. The guide is placed in said channel and extends in the longitudinal direction inside the boom assembly. The guide guides the position of the energy transmission chain and supports it e.g. when the boom assembly is moving in the lateral direction and is stopped.

[0015] In an example, the guide is removably fastened to the inner wall structure of the outer boom part. Furthermore, it may be possible to install the guide inside the outer boom part in such a way that the guide is slid through the inner end or the outer end of the outer boom part. The guide consists of one or more adjacent elements, for example two separate walls, between which the energy transmission chain is placed. The guide consists of one or more successive elements in the longitudinal direction. For example, two energy transmission chains can be placed next to each other in a single guide.

[0016] The separate guide is easy to install, and the manufacture of the wall structure for the boom assembly is easier compared with the situation of making the guide an integral part of the wall structure.

[0017] In an example, at least two above-mentioned supports are provided, and in this case, said opening is placed between the two supports. Said opening is delimited between the two supports. In an example, the guide extends through the opening as well.

[0018] In an example, the support rolls along the inner wall structure. The support is for example a roll, a wheel, a disc, or the like. In another example, the support slides along the inner wall structure. The support is for example a leg, a pin, an arm, a strip, a flange, a plate, or the like.

[0019] In an example, at least one element is fastened to the inner wall structure, along which element said support rolls or slides, and furthermore, said element extends in the longitudinal direction inside the boom assembly. Said element can be a slide bearing which is, for example, a sliding plate or a PTFE plate.

[0020] In an example, the boom assembly also comprises a supporting frame which is fastened to the inner end of the inner boom part and moves with the inner boom part. The first section of the energy transmission chain is fastened to the supporting frame, and furthermore, said support or several supports are fastened to one side of the supporting frame.

[0021] The supporting frame enables an easy installation of the different parts and reinforces the structure of the inner boom part. By means of the supporting frame,

the different parts are fastened to the inner boom part, whose structure can be kept simple. In an example, the supporting frame surrounds the inner end of the inner boom part, so that the supporting frame protects the inner boom part, and various parts can be mounted on all sides of the inner boom part by means of the supporting frame. In an example, at least one slide bearing is fastened to the supporting frame. The slide bearing supports the inner end of the inner boom to the inner wall structure part in the lateral direction.

[0022] The presented solution can be applied in various articulated hoisting booms placed in e.g. various movable working machines and trailers hauled by movable working machines. The telescopic boom assembly according to the presented solution can be fastened to another boom assembly.

[0023] Inside the inner boom part, e.g. an auxiliary boom part can be placed, which is movable inside the inner boom part. In connection with the inner boom part and the auxiliary boom part, it is possible to apply the principles of the above presented solution. The outer boom part can be placed e.g. inside the auxiliary boom part, the outer boom part being movable inside the auxiliary boom part. In connection with the outer boom part and the auxiliary boom part, it is possible to apply the principles of the above presented solution.

[0024] The presented solution can be applied in various movable working machines which comprise an articulated hoisting boom provided with a telescopic boom assembly according to the presented solution. They are, for example, self-propelled all-terrain working machines. Particular examples include forest machines, such as a forwarder and a harvester.

[0025] The presented solution can also be applied in various movable working machines, in which the telescopic boom assembly according to the presented solution is placed either directly or via another boom assembly. Said working machines may comprise an articulated hoisting boom, in which the telescopic boom assembly according to the presented solution is placed. Examples include various types of hoisting devices, telescopic cranes and reach trucks, in which an implement, such as a fork or a working platform, is mounted on the boom assembly.

Brief description of the drawings

[0026] For understanding the presented solution, reference will be made in the description to the appended drawings which show some examples according to the solution.

Fig. 1 shows a working machine of prior art, particularly a forest machine with an articulated hoisting boom, to which a telescopic boom assembly according to the presented solution can be connected.

- Fig. 2 shows a telescopic boom assembly according to the presented solution, partly transparent in the figure for illustration purposes.
- Fig. 3 shows a more detailed view of one end of the telescopic boom assembly according to Fig. 2.
- Fig. 4 shows a more detailed view of the energy transmission chain and the supporting frame, as well as one end of the inner boom part, of the telescopic boom assembly according to Fig. 2.
- Fig. 5 shows a longitudinal sectional side view of the telescopic boom assembly according to Fig. 2, which also includes a guide and a slide bearing.
- Fig. 6 shows a more detailed view of one end of the telescopic boom assembly according to Fig. 2, which also comprises the guide and the slide bearing according to Fig. 5.

More detailed description of embodiments of the invention

[0027] Figure 1 shows an example of a working machine and a hoisting boom in which the solution presented in this description can be applied. It is particularly a forest machine 10, in which the telescopic boom assembly according to the presented solution can be applied.

[0028] The forest machine comprises a frame consisting of one chassis part or two chassis parts 11a-11b connected to each other by means of a joint 12. The driving direction is controlled by means of either wheels or endless tracks, or by means of the joint 12, as in Fig. 1. The forest machine 10 is particularly suitable for moving on an uneven terrain. The forest machine comprises a cabin 13 and a power source 14, for example a combustion engine, as well as an articulated hoisting boom 15 for working, mounted on e.g. a chassis part.

[0029] In the example of Fig. 1, the hoisting boom 15 is mounted on the chassis part 11b, but it can be placed in the chassis part 11a, or even on top of the cabin.

[0030] The hoisting boom 15 can be turned in lateral directions, and it typically comprises several boom assemblies 15a to 15c which are connected to each other by means of joints and fasteners 19. The positions of the hoisting boom 15 and its boom assemblies 15a to 15c are controlled by actuators to generate the hoisting and lowering movements of an implement 16. Typically, the actuator is a cylinder utilizing hydraulic energy which is transmitted to the actuator by means of e.g. flexible hoses. An apparatus needed for generating the hydraulic energy is placed in e.g. a chassis part. Typically, one boom assembly is telescopically operating, for example the outermost boom assembly 15c.

[0031] An implement 16 for working is mounted by means of a fastener 18 at the end of the hoisting boom 15, that is, at the end of the telescopic boom assembly

15c. The implement 16 utilizes hydraulic and/or electric energy which is transmitted to the implement by means of e.g. flexible hoses or cables. An apparatus needed for generating electric energy is placed in e.g. a chassis part.

The implement 16 can be, for example, a harvester head, an apparatus intended for processing a tree trunk, a grapple, or an apparatus intended for the collecting of energy wood, or, for example, an apparatus intended for clearing trees or bushes and equipped with a saw or cutting blades. It can also be an implement that is a combination of the above-mentioned apparatuses, for example a harvester head equipped with a clearing apparatus.

[0032] Instead of the boom assembly 15c of Fig. 1, it is possible to apply a telescopic boom assembly according to the presented solution, denoted by the reference number 15c in Figs. 2 to 6.

[0033] Figures 2 to 6 show a telescopic boom assembly 15c which applies several different features of the presented solution simultaneously and in combination. Said features can also be applied in the telescopic boom assembly 15c separately or independently.

[0034] The forest machine of Fig. 1 is particularly a forwarder, so that a load space 17 for tree trunks is also provided on the chassis part 11 b. The load space 17 is equipped with, for example, bunks and stakes. The implement 16 is a grapple for the manipulation of timber. By means of the hoisting boom 15 and the implement 16, timber is loaded into or unloaded from the load space 17.

[0035] Figure 2 shows a telescopic boom assembly 15c which applies the presented solution. The boom assembly 15c comprises an outer boom part 20 and an inner boom part 21 which can be moved with respect to each other in the longitudinal direction. The inner boom part 21 is movable inside the outer boom part 20. The outer boom part 20 can be fastened **by joints and fasteners 19 to the articulated hoisting boom [tai: to the ... boom articulated by joints and fasteners 19, eli viittaako "nivelien ja kiinnikkeiden 19 avulla" ulkopuomiosan kiinnittämiseen vai nostopuomin nivelöintiin?]**.

[0036] The cross-section of the outer boom part 20 and the inner boom part 21 resembles a square or a rectangle. In an example, the cross-section resembles a circle or a diamond. The inner end 21 a of the inner boom part is movable inside the outer boom part 20, between the inner end 20a and the outer end 20b of the outer boom part. The outer end 21 b of the inner boom part is freely movable outside the outer end 20b of the outer boom part. The inner boom part 21 moves in and out in the longitudinal direction via the outer end 20b of the outer boom part.

[0037] In the boom assembly 15c, a flexible energy transmission chain 24 is applied, for hoses, cables or the like. The hoses and/or cables are placed inside the energy transmission chain 24 which protects the hoses or cables or guides their position. The energy transmission chain 24 is connected between such parts which are mov-

able with respect to each other, for example the inner boom part 21 and the outer boom part 20, and between which hoses or cables are also connected.

[0038] In an example, the energy transmission chain 24 consists of several successive links connected to each other in an articulated manner like a chain, and in such a way that the energy transmission chain 24 can be folded up and folded out when said parts move with respect to each other. The hoses or cables extend through the links, from one link to another. The energy transmission chain 24 keeps the hoses or cables inside the energy transmission chain 24 during the movements of the boom assembly 15c. The energy transmission chain 24 has a cross-section resembling, for example, a square or a rectangle, and it is made of e.g. plastic. Preferably, the links of the energy transmission chain 24 comprise, for example, parts which surround the hoses or cables and keep them inside the links.

[0039] The energy transmission chain 24 is connected to the boom assembly 15c in such a way that the first section 24a is movable with the inner boom part 21. The energy transmission chain 24 is folded in such a way a curved second section 24b, whose location is dependent on the position of the inner boom part 21, is provided as an extension to the first section 24a. A third section 24c is provided as an extension to the second section 24b, extending in the longitudinal direction of the boom assembly 15c and between the inner boom part 21 and the outer boom part 20, for example to the area between the inner end 21 a of the inner boom part and the outer end 20b of the outer boom part.

[0040] The hoses or cables enter the space between the inner boom part 21 and the outer boom part 20 and extend to the third section 24c and further via the second section 24b to the first section 24a, from which they exit into the inner boom part 21.

[0041] The inner boom part 21 has an outer wall structure 21 c, and the outer boom part 20 has an inner wall structure 20c facing the outer wall structure 21 c. A channel 30 is defined between the outer wall structure 21 c and the inner wall structure 20c, extending in the longitudinal direction inside the boom assembly 15c. The third section 24c of the energy transmission chain 24 is placed in the channel 30. The cross-section of the channel 30 resembles e.g. a square or a rectangle.

[0042] The inner wall structure 20c or the outer wall structure 21 c is preferably a sheet-like wall which, according to an example, consists of one sheet layer in a predetermined area. Said predetermined area is placed at a single support 22, or at all supports 22 when there are at least two supports 22, and also in the area between the supports 22, if necessary. Said predetermined area can also be placed at the energy transmission chain 24. According to an example, the energy transmission chain 24, or its lower surface, and an element 50 to which the support 22 is supported, are placed on top of such a sheet-like wall that constitutes a uniform smooth surface in a predetermined area at which the energy transmission

chain 24, one or more elements 50 and the supports 22 are placed. Consequently, the supports 22 extend past the top surface of the energy transmission chain 24 towards said smooth surface and against the element 50. A guide 51 can be placed between the energy transmission chain 24 and the sheet-like wall.

[0043] In the boom assembly 15c, at least one support 22 is applied, connected to the boom assembly 15c in such a way that the support 22 moves with the inner end 21 a of the inner boom part. The support 22 is supported to the inner wall structure 20c, to which the inner end 21 a of the inner boom part is supported by means of the support 22. Each support 22 consists of one part or several successive parts placed in the area of the inner end 21 a of the inner boom part.

[0044] In an example, the support 22 is placed in a lateral direction with respect to the energy transmission chain 24, or in the longitudinal direction of the inner boom part 21. The support 22 delimits one or more openings 40, through which the energy transmission chain 24, particularly its third section 24c, extends when the inner boom part 21 is moving. Preferably, the opening 40 is also delimited by the outer boom part 20 or its inner wall structure 20c. Furthermore, it is possible that an opening 40 is formed on both sides of the support 22, and two adjacent energy transmission chains 24 are used, which operate in the same way.

[0045] In another example, shown in Figs. 2 to 6, at least two supports 22 are provided, and the opening 40 is placed between the supports 22. Consequently, the opening 40 is delimited by the two supports 22 placed in the lateral direction with respect to the longitudinal direction of the energy transmission chain 24 or the inner boom part 21. At least one energy transmission chain 24 or e.g. two adjacent energy transmission chains 24 operating in the same way extend through the opening.

[0046] In an example, the support 22 is configured to roll along the inner wall structure 20c. The support 22 is for example a roll, a wheel, a disc, or the like. In another example, shown in Figs. 2 to 6, the support 22 is configured to slide along the inner wall structure 20c. The support 22 is for example a leg, a pin, an arm, a strip, a flange, or the like.

[0047] Preferably, at least one element 50, along which the support 22 rolls or slides, is fastened to the inner wall structure 20c. The element 50 extends in the longitudinal direction inside the boom assembly 15c or inside the outer boom part 20, and extends e.g. to the outermost end 20b of the outer boom part 20. The length of the element 50 is at least such that corresponds to the travel distance of the support 22. The element 50 consists of one part or several successive parts, for example bands or strips. The element 50 is, for example, a slide bearing which is a sliding plate or a PTFE (polytetrafluoroethylene) plate with a low sliding friction. In the example of Figs. 5 and 6, two elements 50 are provided, placed on both sides of the energy transmission chain 24 and under two movable supports 22.

[0048] The support 22 is connected to the inner boom part 20 either directly or by means of a supporting frame 23. The supporting frame 23 is connected to the inner boom part 21 or its inner end 21 a in such a way that the supporting frame 23 moves with the inner end 21 a of the inner boom part. The support 22 is connected to one side of the supporting frame 23 e.g. in such a way that it forms an extension to one of the sides of the supporting frame 23. In Fig. 4, the support 22 is an extension to the vertical side 23c of the supporting frame 23. The first section 24a of the energy transmission chain 24 is connected to the inner boom part 20 either directly or by means of the supporting frame 23.

[0049] The supporting frame 23 according to Figs. 2 to 6 is constructed to be, for example, annular or ring-shaped in such a way that the supporting frame 23 surrounds the inner boom part 21 or the inner end 21 a of the inner boom part. If necessary, one or more slide bearings 41, 42 are connected to the supporting frame 23 and its sides 23b, 23c, to support the inner boom part 21 or the inner end 21 a of the inner boom part to the outer boom part 20 or the inner wall structure 20c. The supporting takes place in the lateral direction with respect to the longitudinal direction of the inner boom part 21. The slide bearing is, for example, a sliding plate or a PTFE plate.

[0050] According to Fig. 4, the side 23a is placed next to a channel 30 **[viite-numeroa ei näy kuvassa!]**. The side 23b is placed on the opposite side of the supporting frame 23, and the side 23c is placed next to the side 23a and/or the side 23b. The channel 30 is placed between the side 23a and the inner wall structure 20c.

[0051] At least one element 52, to which the inner boom part 21 is supported, is fastened to the outer end 20b of the outer boom part. The element 52 slides or rolls along the inner boom part 21, when the inner boom part 21 moves inside the outer boom part 20. Preferably, the element 52 is placed underneath the inner boom part 21; if necessary, also on its sides and top.

[0052] A guide 51 is placed inside the outer boom part 20 to support the energy transmission chain 24 and particularly its third section 24c in the lateral direction. The guide 51 is placed in the channel 30, and the guide 51 extends in the longitudinal direction inside the boom assembly 15c or the outer boom part 20. The guide 51 prevents the placement of the energy transmission chain 24 in front of the support 22, and collisions. The guide 51 extends through the opening 40 and, for example, all the way to the outermost end 20b of the outer boom part 20. The guide 51 consists of a single part or several parts placed one after the other.

[0053] The shape of the guide 51 is a Ushape, such as a flute, which comprises walls or a pair of separate walls between which a guiding channel is formed to shelter the third section 24c of the energy transmission chain 24 when the energy transmission chain 24 is folded out. The inner wall structure 20c may constitute at least part of the bottom of the guide 51, against which the energy

transmission chain 24 is placed. The walls of the guide 51 can be Lshapes **facing** each other, for example forming a flute, the energy transmission chain 24 being placed against the walls. The walls of the guide 51 can be Lshapes facing each other and being parallel.

[0054] For the installation, the guide 51 is removably fastened to the inner wall structure 20c. Preferably, the guide 51 can be installed inside the outer boom part 20 by sliding it inside the outer boom part 20 through the inner end 20a or the outer end 20b of the outer boom part. Preferably, the guide 51 is a Ushaped flute.

[0055] The protective housing 25 is fastened to the inner end 20a of the outer boom part. Inside the protective housing 25, a space is provided, into which the curved second section 24b of the energy transmission chain can move when the inner boom part 21 moves inside the outer boom part 20 and the inner end 21 a of the inner boom part moves towards the inner end 20a of the outer boom part. The housing 25 is an extension to the outer boom part 20, and entry into it is provided through the inner end 20a of the outer boom part.

[0056] The invention is not limited solely to the examples, embodiments and alternatives presented in the drawings or the above description, and they should not be used as limiting examples. As an example, the channel 30, the third section 24c of the energy transmission chain, the guide 51, or the supports 22 can also be placed on top or sides of the inner boom part 21 when the boom assembly 15c is viewed in the horizontal direction, according to Fig. 2. Thus, the supports 22 extend e.g. upwards, and the Ushape is open downwards. Preferably, the channel 30, the third section 24c of the energy transmission chain, the guide 51, or the supports 22 are placed under the inner boom part 21, as shown in Fig. 2. Thus, the supports 22 extend downwards, and the Ushape is open upwards.

[0057] Neither should the above-presented drawings be understood in such a way that all the features shown in them would also be in use in the presented solutions. The above-presented features can be combined in the telescopic boom assembly in such a way that it comprises the desired functions. The supporting frame 23 is not necessary but it facilitates the installation. The guide 51 is not necessary but it prevents swinging of the energy transmission chain 24 in the lateral direction.

[0058] The invention can be applied to the extent defined in the appended claims.

Claims

1. A telescopic boom assembly (15c) with at least two boom parts (20, 21), comprising:
 - an outer boom part (20); and
 - an inner boom part (21) which is movable in the longitudinal direction inside the outer boom part (20);

- an outer wall structure (21) of the inner boom part;
 - an inner wall structure (20c) of the outer boom part, opposite to the outer wall structure (21 c), wherein a channel (30) is defined between the outer wall structure (21 c) and the inner wall structure (20c), extending in the longitudinal direction inside the boom assembly (15c); and
 - a flexible energy transmission chain (24), inside which the hoses, cables or the like are placed and which can be folded up and folded out when the inner boom part (21) moves inside the outer boom part (20); and which has a first section (24a) movable with the inner end (21 a) of the inner boom part and is followed by a curved second section (24b) followed by a third section (23c) which is in said channel (30) and extends in the longitudinal direction inside the boom assembly (15c);

characterized in that the boom assembly further comprises:

- at least one support (22) moving with the inner end (21 a) of the inner boom part and supporting the inner end (21 a) of the inner boom part to the inner wall structure (20c); and further said at least one support (22) being placed in the lateral direction with respect to the energy transmission chain (24); and further said at least one support (22) delimiting one or more openings (40), through which the third section (24c) of the energy transmission chain extends when the inner boom part (21) moves inside the outer boom part (20).
2. The telescopic boom assembly according to claim 1, **characterized in that** the boom assembly comprises at least two said supports (22), and further said one or more openings (40) are placed between said at least two supports (22).
 3. The telescopic boom assembly according to claim 1 or 2, **characterized in that** said support (22) is configured to roll along the inner wall structure (20c) and is, for example, a roll, a wheel, a disc, or the like; or alternatively said support is configured to slide along the inner wall structure (20c) and is, for example, a leg, a pin, an arm, a strip, a flange, a plate, or the like.
 4. The telescopic boom assembly according to any of the claims 1 to 3, **characterized in that** at least one element (50) is fastened to the inner wall structure (20c), along which element at least one of said supports (22) rolls or slides and which extends in the longitudinal direction inside the boom assembly (15c).

5. The telescopic boom assembly according to claim 4, **characterized in that** said element (50) is a slide bearing which is e.g. a sliding plate or a PTFE plate.
6. The telescopic boom assembly according to any of the claims 1 to 5, **characterized in that** the telescopic boom assembly further comprises a supporting frame (23) which is fastened to the inner boom part (21) and moves with the inner boom part (21), and to which the first section (24a) of the energy transmission chain (24) is fastened, and further on whose one side said support (22) is fastened.
7. The telescopic boom assembly according to claim 6, **characterized in that** the supporting frame (23) is configured to surround the inner end (21 a) of the inner boom part.
8. The telescopic boom assembly according to claim 6 or 7, **characterized in that** at least one slide bearing (41, 42) is fastened to the supporting frame (23), said slide bearing (41, 42) supporting the inner end (21 a) of the inner boom part in the lateral direction to the inner wall structure (20c).
9. The telescopic boom assembly according to any of the claims 1 to 8, **characterized in that** the telescopic boom assembly further comprises at least one element (52) which is fastened to the outer end (20b) of the outer boom part and to which the inner boom part (21) is supported and configured to roll or slide when the inner boom part (21) moves inside the outer boom part (20).
10. The telescopic boom assembly according to any of the claims 1 to 9, **characterized in that** the telescopic boom assembly further comprises a protective housing (25) fastened to the inner end (20a) of the outer boom part and defining a space into which the curved second section (24b) of the energy transmitting chain can enter when the inner boom part (21) moves inside the outer boom part (20).
11. The telescopic boom assembly according to any of the claims 1 to 10, **characterized in that** the telescopic boom assembly further comprises a guide (51) which supports the third section (24c) of the energy transmitting chain in the lateral direction and is placed inside said channel (30) and extends in the longitudinal direction inside the boom assembly (15c).
12. The telescopic boom assembly according to claim 11, **characterized in that** said guide (51) extends through said opening (40).
13. The telescopic boom assembly according to claim 11 or 12, **characterized in that** the guide (51) is

Ushaped, comprising walls or a pair of separate walls, which define a guiding channel between them, into which channel the third section (24c) of the energy transmitting chain is placed.

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14. The telescopic boom assembly according to any of the claims 11 to 13, **characterized in that** the guide (51) is removably fastened to the inner wall structure (20c) of the outer boom part, and that the guide (51) can be installed inside the outer boom part (20) by sliding it through the inner end (20a) or the outer end (20b) of the outer boom part. 10
15. An articulated hoisting boom, **characterized in that** the articulated hoisting boom comprises a telescopic boom assembly according to any of the claims 1 to 14. 15
16. A movable working machine, particularly a forest machine, comprising an articulated hoisting boom, **characterized in that** the articulated hoisting boom comprises a telescopic boom assembly according to any of the claims 1 to 14. 20

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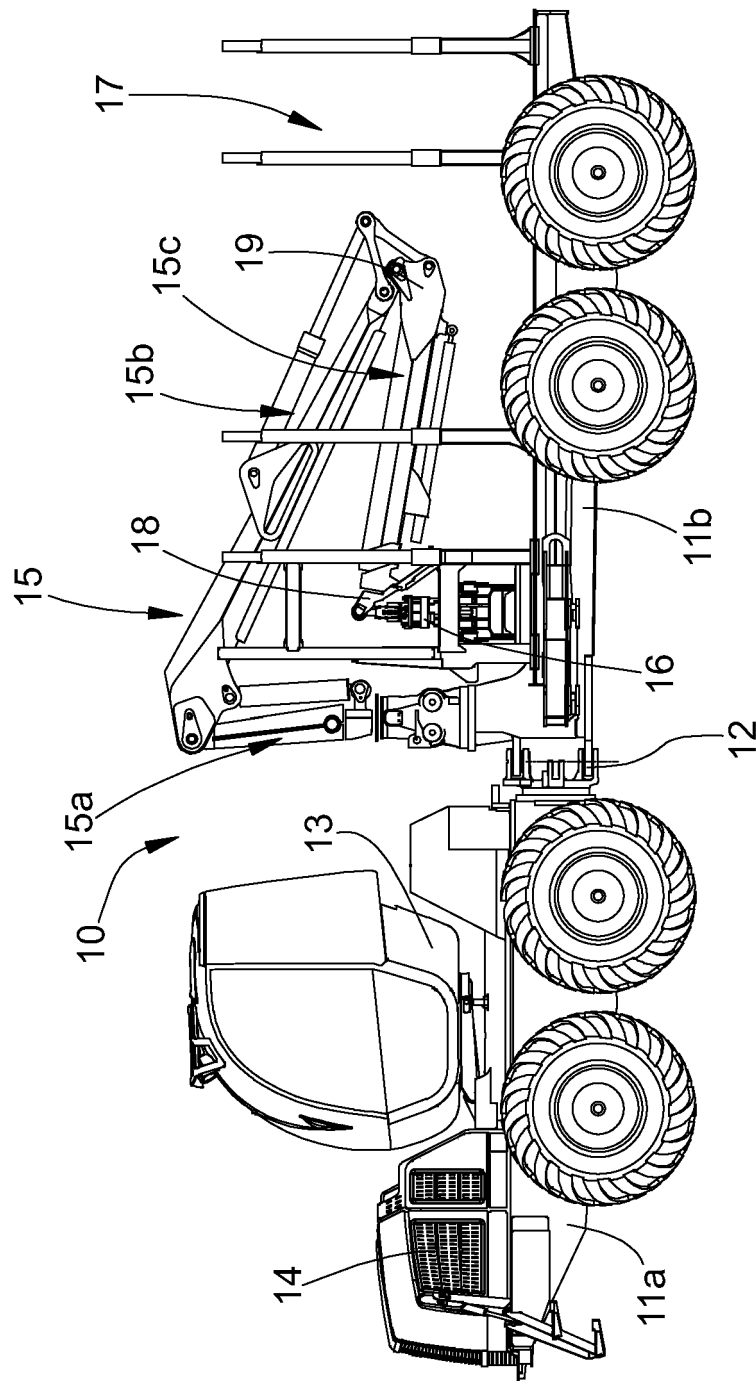


Fig. 1

- Prior art -

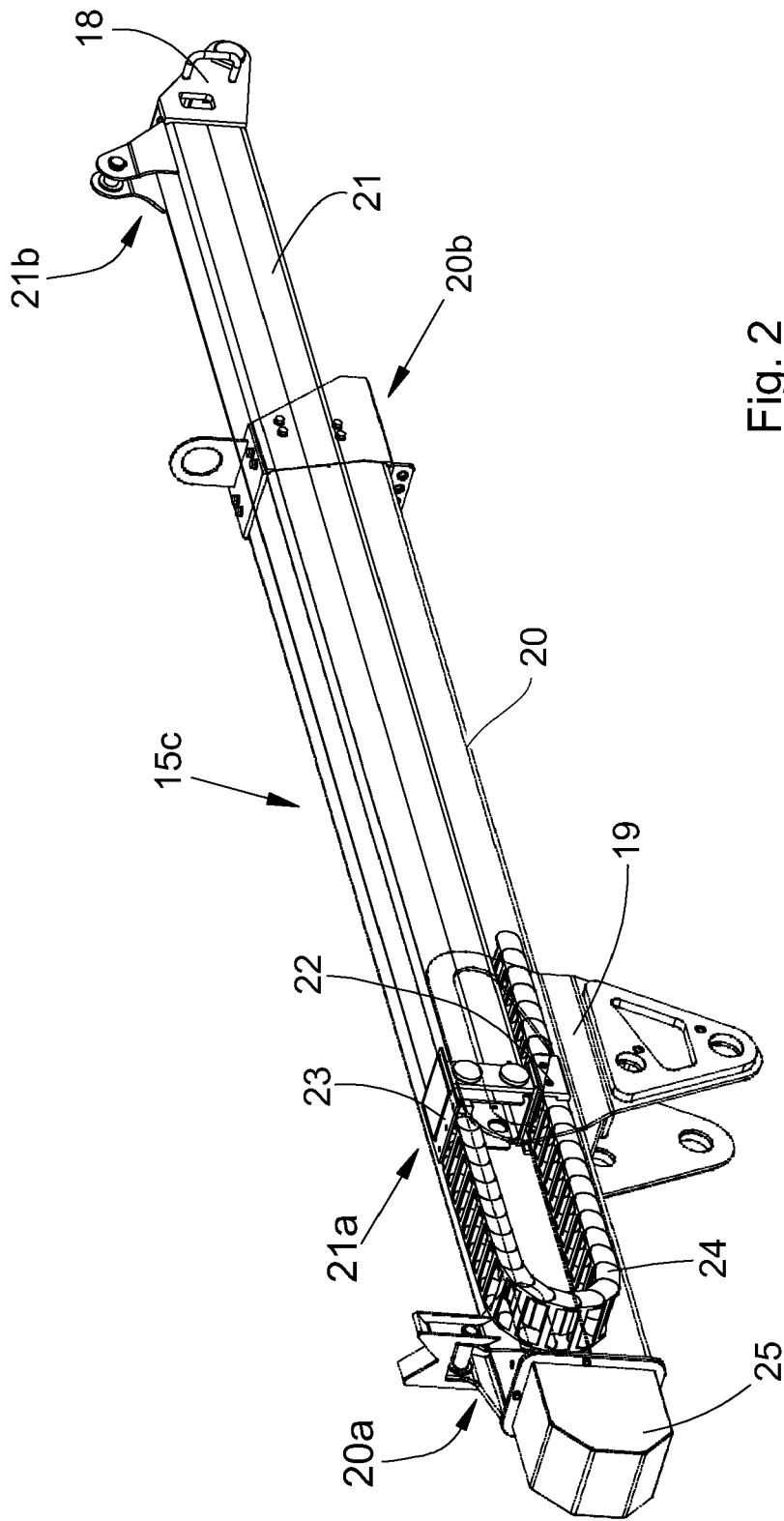


Fig. 2

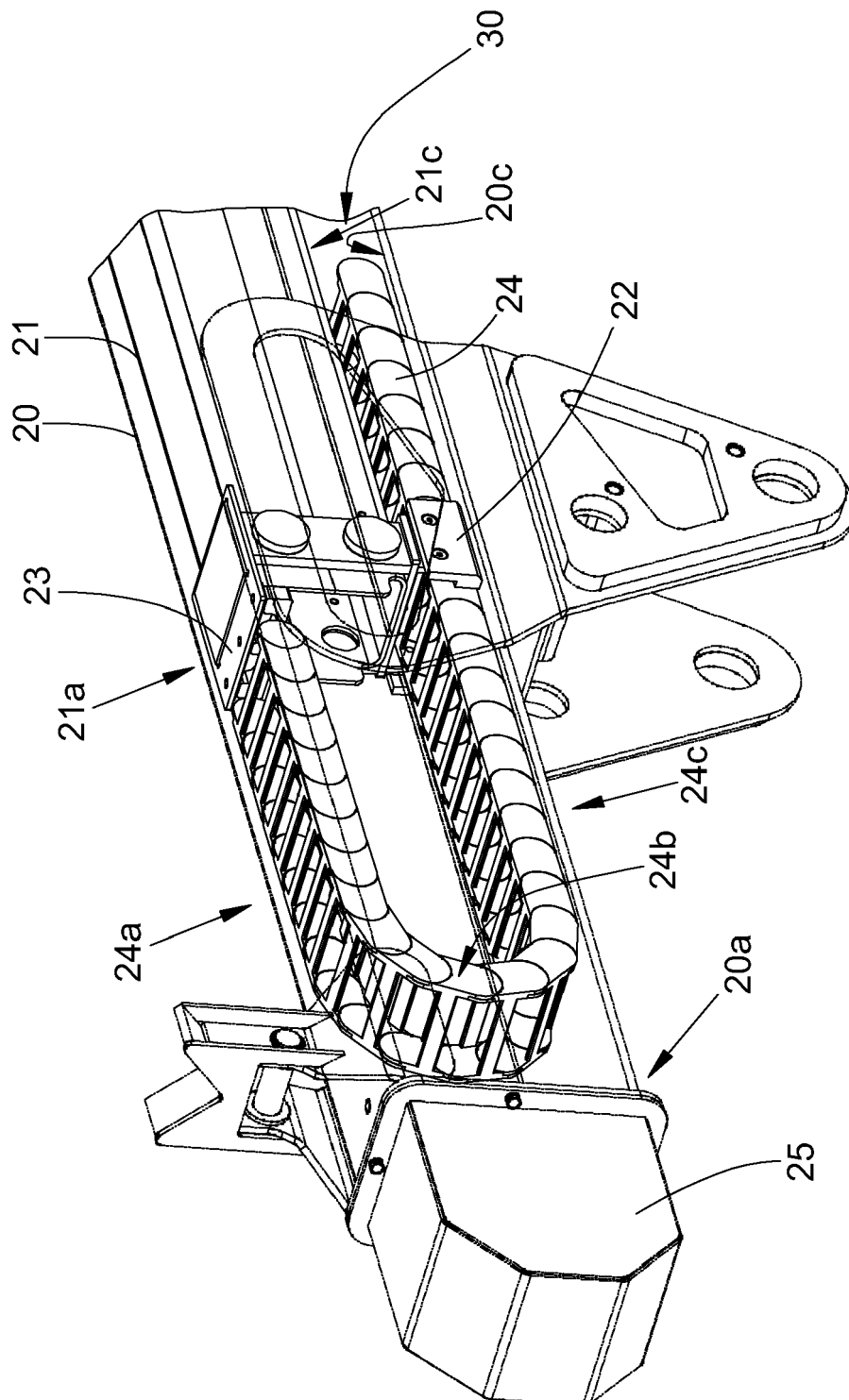


Fig. 3

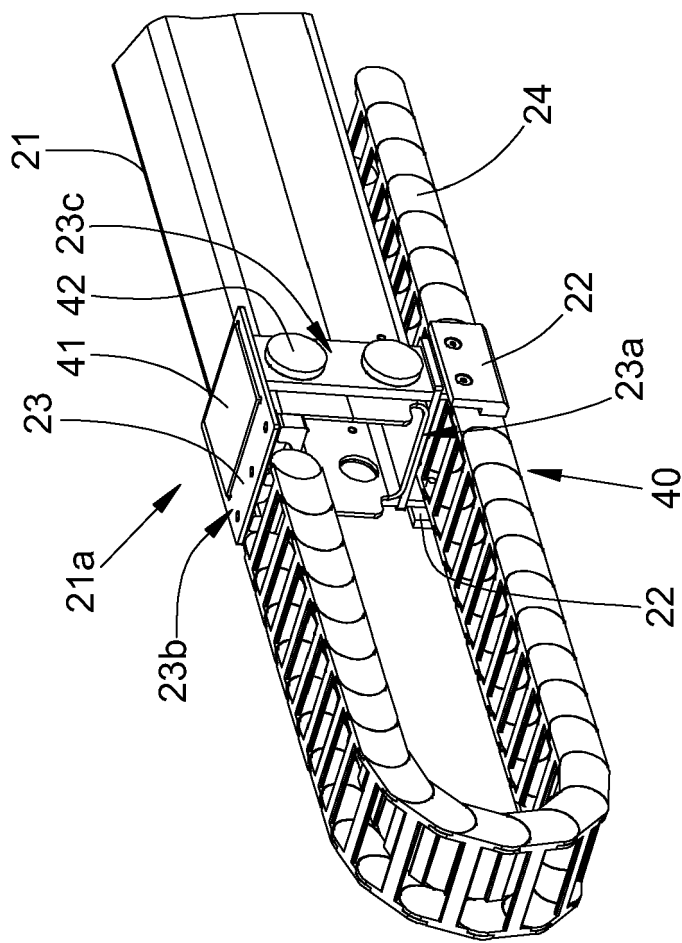


Fig. 4

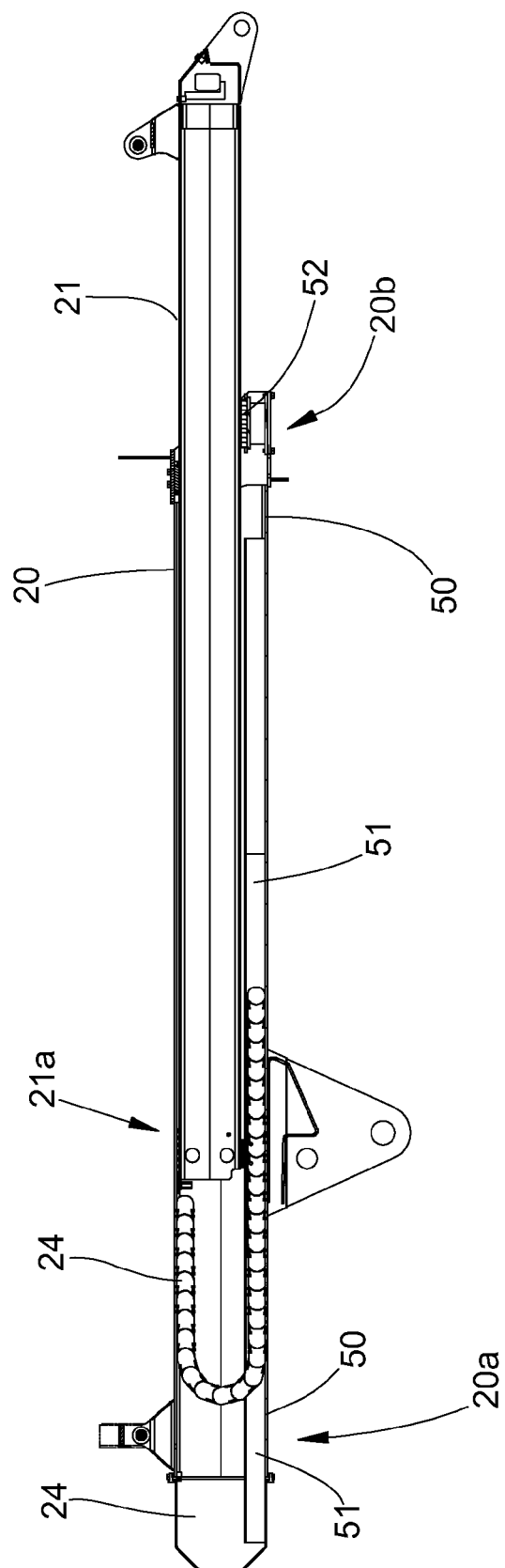


Fig. 5

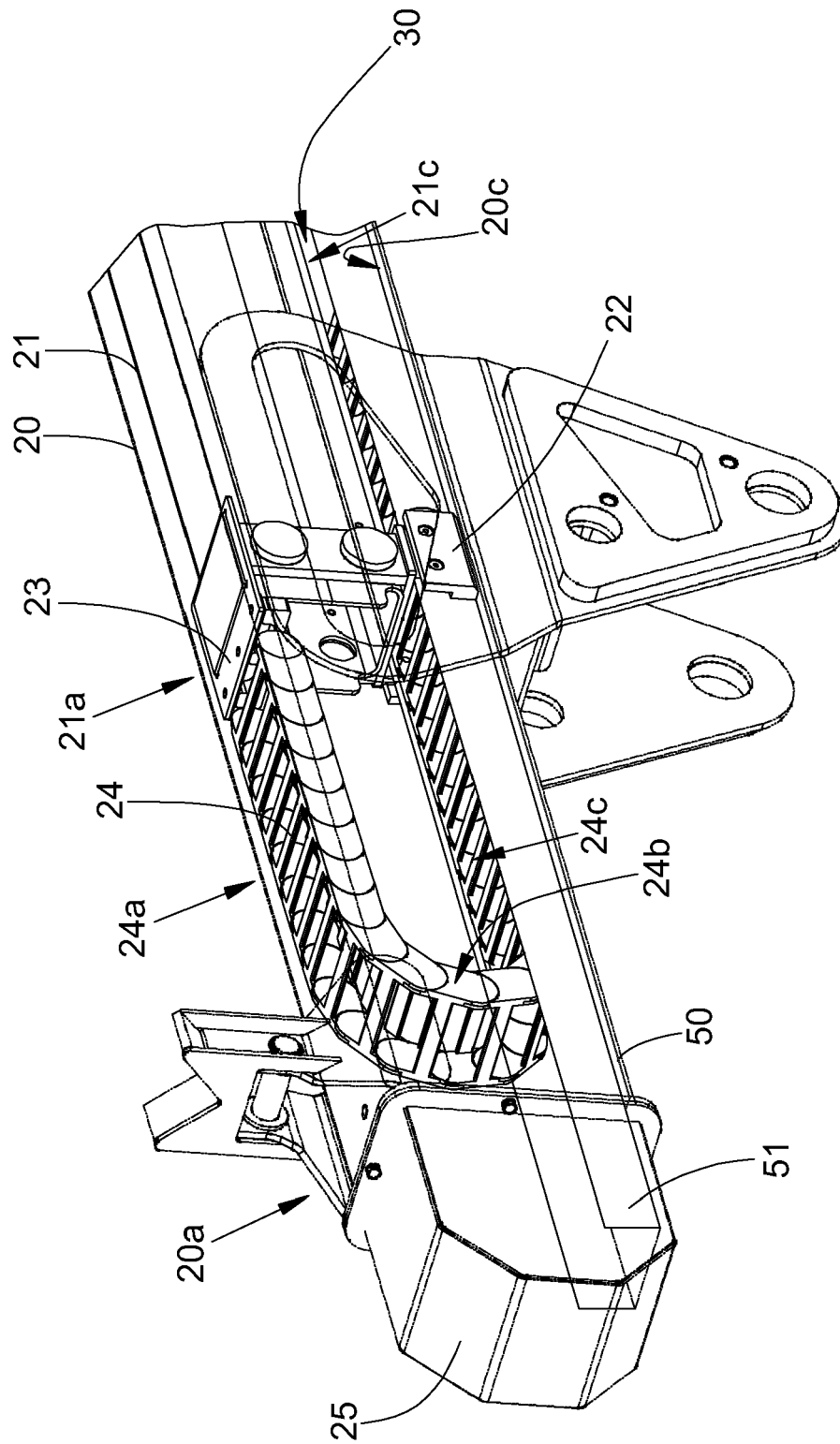


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 14 39 7506

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Place of search The Hague		Date of completion of the search 21 May 2014	Examiner Serôdio, Renato
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