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(54) **A telescopic arm for a lift truck**

Teleskopausleger für ein Flurförderzeug

Mât télescopique pour un chariot élévateur

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Description

[0001] Off-road lift trucks with telescopic arms are known in the prior art, recently going by the name of "telehandlers"; they are equipped with box sections, usually rectangular in shape.

[0002] In consideration of the types of stress these arms are subject to, rather different to those crane arms are designed to withstand, the sections have a degree of resistance to flexion which is not entirely satisfactory, as they exhibit problems of instability due to buckling as well as instability to lateral solicitations.

[0003] Document FR-A-2790538 discloses a telescopic arm with a rectangular beam structure comprising: a flat top; two upper curved angles directing downwards; two sides; two lower curved angles extending from the sides; and a bottom. The sides extend downwards from the upper angles, and have a fold with the edge directing outwards and placed under the medium axis. The bottom lower angles also have a fold with an edge directing outwards and placed on a vertical axis. The telescopic arm having at least one external arm and at least one extending arm which is slidably inserted along a longitudinal axis thereof internally of the external arm and is complementarily shaped in relation to the external arm. Sliding elements are interposed between the external arm and the extending arm and comprise a support, solidly constrained to the external arm and a skate, solidly constrained to the support. The sliding elements are fixed and not adjustable in a simple way in order to enable manufacturing errors in the various components to be corrected and to allow take up to compensate for wear and other deformations.

[0004] The main aim of the present invention is to obviate the last above-mentioned drawbacks in the prior art.

[0005] A further aim of the invention is to realise a system of skates for relative sliding of the arms, which is easy to mount, dismount and adjust.

[0006] An advantage of the invention is that it is simple.

[0007] A further advantage of the invention is that it improves resistance to buckling of the lower side, which is subject to compression, of the box section of the arms, in comparison to a traditional rectangular section of a same area.

[0008] A further advantage of the present invention is due to the special shape of the section of the arms by virtue of which the extending arm couples, under the effect of the load, with the external arm, creating a sort of wedge effect that increases guidability and the precision of the coupling between the two arms. In this way, in the case of lateral solicitations, the telescopic arm is very stable thanks to a self-centring action of the coupled arms. There is also an automatic take-up of play in the coupling between the external arm and the extending arm.

[0009] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of some embodiments of the de-

vice, illustrated purely by way of a non-limiting examples in the accompanying figures, in which:

figure 1 illustrates a straight transversal section made according to a plane which is perpendicular to the longitudinal axis of the telescopic arm;

figure 2 is the same section as in figure 1, relating to a further embodiment of the invention.

[0010] With reference to the figures of the drawings, the telescopic arm (for a lift truck) of the invention comprises at least an external arm 2 and at least an extending arm 3 which is slidably inserted along a longitudinal axis x (perpendicular to the plane of the drawing) internally of the external arm 2 and is complementarily shaped with respect to the external arm 2. The external arm 2 and the extending arm 3 have box sections in which a lower part 4 exhibits at least two tracts 5, symmetrically arranged with respect to a vertical plane of symmetry π (containing the longitudinal axis x) which at least two tracts 5 delimit a concavity facing internally of the section and are inclined by a determined angle of inclination α with respect to the plane of symmetry π . Preferably the angle of inclination α is comprised between 60° and 89° .

[0011] In a first embodiment the two tracts 5 are joined at the vertical plane of symmetry π . The lower part of the box section of the external arm 2 and the extending arm 3 exhibits a V-shape with the vertex thereof facing externally of the section.

[0012] In a second embodiment, the two tracts 5 are conjoined by a straight tract 5a which is perpendicular to the plane of symmetry π .

[0013] Sliding elements 6 are located between the external arm 2 and the extending arm 3, which sliding elements 6 are arranged longitudinally at corners of the extending arm 3 and are complementarily shaped to the corners. Preferably the sliding elements 6 do not extend over the whole length of the corners, but are subdivided into a plurality of tracts of shorter length aligned along the corner. Each of the sliding elements 6 comprises a support 7, solidly constrained to the external arm 2, and a skate 8, solidly constrained to the support 7, arranged in contact with the external surface of the extending arm 3. Each of the skates 8 comprises at least two portions 8a, 8b which are not joined and which are arranged respectively in contact with two adjacent faces of the extending arm 3. The two portions 8a, 8b are connected to the respective support 7 by removable or unremovable means for connection, preferably screws or pins. The two portions 8a and 8b of each skate 8 are non-joined at a plane which is parallel to the longitudinal axis x and which passes in proximity of the corner at which the skate 8 is located. This means that the skate can adapt to the shape of the extending arm 3 without fracturing or cracking at the internal vertex, as happens with skates currently in use in the prior art.

[0014] Each support 7 is solidly constrained to the external arm 2 by adjustable means for connecting which

enable an adjustment of the position of the relative sliding element 6 along at least two directions which are perpendicular to the faces of the external arm 2; the adjustable means for connecting join up to each other at the corner the sliding element 6 is situated on.

[0015] The adjustable means for connecting comprise a plurality of screws 9 which pass through the breadth of the external arm 2, through respective slots, and are arranged with longitudinal axes thereof perpendicular to respective faces of the external arm 2. The screws 9 are solidly constrained at one end thereof to a respective support 7, while at the other end thereof they are provided with a nut 9a which is predisposed to be tightened externally in contact with the external arm 2. The adjustable means for connecting, as described above, enable each skate 8 to be arranged in contact with the extending arm 3, in order to compensate any errors in shape and size of the extending arm 3. Each screw can translate parallel to itself along the slot in which it is arranged, following displacements imposed by the other screws, so that each skate 8 can be fixed in a determined position in contact with the extending arm 3.

[0016] Making each skate 8 in two portions leads to considerable production advantages (reduction in waste and working times) and means that the two portions can be assembled separately on a corresponding rigid support at a distance of a few millimetres from one another, enabling manufacturing errors in the various components to be corrected (it is possible that considerable tolerances were allowed during manufacture of the parts), and allowing take-up to compensate for wear and any other deformations.

[0017] There is a further advantage which consists in the fact that each portion of skate (or half-skate) is completely independent as regards adjustment and for take-up of play, and can also be replaced independently of the contiguous portion, with evident savings.

[0018] Overall the shape of the section of the arms and the independent adjustment of the skates make the coupling between the external arm and the extending arm extremely precise and stable, and improve the rigidity and characteristics of guidability thereof.

Claims

1. A telescopic arm for a lift truck, of a type having at least one external arm (2) and at least one extending arm (3) which extending arm (3) is slidably inserted along a longitudinal axis (x) thereof internally of the external arm (2) and is complementarily shaped in relation to the external arm (2), the external arm (2) and the extending arm (3) having box sections, in which a lower part (4) exhibits at least two tracts (5), symmetrically arranged with respect to a vertical plane of symmetry (π), which at least two tracts (5) delimit a concavity facing inwardly of the section and which at least two tracts (5) are inclined by a deter-

mined angle of inclination (α) with respect to the plane of symmetry (π) sliding elements (6) *being* interposed between the external arm (2) and the extending arm (3), which sliding elements (6) are arranged longitudinally at corners of the extending arm (3) and are shaped complementarily thereto, each of the sliding elements comprising a support (7), solidly constrained to the external arm (2), and a skate (8), solidly constrained to the support (7), whereby the skate (8) is arranged in contact with an external surface of the extending arm (3); each support (7) *being* solidly constrained to the external arm (2) by adjustable means for connecting which enable adjustment of a position of a relative sliding element (6) in at least two perpendicular directions to the faces of the external arm (2) which conjoin at a corner in which the sliding element (6) is arranged, **characterised in that** the adjustable means for connecting comprise a plurality of screws (9) which pass through the external arm (2) and which are arranged having longitudinal axes thereof which are perpendicular to respective faces of the external arm (2), the plurality of screws being solidly constrained at an end thereof to a respective support (7) and at another end thereof bearing a nut (9a) which can be tightened externally and contactingly to the external arm (2).

2. The telescopic arm of claim 1, **characterised in that** the angle of inclination (α) is comprised between 60° and 89°.
3. The telescopic arm of claim 1, **characterised in that** the at least two tracts (5) conjoin one to another at the plane of symmetry (π).
4. The telescopic arm of claim 1, **characterised in that** the at least two tracts (5) are joined together by means of a straight tract (5a) which is perpendicular to the plane of symmetry (π).
5. The telescopic arm of claim 1, **characterised in that** each of the skates (8) comprises at least two portions (8a, 8b) which are not joined together and which are arranged respectively in contact with two adjacent faces of the extending arm (3), the two portions (8a, 8b) being connected to respective supports (7) by means of removable or unremovable means for connecting.

Patentansprüche

1. Teleskopausleger für einen Gabelstapler von einem Typ mit wenigstens einem äusseren Arm (2) und wenigstens einem Verlängerungsarm (3), welcher Verlängerungsarm (3) gleitbar entlang seiner Längsachse (x) in das Innere des äusseren Armes (2) einge-

setzt und im Verhältnis zu dem äusseren Arm (2) ergänzend geformt ist, wobei der äussere Arm (2) und der Verlängerungsarm (3) Kastenquerschnitte haben, in welchen ein unterer Teil (4) wenigstens zwei Abschnitte (5) aufweist, symmetrisch angeordnet im Verhältnis zu einer vertikalen Symmetrieebene (π), welche wenigstens zwei Abschnitte (5) eine dem Innenraum des Querschnittes zugewandte Vertiefung abgrenzen, und welche wenigstens zwei Abschnitte (5) im Verhältnis zu der Symmetrieebene (π) um einen vorgegebenen Neigungswinkel (α) schräggestellt sind, wobei Gleitelemente (6) zwischen dem äusseren Arm (2) und dem Verlängerungsarm (3) eingesetzt sind, welche Gleitelement (6) längsverlaufend an den Kanten des Verlängerungsarmes (3) angeordnet und zu diesen ergänzend geformt sind, wobei jedes der Gleitelemente eine fest an dem äusseren Arm (2) gehaltene Halterung (7) enthält, sowie einen Gleitschuh (8), fest gehalten an der Halterung (7), wobei der Gleitschuh (8) im Kontakt mit einer äusseren Oberfläche des Verlängerungsarmes (3) angeordnet ist; wobei jede Halterung (7) fest an dem äusseren Arm (2) gehalten ist, und zwar durch regulierbare Mittel, welche das Einstellen einer Position eines entsprechenden Gleitelementes (6) in wenigstens zwei lotrechten Richtungen zu den Flächen des äusseren Armes (2) erlauben, welche an einer Kante zusammenlaufen, an der das Gleitelement (6) angeordnet ist, **dadurch gekennzeichnet, dass** die Reguliermittel zum Verbinden eine Anzahl von Schrauben (9) enthalten, welche durch den äusseren Arm (2) gehen und mit ihren Längsachsen lotrecht zu den jeweiligen Flächen des äusseren Armes (2) angeordnet sind, wobei die Schrauben (9) mit einem ihrem Ende fest an einer jeweiligen Halterung (7) angebracht sind und ein anderes Ende derselben eine Mutter (9a) aufweist, welche von aussen im Kontakt mit dem äusseren Arm (2) festgezogen werden kann.

2. Teleskopausleger nach Patentanspruch 1, **dadurch gekennzeichnet, dass** der Neigungswinkel (α) zwischen 60° und 89° beträgt.
3. Teleskopausleger nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die wenigstens zwei Abschnitte (5) sich miteinander in der Symmetrieebene (π) verbinden.
4. Teleskopausleger nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die wenigstens zwei Abschnitte (5) mit Hilfe eines geradlinigen Abschnittes (5a) miteinander verbunden sind, welcher lotrecht zu der Symmetrieebene (π) verläuft.
5. Teleskopausleger nach Patentanspruch 1, **dadurch gekennzeichnet, dass** jeder der Gleitschuhe (8) wenigstens zwei Abschnitte (8a, 8b) enthält, welche

nicht miteinander verbunden sind, und welche jeweils im Kontakt mit zwei aneinander grenzenden Flächen des Verlängerungsarmes (3) angeordnet sind, wobei die beiden Abschnitte (8a, 8b) an jeweilige Halterungen (7) angeschlossen sind, und zwar mit Hilfe von lösbaren oder nicht lösbaren Verbindungsmitteln.

10 Revendications

1. Mât télescopique pour un chariot élévateur, du type comprenant au moins un bras externe (2) et au moins un bras extensible (3), lequel bras extensible (3) est inséré de manière coulissante le long de son axe longitudinal (x) intérieurement au bras externe (2) et est conformé complémentirement par rapport au bras externe (2), le bras externe (2) et le bras extensible (3) ayant des sections en forme de boîte, dans lequel une partie inférieure (4) présente au moins deux zones (5), symétriquement disposées par rapport à un plan vertical de symétrie (π), lesquels au moins deux zones (5) délimitent une concavité orientée vers l'intérieur de la section et lesquels au moins deux zones (5) sont inclinées selon un angle d'inclinaison (α) déterminé par rapport au plan de symétrie (π), des éléments coulissants (6) étant interposés entre le bras externe (2) et le bras extensible (3), lesquels éléments coulissants (6) étant disposés longitudinalement en correspondance des angles du bras extensible (3) et étant conformés complémentirement à ces derniers, chacun des éléments coulissants comprenant un support (7), solidaire du bras externe (2), et un patin (8), solidaire du support (7), le patin étant ainsi disposé en contact avec une surface externe du bras extensible (3); chaque support (7) étant solidaire du bras externe (2) par l'intermédiaire de moyens réglables de connexion qui permettent le réglage d'une position d'un relatif élément coulissant (6) dans au moins deux directions perpendiculaires aux faces du bras externe (2) se rejoignant en correspondance d'un coin dans lequel l'élément coulissant (6) est disposé, **caractérisé en ce que** les moyens réglables de connexion comprennent une pluralité de vis (9) passant au travers du bras externe (2) et étant disposées avec leurs axes longitudinaux perpendiculaires aux faces respectives du bras externe (2), la pluralité de vis étant solidaires, en correspondance d'une de leurs extrémités, d'un respectif support (7) et, en correspondance de leur autre extrémité, supportant un écrou (9a) pouvant être serré extérieurement et en contact avec le bras externe (2).
2. Mât télescopique selon la revendication 1, **caractérisé en ce que** l'angle d'inclinaison (α) est compris entre 60° et 89° .

3. Mât télescopique selon la revendication 1, **caractérisé en ce que** les au moins deux zones (5) se rejoignent entre elles en correspondance du plan de symétrie (π).

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4. Mât télescopique selon la revendication 1, **caractérisé en ce que** les au moins deux zones (5) sont jointes entre elles au moyen d'une portion rectiligne (5a) perpendiculaire au plan de symétrie (π).

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5. Mât télescopique selon la revendication 1, **caractérisé en ce que** chacun des patins (8) comprend au moins deux portions (8a, 8b) qui ne sont pas jointes entre elles et qui sont disposées respectivement en contact avec deux faces adjacentes du bras extensible (3), les deux portions (8a, 8b) étant connectées à de respectifs supports (7) au moyen de moyens de connexion amovibles ou non amovibles.

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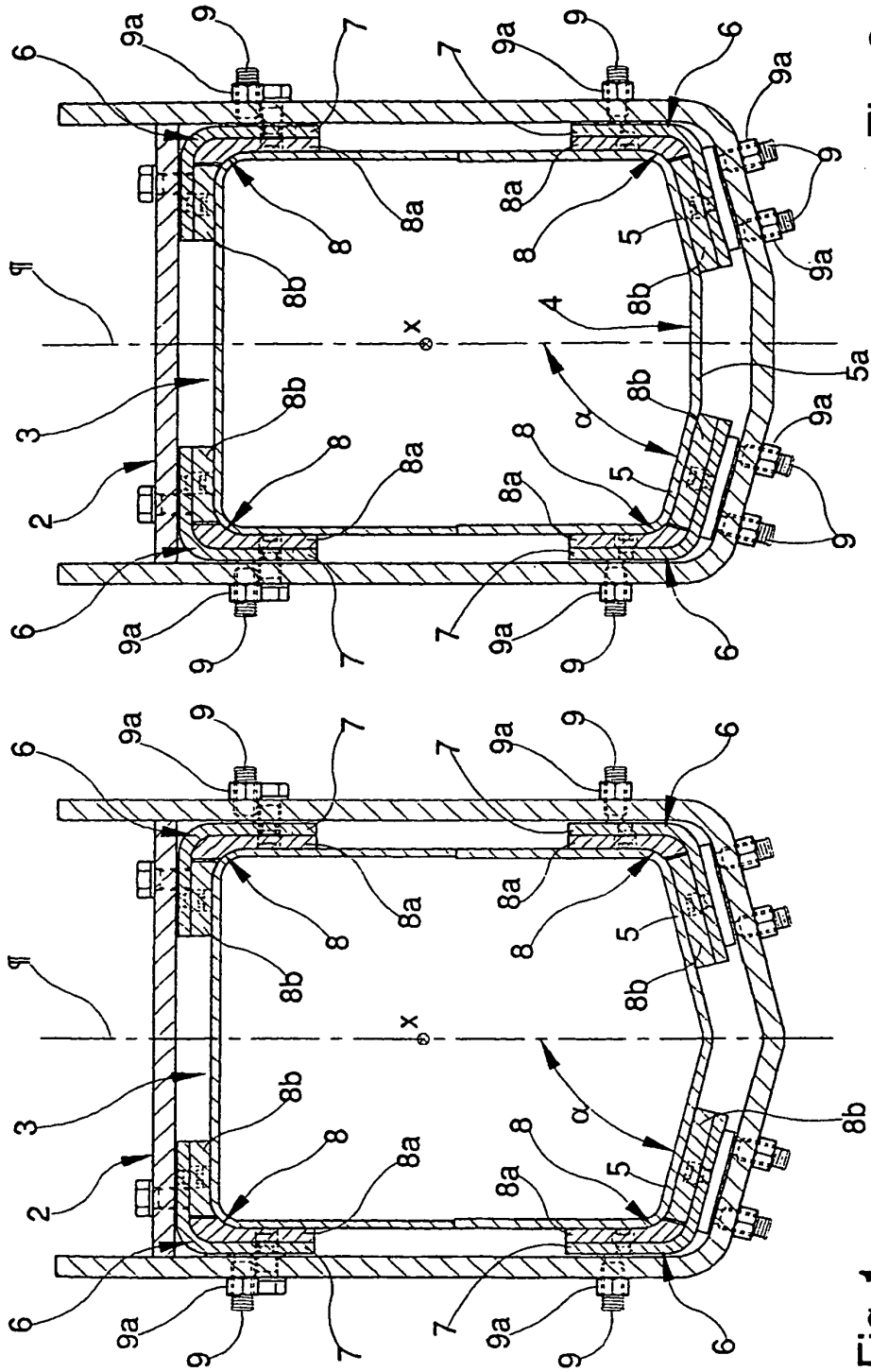


Fig. 1

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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