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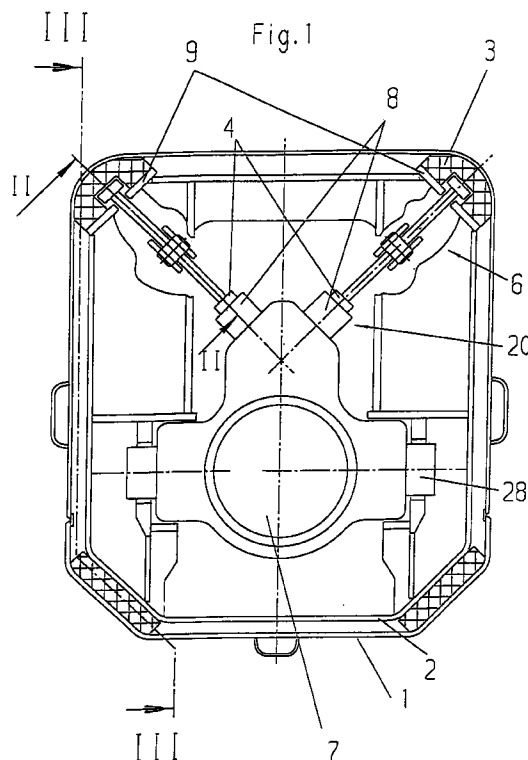
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(54) Vorrichtung und Verfahren zum Arretieren von teleskopischen Auslegerteilen

(57) The device and method for arresting movement of sections in a telescopic jib, which includes at least a first section (1) and a second section (2) and a telescopic cylinder (7) telescoping the second section (2) along a longitudinal axis of the telescopic jib relative to the first section (1), telescopes the second section (2) using the telescopic cylinder (7) to a desired working position. Then, movement of the second section (2) is arrested using at least one sliding element (3) connected and moveable with respect to the second section (2). The sliding element (3) is disposed between the first (1) and second sections (2), and arrests movement of the second section (2) with respect to the first section (1) when in an arresting position.



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a device for arresting/de-arresting a telescopically extensible section of a telescopic jib (i.e., boom) and a method for arresting/de-arresting these sections.

2. Description of Related Art

It is known to pin the individual sections of a telescopic jib. Pinning serves to relieve the load on a telescoping system once a section of the telescopic jib has been telescoped to a working position. For this pinning, individual pinning points must be provided.

Pinning points, however, are complicated to design, and are only provided in a limited number (e.g., two pinning points being placed for each extendable jib section) so that each telescopically extensible section has an equally limited number of working positions. It is only in these working positions that it is possible to make full use of the telescopic jib, (i.e., loading the telescopic jib to maximum permissible capacity). Between these two pinning points the individual sections cannot be pinned, and can only handle minor forces. As a result, only low loads may be lifted by the telescopic jib when a section is in an intermediate position. In addition, suitable length/position sensing instruments are required to bring the section to be pinned precisely into the position for pinning.

One such pinning system for a telescopic jib is described in European Patent 0 661 234 A1.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a method and apparatus for arresting a section of a telescopic jib which overcomes the problems and disadvantages discussed above.

Another object of the present invention is to provide a device and a method for arresting a section of a telescopic jib in any position.

A further object of the present invention is to provide a device and a method for arresting a section of a telescopic jib in any position by actuating elements used to arrest the section.

A still further object of the present invention is to provide a device and a method for arresting a section of a telescopic jib in any position which does not require actuating elements to arrest the section.

Also an object of the present invention is to provide a device and a method for arresting a section of a telescopic jib which does not require position sensing instruments.

These and other objects are achieved by providing

a crane comprising: a telescopic jib having at least a first section and a second section; a telescopic cylinder telescoping said second section along a longitudinal axis of said telescopic jib relative to said first section; and at least one sliding element connected and moveable with respect to said second section, and disposed between said first and second sections, said sliding element arresting movement of said second section with respect to said first section when in an arresting position.

These and other objects are further achieved by providing a method of arresting movement of at least one section in a telescopic jib which includes at least a first section and a second section, and a telescopic cylinder telescoping said second section along a longitudinal axis of said telescopic jib relative to said first section, the method comprising: telescoping said second section using said telescopic cylinder to a desired working position; and arresting movement of said second section using at least one sliding element connected and moveable with respect to said second section, said sliding element being disposed between said first and second sections, and arresting movement of said second section with respect to said first section when in an arresting position.

Other objects, features, and characteristics of the present invention; methods, operation, and functions of the related elements of the structure; combination of parts; and economies of manufacture will become apparent from the following detailed description of the preferred embodiments and accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is a transverse section through a telescopic jib according to the present invention;

Fig. 2 is a cross-sectional view along the line II-II in Fig. 1; and

Fig. 3 is a cross-sectional view along the line III-III in Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 illustrates a cross-section of the telescopic jib according to the present invention. As shown, the telescopic jib includes an outer section 1 and an inner section 2 each having a substantially rectangular shape. The upper corners of the outer section 1 are rounded,

while flat sides are at the lower corners of the outer section 1. Similarly, flat sides are at the lower corners of the inner section 2. By contrast, inclined guide surfaces 9 are at the upper corners of the inner section 2.

Auxiliary sliding elements 3' are disposed between the flat sides at the lower corners of the inner and outer sections 2 and 1, and are connected to the inner section 2. Similarly, sliding elements 3 are disposed between the rounded upper corners of the outer section 1 and the inclined guide surfaces 9 at the upper corners of the inner section 2. The auxiliary sliding elements 3' and the sliding elements 3 are made of a plastic material such as polyamide.

A kinematic system 6 connects the sliding elements 3 to the inner section 2 such that the sliding elements 3 move with respect to the inner section 2.

As further shown in Fig. 1, the telescopic jib includes a telescoping cylinder 7 having extendable and retractable pins 28 for engaging holes in the inner section 2. Accordingly, when pinned to the inner section 2, the telescoping cylinder 7 can extend and retract the inner section 2 with respect to the outer section 1. Instead of a telescopic cylinder 7, other known mechanisms could be used to extend and retract the inner section 2 relative to the outer section 1.

Fig. 2 illustrates a cross-section of the telescopic jib according to the present invention along line II-II in Fig. 1, and Fig. 3 illustrates a cross-section of the telescopic jib along line III-III in Fig. 1. Figs. 2 and 3 illustrate one of the kinematic systems 6, the sliding elements 3, and the auxiliary sliding elements 3' in greater detail. As shown in Fig. 2, the kinematic system 6 includes an angle member 22 pivotally connected to the inner section 2 at its elbow by a bracket 30. A first end 24 of the angle member 22 is pivotally connected to the sliding element 3. A T-shaped second end 26 of the angle member 22 is connected to the guide surface 9 by a spring storage mechanism 5. The spring storage mechanism 5 exerts a force on the second end 26 away from the guide surface 9.

As shown in Figs. 1 and 2, the telescopic cylinder 7 also includes piston/cylinder units 20 which respectively contact the second end 26 of the angle members 22 in each kinematic system 6 when the telescoping cylinder 7 is pinned to the inner section 2. The piston/cylinder units 20 include a cylinder 8 and a piston 4, and are preferably hydraulic or pneumatic. When the piston 4 extends, the piston 4 exerts a force on the second end 26 of the angle member 22 which opposes the force applied by the spring storage mechanism 5.

As shown in Figs. 2 and 3, the guide surfaces 9 are inclined with respect to the longitudinal axis of the telescopic jib. The guide surfaces 9 are inclined at an angle of 2 to 30° with respect to the longitudinal axis of the telescopic jib; and, preferably, inclined at an angle of 5 to 15° with respect to longitudinal axis of the telescopic jib. Also, the thickness of the sliding elements 3 increases from a distal end of the telescopic jib to a proximal end

of the telescopic jib, and matches the inclination of the guide surfaces 9.

Fig. 3 illustrates the sliding elements 3, the auxiliary sliding elements 3', and the kinematic systems 6 positioned at the base of the inner section 2. It should be understood that the sliding elements 3, the auxiliary sliding elements 3', and the kinematic systems 6 are not limited to being positioned at the base of the inner section 2, but could be positioned, for instance, at the head of the inner section 2.

The operation of the present invention will now be described with respect to Figs. 1-3. After the pins 28 of the telescoping cylinder 7 engage the inner section 2, the pistons 4 of the piston/cylinder units 20 on the telescoping cylinder 7 extend. As a result, the force applied by the pistons 4 on the angle members 22 counteracts and overcomes the force exerted by the spring storage mechanisms 5 such that the angle members 22 pivot and move the sliding elements 3 in a longitudinal direction towards the proximal end of the telescopic jib and/or a radial direction towards the guide surfaces 9. In other words, the sliding elements 3 do not need to be moved in the longitudinal direction to arrest movement of the inner section 2. In this unlocked state, shown in Fig. 2, the telescoping cylinder 7 extends or retracts the inner section 2 with respect to the outer section 1 until a desired working position is achieved.

Once at a desired working position, the pistons 4 are retracted. As a result, the spring storage mechanisms 5 exert a force on the second end 26 of the angle members 22 such that the sliding elements 3 move in a longitudinal direction towards the distal end of the telescopic jib and/or a radial direction away from the guide surfaces 9. The sliding elements 3 act as brake blocks due to the resulting contact force between the sliding elements 3 and the inner surface of the outer section 1 and the guide surfaces 9, and arrest movement of the inner section 2 with respect to the outer section 1. The arrangement of the sliding elements 3 and the auxiliary sliding elements 3' places tension, circumferentially, on the outer section 1 when arresting the inner section 2. The telescoping cylinder 7 can then be unpinned from the inner section 2, and the same operation performed with respect to other sections (not shown) of the telescopic jib which have kinematic systems and sliding elements associated therewith.

When a load is placed on the telescopic jib, the load exerts a force on the inner section 2 such that the contact force between the sliding elements 3 and the inner surface of the outer section 1 and the guide surfaces 9 increases. As the load on the telescopic jib increases, the contact pressure increases so that stable and secure locking of the inner section 2 relative to the outer section 1 is achieved, and unwanted retraction of the inner section 2 is prevented. Consequently, arresting the inner section 2 does not require the use of spring storage mechanisms 5 exerting a force away from the guide surfaces 9 to move the sliding elements 3 into an

arresting position. Instead, automatic arresting of the inner section 2 can be achieved when a load is placed on the telescopic jib.

To de-arrest the second section 2, it is preferable to first unload the telescopic jib. Then, the telescoping cylinder 7 is pinned to the inner section 2, and the pistons 4 are extended to counteract and overcome the force applied to the angle member 22 by the spring storage mechanisms 5. The force applied by the pistons 4, causes the angle member 22 to pivot and move the sliding elements 3 away from the arresting position such that the telescoping cylinder 7 can extend or retract the inner section 2 relative to the outer section 1.

While the present invention has been described as using two sliding elements 3 and two auxiliary sliding elements 3', the number of sliding elements and auxiliary sliding elements is not limited to two, but could be greater than or less than two with an associated increase or decrease in the number of the kinematic systems 6.

Furthermore, the spring storage mechanisms 5 have been described as exerting a force on the second end 26 of the angle members 22 away from the guide surfaces 9. In an alternate embodiment, the spring storage mechanisms 5 bias the second end 26 of the angle members 22 towards the guide surfaces 9 such that the sliding elements 3 are biased towards an unlocked position. This eliminates the need for the piston/cylinder units 20, and the inner section 2 is arrested by loading the telescopic jib as discussed above.

As mentioned above, besides being applicable to a two-section telescopic jib, the present invention is applicable to a multi-section telescopic jib wherein kinematic systems and sliding elements are provided for each telescoping section.

Furthermore, it will be appreciated that the present invention while described as being applicable to telescopic jibs such as used in cranes, is also applicable to other telescoping extensible elements such as telescoping antennas.

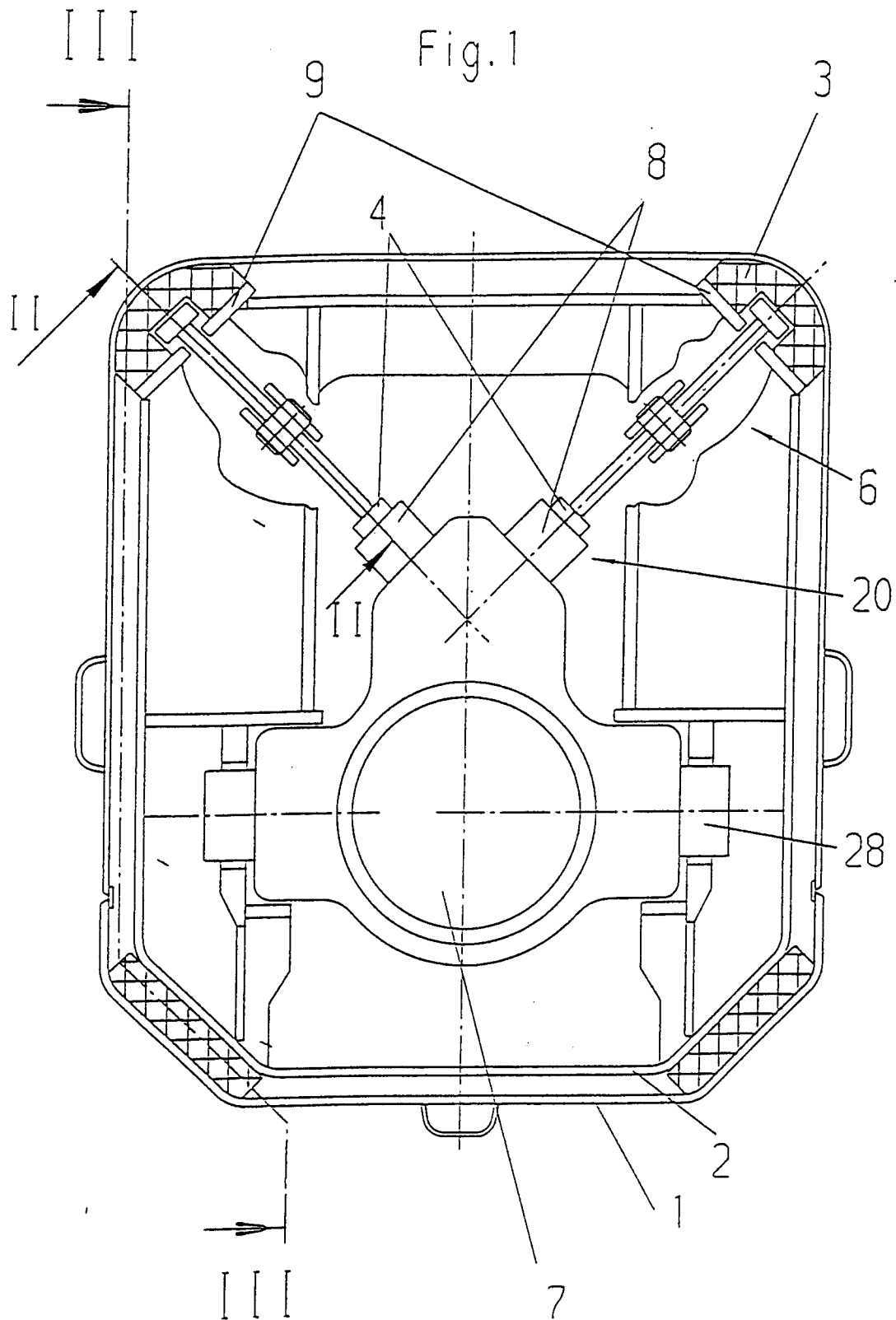
The device and method for arresting movement of a telescopic jib according to the present invention makes it possible to lock or arrest a section of the telescopic jib in any position without being bound to specific working positions dictated by pinning point designs. Accordingly, pinning points are no longer needed for arresting sections of a telescopic jib, which eliminates the need for position sensing instruments, and the telescopic jib can be used to its maximum capacity in any desired working position.

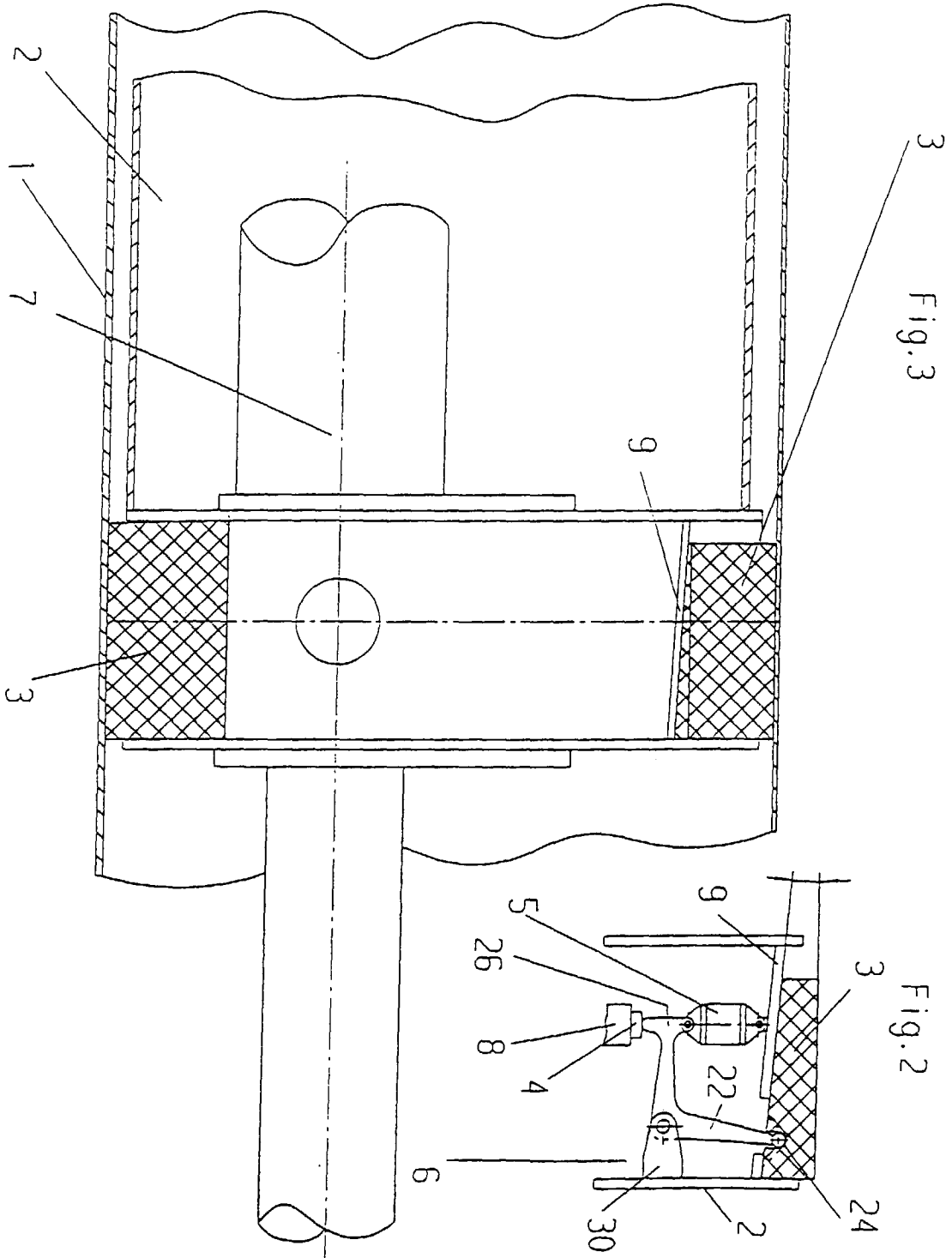
The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. A mobile crane comprising a telescopic jib, the individual sections (2) of which are extensible and retractable and may be arrested in various positions, at least one sliding element (3, 3') being provided on the telescopically extensible sections (2) for guiding said telescopically extensible sections (2);
characterized in that
at least one sliding element (3) is arranged on at least one telescopically extensible section (2) so that it can be moved relative to said telescopically extensible section (2) for arresting by non-positive action said telescopically extensible section (2) in a fixed position relative to a section (1) surrounding said section (2).
2. The crane as set forth in claim 1, characterized in that two, three or four sliding elements (3) are provided on said section (2) for arresting.
3. The crane as set forth in claim 1 or 2, characterized in that additional sliding elements (3') are provided on said section (2).
4. The crane as set forth in any of the preceding claims, characterized in that said sliding element (3) is shiftable longitudinally and/or axially relative to said telescopic jib.
5. The crane as set forth in any of the preceding claims, characterized in that said sliding element (3) comprises a thickness increasing downwards longitudinally of said telescopic jib.
6. The crane as set forth in any of the preceding claims, characterized in that a guide (9) inclined at a predetermined angle (10) in the telescoping direction is provided on said section (2) for said sliding element (3).
7. The crane as set forth in any of the preceding claims, characterized in that said sliding element (3) comprises an inclined surface area.
8. The crane as set forth in any of the preceding claims, characterized in that the surface area of said guide (9) is configured so that the angle of inclination of said surface area (9) with respect to the longitudinal direction of the telescopic jib corresponds to the angle of inclination of the side of the sliding element (3) facing said surface area.
9. The crane as set forth in claim 8, characterized in that said angle of inclination is approximately 2 to 30°, more particularly approximately 5° to 15°.

10. The crane as set forth in any of the preceding claims, characterized in that a stored energy operating mechanism, more particularly a spring element (5), for imparting a spring force to the sliding element (3) is arranged, more particularly hinged, on said section (2). 5
11. The crane as set forth in any of the preceding claims, characterized in that a kinematic system (6), more particularly a hinged angle element, for translating the force caused by said spring element (5) to said sliding element (3) is arranged, more particularly hinged, on said section (2). 10
12. The crane as set forth in any of the preceding claims, characterized in that said sliding elements (3, 3') are arranged in the head and/or base region of said section (2). 15
13. The crane as set forth in any of the preceding claims, characterized in that said sliding elements (3, 3') are arranged in the base region of said section (2) so that said surrounding section (1) is tensioned circumferentially. 20
14. The crane as set forth in any of the preceding claims, characterized in that an actuating means (4) is arranged on a telescoping cylinder (7) for unlocking said sliding element (3). 25
15. The crane as set forth in claim 14, characterized in that said actuating means (4) acts on said kinematic system (6) so that said sliding element (3) can be moved against the spring force of said spring element (5). 30
16. The crane as set forth in any of the preceding claims, characterized in that said telescopic jib comprises three or more telescopically extensible sections (2). 35
17. A method of arresting sections (2) of a telescopic jib of a crane in a working position, wherein 40
- a) a section (2) is brought into the working position, and 45
- b) said section (2) is arrested by means of at least one sliding element (3, 3') by positive and/or non positive action in said working position. 50
18. The method as set forth in claim 17, characterized in that said telescopic jib is not loaded during arresting of said section (2). 55
19. The method as set forth in claim 17 or 18, characterized in that said sliding element (3) locks itself in said arrested condition.
20. The method as set forth in claim 19, characterized in that said sliding element (3) is additionally urged into contact by the effect of a force caused by a load.
21. The method as set forth in claim 19 or 20, characterized in that said sliding element (3) locks itself by a spring force.
22. The method as set forth in any of the claims 17 to 21, characterized in that said telescoping device (7) does not continue to hold said section (2) in a predetermined position after said section (2) has been arrested.
23. A method for de-arresting the sections (2) of a telescopic jib of a crane, characterized in that arresting of the section (2) is released by shifting a sliding element (3).
24. The method as set forth in claim 23, characterized in that arresting is released by an actuating means (4) applying a force to said sliding element (3).
25. The method as set forth in any of the claims 23 or 24, characterized in that said telescopic jib is firstly unloaded, more particularly with the aid of a telescoping device (7), before said section (2) is de-arrested.
26. The method as set forth in any of the claims 23 to 25, characterized in that de-arresting said section (2) is undertaken against a spring force caused by a spring element (5) arranged on said section (2).







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EUROPEAN SEARCH REPORT

Application Number
EP 97 12 2425

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 3 398 492 A (NANSEL) * the whole document *	1, 17, 23	B66C23/70
A	FR 2 236 771 A (ROCK)		
A	GB 2 201 942 A (SCHWERMASCHINENBAUKOMBINAT TAKRAF)		
A	DE 27 57 040 A (SCHEUERPFUG)		
A	DE 26 26 511 A (FRIED. KRUPP)		
A	FR 2 235 077 A (RASTETTER)		
A	FR 1 015 618 A (POTAIN)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B66C B66F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 March 1998	Examiner Van den Berghe, E
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