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(54) **A TELESCOPIC ARM FOR A FORESTRY CRANE**

(57) The present invention belongs to the field of manufacturing and transport, more precisely the invention relates to a telescopic arm for a crane together with a hydraulic cylinder (4), piping and attachments in the arm of the forestry crane.

The telescopic arm (1-3) for a forestry crane with a system of internal leading of flexible hydraulic tubes (8a,

8b, 8c, 8d) of outer users is designed in such a way that in the longitudinal axis of the telescopic arm a hydraulic cylinder (4) is provided that has a housing (1a) with larger wheels for flexible tubes. A chain (6a, 7a) is installed above the cylinder via a sprocket having a separate axis from the leading wheels (5a, 5b).

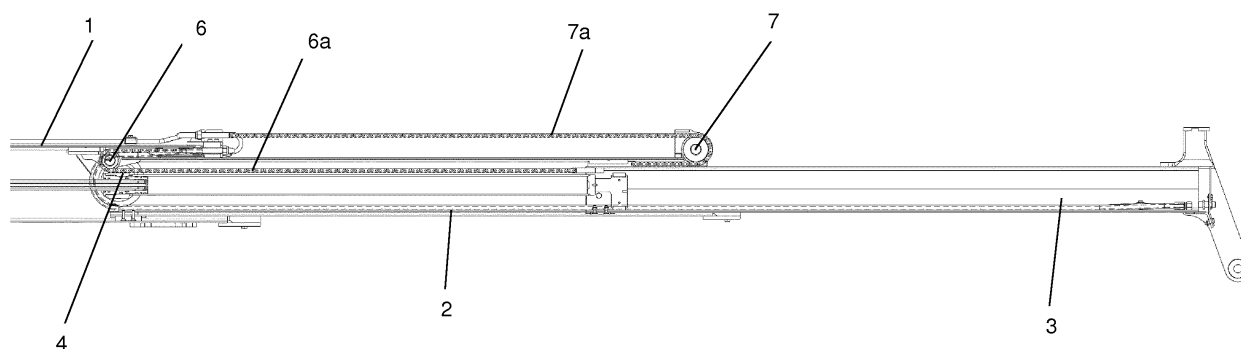


Fig. 1

Description

Field of the invention

[0001] The present invention belongs to the field of manufacturing and transport, more precisely the invention relates to a telescopic arm for a crane together with a hydraulic cylinder, tubes and attachments in the arm of the forestry crane.

The technical problem

[0002] The technical problem, which is solved by the present invention, is a constructional solution of a mechanism for a telescopic arm to be used on/with a forestry crane, in which the housing of the telescopic arm will house the hydraulic cylinder and flexible tubes for hydraulic control of the crane. Constructional design of the telescopic arm must predict a possibility of the hydraulic tubes getting damaged as well as outer appearance of the whole crane. Spatial limitation in the housing of the telescopic arm is created due to sub-systems, which are the hydraulic cylinder as the drive of the system of telescopic arms, chain transfers on a system of pulleys for driving the middle and inner telescopic arm and a system for leading tubes of outer users. The number of outer users and needed flows affect the number of tubes and their diameter again represents a spatial problem of how to arrange all needed elements in a way that they are not obstructing movement of each other and/or rubbing each other. The curvature radius of flexible tubes during operation crucially affects the lifespan of tubes, as the contact between wheels for leading the tubes and their coatings causes tension in the coatings, which may lead to stratification of tubes and also leakage and breakdowns. In addition, the constructional design of arrangements of sub-systems of the telescopic arm has to take into account access to individual parts in case of crane maintenance and repair.

[0003] The aim of the present invention is a constructional arrangement of all dynamic and static elements of the telescopic arm that will enable installation of wheels for leading flexible hydraulic tubes, the wheels being as large as possible, which will prolong the lifespan of tubes.

State of the art

[0004] European patent 2135836 together with the European patent EP 1842823 B1 discloses a solution of a telescopic arm with the solution for placement of a hydraulic cylinder in the interior of the telescopic arm housing with an emphasis on installation block and sliding bearing or shoe.

[0005] For larger cranes some manufacturers use a larger cylinder and larger tubes or even more tubes, for example three pairs, which leads to an increase in the size of the wheel and measurements of the telescope, making such telescopic arms large and too heavy. In this

case some manufacturers use several smaller wheels arranged in a semi-circle, a solution that allows improved air between the piston rod and wheels for flexible tubes. However, this solution has a problem in breaking of tubes in several smaller diameters and increased contact pressure in the coating of tubes around wheels. Another solution is to use slightly smaller wheels, which can be installed besides the piston and then turning the flexible tubes from horizontal to a vertical arrangement.

[0006] The solution according to the invention differs from the known solutions in that the interior of the telescopic arm for a crane is provided with large wheels for flexible hydraulic tubes.

Description of the solution of the technical problem

[0007] The telescopic arm for a forestry crane with a system of internal leading of flexible hydraulic tubes of outer users is designed in such a way that in the longitudinal axis of the telescopic arm a hydraulic cylinder is provided that has a housing with larger wheels for receiving flexible hydraulic tubes. A chain is installed above the cylinder via a sprocket having a separate axis from the leading wheels.

[0008] The telescopic arm for a forestry crane with the system of internal leading of flexible hydraulic tubes of outer users according to the invention will be described in further detail based on figures, which show:

- Figure 1 telescopic arm according to the invention
- Figure 2 cross-section of the telescopic arm
- Figure 3 cross-section of completely stretched telescopic arm
- Figure 4 cross-section of the telescopic arm
- Figure 5 transverse cross-section of the telescopic arm

[0009] The basic working principle of the double telescopic arm is known and has been used in all similar products on the market. Thus the kinematics of the double telescope as a mechanism is known. Of significant importance is functioning of a system of inner leading of tubes, which have to follow operation of the telescopic arm and arrangement of dynamic and static elements inside the housing of the telescopic arm.

[0010] The system of tubes inside the telescopic arm of the forestry crane is not intended for functioning of the telescopic arm, but for driving the outer users, in this case two outer users, which requires four tubes, namely two four pressure and two for return conduits. To ensure functioning of the whole telescopic arm an inner hydraulic cylinder is used, which enables variation of the length of the telescopic arm. For additional functions of users it is possible to provide more than four flexible hydraulic tubes.

[0011] Housing 1a of an outer arm 1 of a forestry crane is provided with a middle telescopic arm 2, the interior of which is provided with an inner telescopic arm 3. A hy-

hydraulic cylinder 4 with a piston 42 is mounted in the longitudinal axis of the outer arm 1 (figure 2). Besides a vertical axis of a wheel 5 a pulley 6 is installed, via which a chain 6a runs between the housing 1a and the middle telescopic arm 2.

[0012] Attachments 43a and 43b, between which the hydraulic cylinder 4 is mounted, are affixed to the middle telescopic arm 2 with screws 9a and 9b. On each side of the cylinder 4 wheels 5a and 5b are installed. Flexible tubes 8a and 8b are disposed around the wheel 5a in the space between the outer arm 1 and the middle telescopic arm 2. Because the outer arm 1 is fixed, the middle telescopic arm 2 moves with the same speed as the inner telescopic arm 3 with regards to the middle arm 2 due to the system of fastening of chains 6a and 7a. The diameter of the wheel 5a and the diameter of the wheel 5b have the same size as the length of the shortest inner side of the inner telescopic arm or smaller.

[0013] Due to the maximum diameter of wheels 5a and 5b accommodation of the flexible hydraulic tubes 8a, 8b, 8c and 8d is optimal, as load and strain of the tube coatings are minimal. This system ensures that the length of flexible tubes 8a, 8b, 8c and 8d is maintained, as the tubes 8a, 8b as well as 8c, 8d are wound over the large wheels 5a and 5b at the length of movement of the piston rod 42 of the cylinder 4 (figure 5).

[0014] The outer arm 1 has a fastening element, where the beginning of the chain 7a is fastened, wherein the chain 7a runs from the pulley 7 towards the second fastening on the inner telescopic arm 3 (Figures 1 and 2). In case the piston rod 42 of the cylinder 4 is extended, the chain 7a pulls out the inner telescopic arm 3. The sprocket 7 is fastened to the middle telescopic arm 2, the first end of the chain 7a to the outer arm 1 and the other end of the chain 7a to the inner telescopic arm 3.

[0015] In case the piston rod 42 of the cylinder 4 is inside the cylinder 4, the chain 6a pulls the middle telescopic arm 2 into the interior of the outer telescopic arm 1. The sprocket 6 is fastened to the middle telescopic arm 2, the first end of the chain 6a to the outer arm 1 and the other end of the chain 6a to the inner telescopic arm 3.

[0016] The telescopic arm for a forestry crane with the system of interior leading of flexible hydraulic tubes of outer users has the middle telescopic arm 2 installed in the housing 1a of the outer arm 1, the middle arm 2 housing the inner telescopic arm 3, as well as the hydraulic cylinder 4, flexible hydraulic tubes 8a, 8b, 8c and 8d, the pulley 6 with the chain 6a. The pulley 7 with the chain 7a is located outside the arm 1. According to the invention the hydraulic cylinder 4 with the piston rod 42 is installed in the longitudinal axis of the outer arm 1, wherein the first wheel 5a is mounted on one side of the cylinder 4 and the second wheel 5b is mounted on the other side, the wheels intended for receiving flexible hydraulic tubes needed for controlling outer users. An advantage of such solution is in that the diameters of wheels 5a and 5b has almost the same size as the side of the inner telescopic arm 3 interior. The diameter of the wheels 5a and 5b can

be changed so that the diameter has the size equal to the smallest side of the inner telescopic arm 3 interior. This solution of the telescopic arm of the forestry crane according to the invention has a pulley 6 installed besides the vertical axis of wheels 5a and 5b, wherein the chain 6a runs via the pulley 6 between the middle telescopic arm 2 and the inner telescopic arm 3, to which it is also fastened. In case the crane has to be controlled with more than four commands, the wheels 5a and 5b are arranged to receive up to eight flexible hydraulic tubes. For moving the telescopic arm one or more hydraulic cylinders may be installed.

[0017] The solution of the telescopic arm for a forestry crane with the system of interior leading of flexible hydraulic tubes of outer users according to the invention enables longer lifespan of the flexible hydraulic tubes due to maximum diameters of wheels for winding the tubes and well as due to the appropriately dimensioned diameter of the cylinder. Installation of two large leading wheels 5a and 5b is enabled, because the curvature radius of the tubes is maximal with regards to the given space, which is the ideal solution. Tensions in the flexible hydraulic tubes and their coatings are minimal, which also contributes to their longer lifespan.

Claims

1. A telescopic arm for a forestry crane having a housing (1a) of an outer arm (1) provided with a middle telescopic arm (2) and inside the middle arm (2) an inner telescopic arm (3) as well as a hydraulic cylinder (4), flexible hydraulic tubes (8a, 8b, 8c in 8d), a pulley (6) with a chain (6a) and a second pulley (7) with a second chain (7a) outside of the arm (1), **characterised in that** the hydraulic cylinder (4) with a piston rod (42) is installed in the longitudinal axis of the outer arm (1); that on one side of the cylinder (4) a first wheel (5a) and on the other side of the cylinder (4) a second wheel (5b) is mounted for winding the flexible hydraulic tubes needed for control of outer users.
2. The telescopic arm for a forestry crane according to claim 1, **characterised in that** the diameters of wheels (5a and 5b) may have a size as the length of the smallest interior side of inner telescopic arm (3).
3. The telescopic arm for a forestry crane according to any of the preceding claims, **characterised in that** the diameter of both wheels (5a and 5b) is equal to the length of the shortest inner side of the inner telescopic arm (3) or smaller.
4. The telescopic arm for a forestry crane according to any of the preceding claims, **characterised in that** besides the vertical axis of wheels (5a in 5b) the pul-

ley (6) is mounted, via which the chain (6a) runs between the outer arm (1) and the middle telescopic arm (2), wherein the chain is attached to the inner telescopic arm (3).

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5. The telescopic arm for a forestry crane according to any of the preceding claims, **characterised in that** up to eight flexible hydraulic tubes may be installed to the wheels (5a and 5b).

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6. The telescopic arm for a forestry crane according to any of the preceding claims, **characterised in that** one or more cylinders are installed for moving the telescopes.

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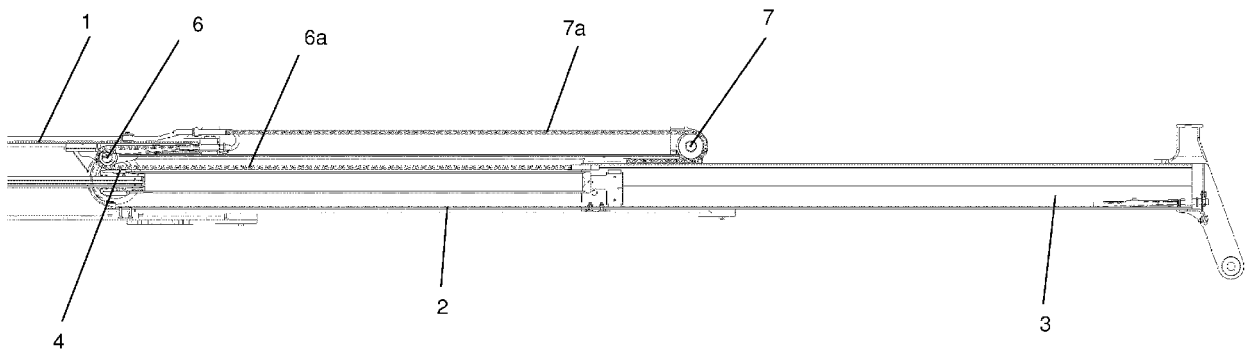


Fig. 1

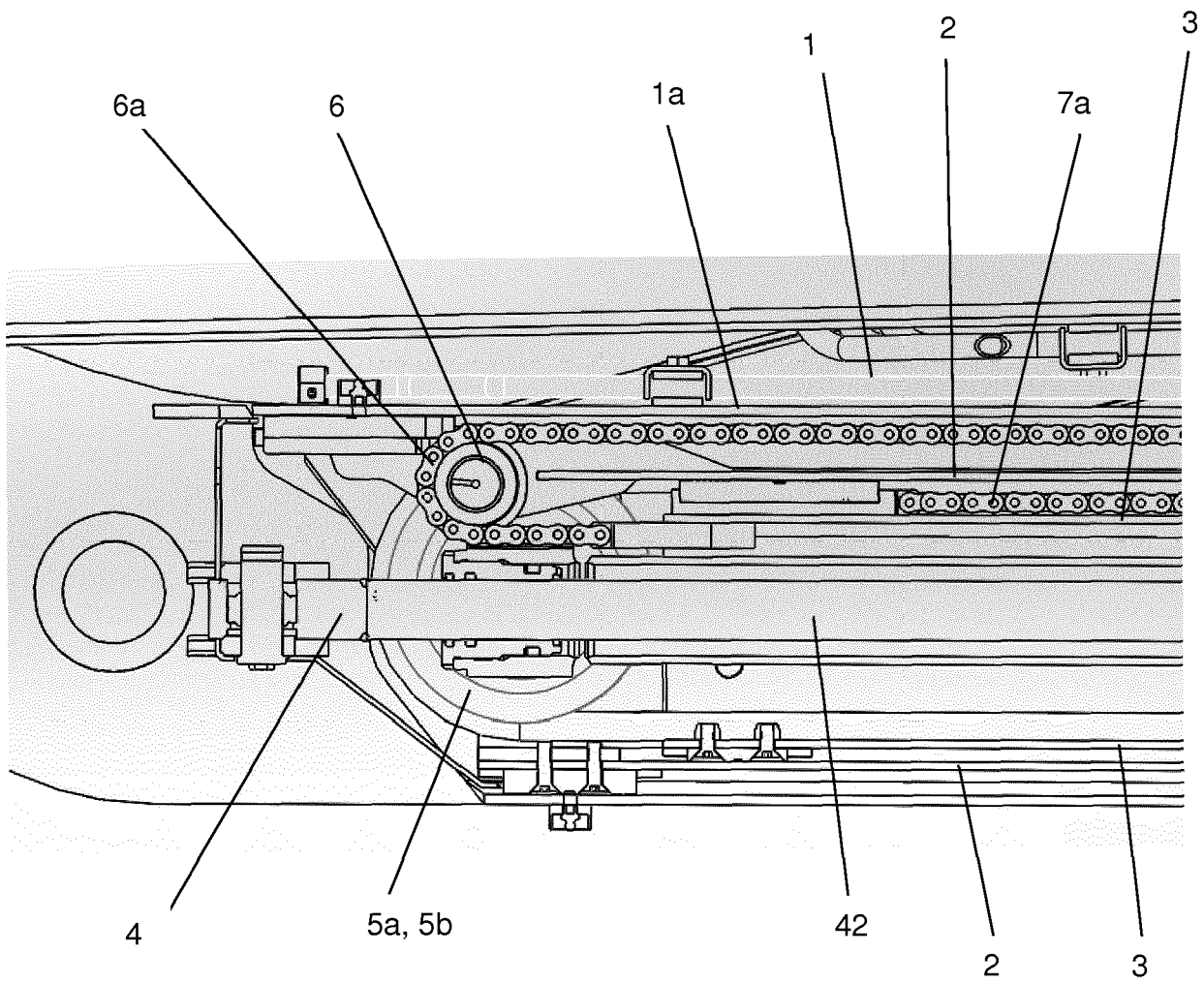


Fig. 2

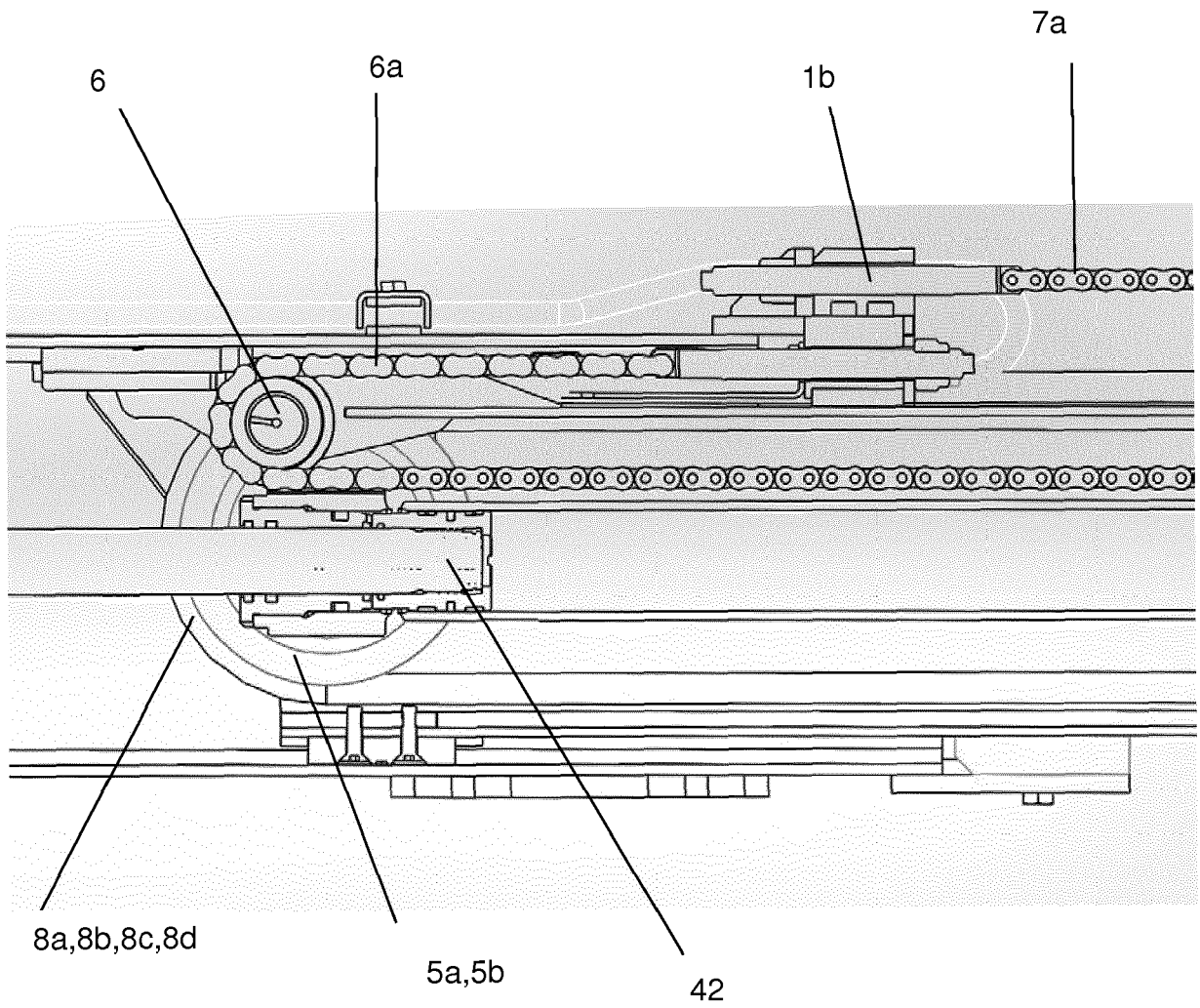


Fig. 3

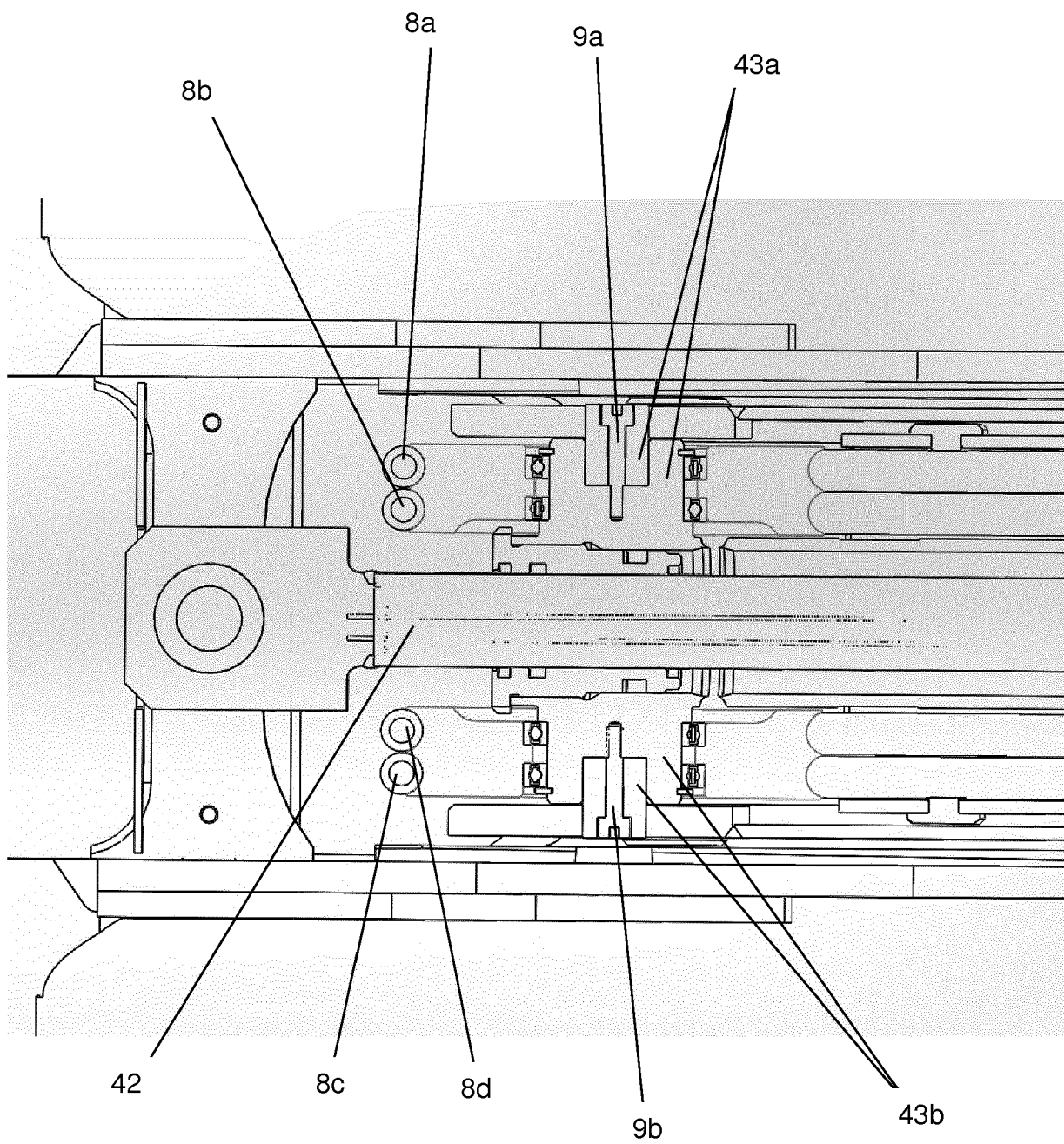


Fig. 4

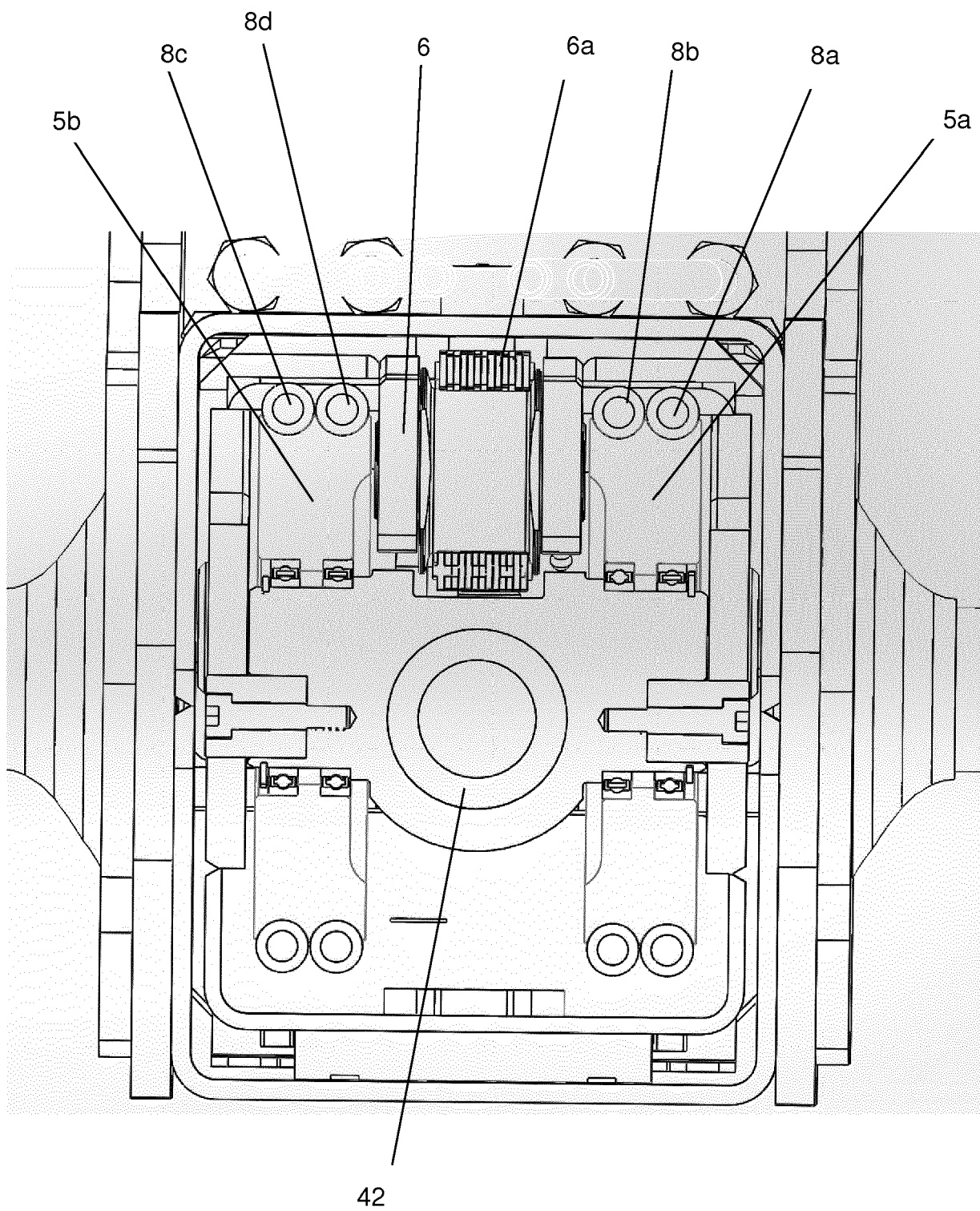


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 18 19 4262

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			TECHNICAL FIELDS SEARCHED (IPC)
			B66C B66F E02F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 January 2019	Examiner Colletti, Roberta
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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