United States Patent

[11] 3,572,636

[72] Inventor **Rolf Gustaf Johansson**
Saltsjo-Duvnas, Sweden

[21] Appl. No. **722,975**
[22] Filed **Apr. 22, 1968**
[45] Patented **Mar. 30, 1971**
[73] Assignee **A B Byggforbattring**
Stockholm, Sweden
[32] Priority **Apr. 25, 1967**
[33] **Sweden**
[31] **5808/1967**

[54] **DEVICE FOR AUTOMATIC CONTROL OF CLIMBING JACK MOVEMENTS**
9 Claims, 2 Drawing Figs.

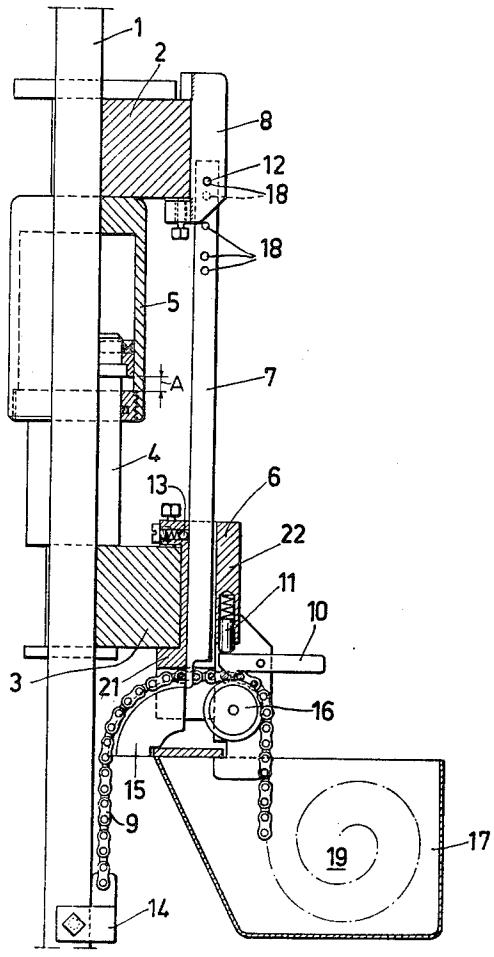
[52] **U.S. Cl.** **254/106**
[51] **Int. Cl.** **B66f 1/00,**
E02d 21/00
[50] **Field of Search** 254/105-
—107; 187/(Inquired)

[56] **References Cited**
UNITED STATES PATENTS

2,914,302	11/1959	Sampson	254/106
2,944,403	7/1960	Smith	254/106X
3,172,297	3/1965	Thiene	254/106x
3,389,890	6/1968	Bradbury	254/106

Primary Examiner—Lester M. Swingle
Assistant Examiner—David R. Melton
Attorney—Holman & Stern

ABSTRACT: A method of controlling the travelling distance of a climbing jack which climbs stepwise on a smooth climbing rod in which the step length of the jack is controlled by a flexible elongated control member connected to the climbing rod and stretched in parallelism to such rod by the jack. The control member at equally spaced points produces impulses in cooperation with a locking means provided for the jack so that by such impulses in cooperation with the locking means, the step length of the stepwise movement of the jack is limited.



Patented March 30, 1971 3,572,636

2 Sheets-Sheet 1

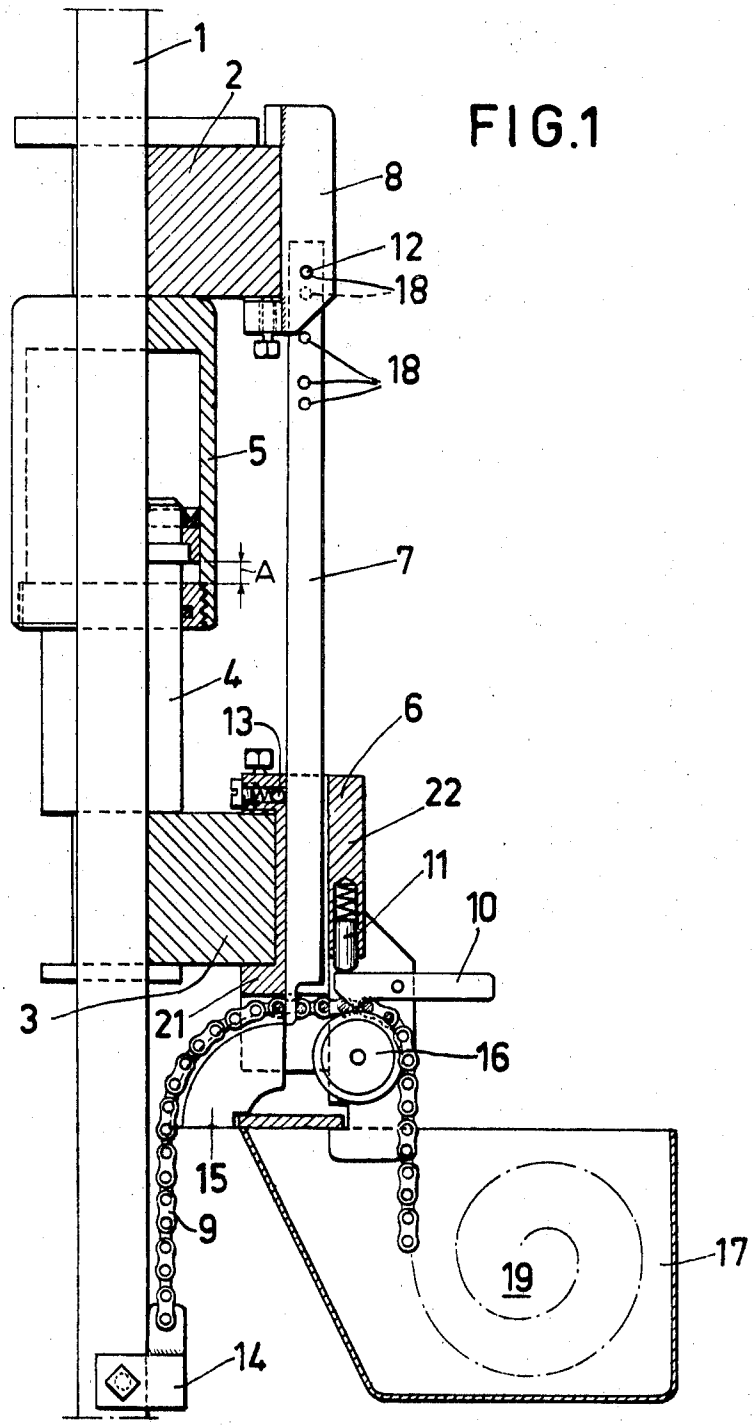


FIG.1

INVENTOR
ROLF GUSTAF JOHANSSON
BY Blaesnik, Downing & Seibold
ATTORNEYS

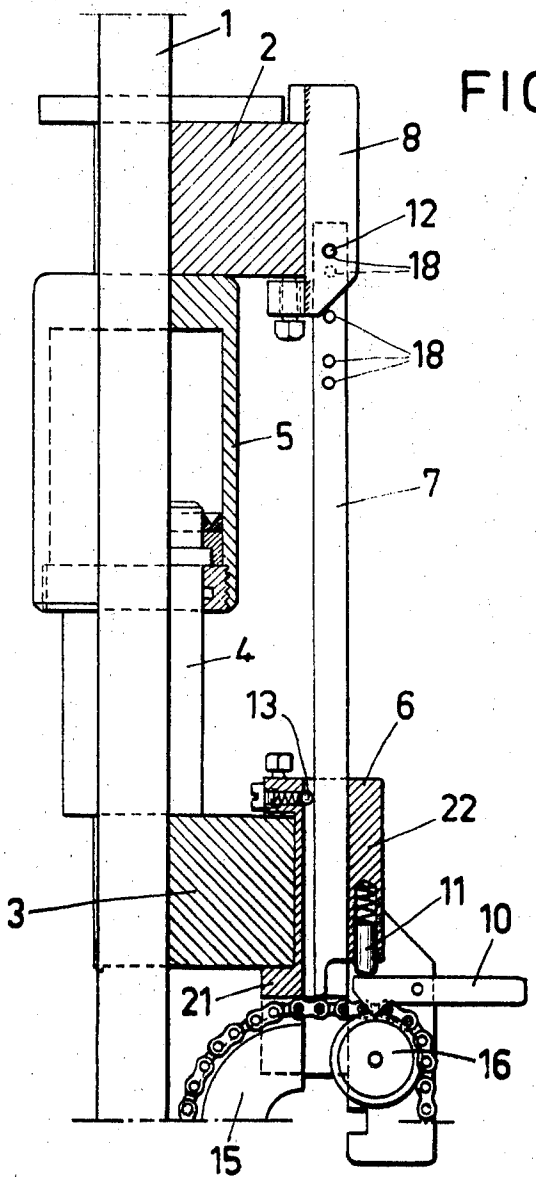


FIG.2

DEVICE FOR AUTOMATIC CONTROL OF CLIMBING JACK MOVEMENTS

BACKGROUND OF THE INVENTION

Climbing jacks have long been in use primarily for the lifting of forms in connection with sliding form casting. In recent years, climbing jacks have increasingly come into use for other purposes, such as the lifting of heavy loads, in connection or without connection with sliding form casting.

Climbing jacks generally have in common, two pairs of grip members alternatingly movable along a rod in such a manner that one pair always is retaining while the other pair is being moved. The power required for the movement is obtained from the lifting members, which are connected with the grip members and which may be mechanical, pneumatic or hydraulic. In certain connections particularly hydraulic climbing jacks, with their low weight in relation to their lift capacity, have proved to be an ideal lifting equipment.

In many cases it is desirable to apply a plurality of cooperating climbing jacks for the lifting of a load. When the jacks are required to move distances of equal length, difficulties have arisen, because one disadvantage of climbing jacks is the difficulty of allowing several cooperating climbing jacks to move distances of equal length.

SUMMARY OF THE INVENTION

The invention involves a method for automatically controlling the travel distance of a stepwise operating climbing jack during its upward or downward movement on a climb rod, and the essential features of said method becoming evident from claim (1). The control means cooperates with a locking means or the like whereby the length of the steps of the climbing jack is limited.

The invention is described in greater detail in the following, in connection with the accompanying drawings showing by way of example a device for carrying out the method according to the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows partially in section a climbing jack for upward climbing, inclusive of a climb rod and control means, with the lower grip head having been moved by spring action to the upper position blocked by the control mean; and

FIG. 2 shows the same device as FIG. 1, with the upper grip head having been moved to its uppermost position by hydraulic pressure cylinder-piston means.

DETAILED DESCRIPTION OF THE INVENTION

The climbing jack climbs on an entirely smooth climb rod 1 and comprises a hydraulic pressure cylinder 5 provided with a piston 4. Both of grip heads 2 and 3 of the climbing jack are provided with grip members which block the downward movement but allow for unimpeded upward movement. Between the two grip heads 2, 3, two hydraulic jacks are arranged on diametrically opposite sides of the climb rod 1, each of said jacks comprising a piston 4, a cylinder 5 and a return spring (not shown), with the said spring biasing the lower grip head 3 upwards against the upper grip head 2 when the medium in the cylinder 5 is pressureless.

The control means comprises a locking head 6 secured by clamp screws to the lower grip head 3. A locking bar 7 is pivoted to a holder 8 by a cotter pin 12 which is positioned in a hole 18 and the holder is secured by a clamp screw secured to the upper grip head 2.

To describe the function of the control means, it will be assumed that the climbing jack is to move upwardly a load supported on the grip head 2. The rod 1 rests at its lower end on a fixed support or with its upper end in a suspended connection with a fixed support. Without the control means, the climbing jack theoretically would travel at each step a distance having the same length as the maximum stroke of the jack. For several reasons, however, the length of the climbing step is always shorter than the maximum stroke of the pressure cylinder, and in the case of several cooperating climbing jacks, the steps have individual different lengths. As the individual differences have the tendency to multiply, after a plurality of climbing steps, they result in unacceptable deviations, so that manual adjustment of the individual climbing distances is required.

The present control method eliminates this highly tedious manual adjustment work.

When hydraulic pressure is being supplied to the cylinder 5, the upper grip head 2 with the load supported thereon is lifted a distance as great as permitted by a full stroke, and which corresponds to the distance A in FIG. 1. At the same time, the locking bar 7 is lifted and thereby ceases to effect a locking action on a chain 9 which is fastened by locking means 14 to the climb rod 1 and wound by a suitable winding device 19 in a chain box 17 after its travel over the rollers 15 and 16. It will be seen that the rollers 15 and 16 and the chain box 17 are mounted on the locking head 6. The chain 9 can be held in stretched condition by a locking member 10 which, by a spring-loaded piston or plunger 11, is pressed against the chain. When the locking bar 7 is free of its engagement with a space in the chain 9, its lower end is held by a spring-loaded ball 13 through a distance corresponding to the distance between two spaces in the chain to the position shown in FIG. 2.

When the hydraulic medium in the cylinder 5 is actuated by the actuating means to perform a return motion, the piston is forced upwards by the spring, thus moving the grip head 3 and the locking head 6 in the same direction. The chain 9, during the lateral movement, is thereby moved upwards against the locking bar 7 which again moves into a space in the chain. The chain moves the locking bar 7 to the position shown in FIG. 1 whereby the further upward movement of the piston is locked by the chain. The locking bar 7 can be set, by the cotter pin 12, in such a position that one or several spaces in the chain 9 can pass the lower end of the locking bar before a locking is effected.

It should be pointed out that when the lower grip head 3 is moving upwardly, the horizontal portion of the chain 9 is moving to the left with respect to the grip head 3 and its associated components 21 and 22. As the chain moves to the left relative to the head 3, the spring loaded lever 10 maintains the chain 9 in a stretched condition.

In FIG. 2, it will be seen that the upper grip head 3 has been moved upwardly hydraulically as much as possible so the heads 2 and 3 are disposed at their farthermost relative position. The locking bar 7 is free from the chain 9 and is pressed against the member 22 by means of the spring-loaded ball 13. In FIG. 1, the lower head 3 has been moved upwardly and lower tail portion of the bar 7 has entered a space in the chain 9 and has been moved to the left by the chain to stop against the member 21 thereby providing an uppermost position for the grip head 3.

Thereafter, the upper head 2 is again moved upwardly and so on and for each step, and the uppermost position of the lower head 3 is determined by the distance between the spaces in the chain 9.

It will be appreciated that by mounting the locking bar 7 on higher levels relative to the head 2, the lower tail portion of the locking bar 7 will pass 1, 2 or several spaces in the chain prior to entering the chain by means of which the step length of the jack can be set selectively. For effecting this action, the locking bar 7 is provided with a plurality of apertures 18 for the cotter pin 12.

As all of the climbing jacks used in a common lifting operation are provided with the present control means, all jacks are given a travel distance of substantially equal length, independently of the number of climbing steps. The chains always are stretched equally by the spring force pressing the pistons with the lower grip heads upwards. The individual differences in the climbing step length being caused on smooth rods, such as by different loads on the jacks and by the particular gripping

capacity of the grip means, automatically are compensated for at the next following climbing step, because at that time the piston can move into the cylinder to a greater depth. All of the climbing jacks used in the common lifting operation are caused to execute the climbing steps simultaneously, such as for example hydraulically.

I claim:

1. A device for automatically controlling the travelling distance of a climbing jack climbing stepwise on a smooth climbing rod, comprising a flexible elongated control member, means connecting said control member to and stretching the same parallel to the climb rod by the climbing jack, said control member having equally spaced openings, and a locking means on the climbing jack in each of successive step motions of the jack engaging a subsequent opening of the control member thus effecting limiting of the length of the step.

2. The device as claimed in claim 1 in which said flexible, elongated control member is defined by a chain.

3. The device as claimed in claim 2 in which said chain is a roller-type chain.

4. The device as claimed in claim 1 further including two grip heads operating alternately for effecting the stepwise movement, said locking means which, by a variation in the distance between said grip heads resulting from said stepwise movement, is actuated to engage an opening in the control member so that by such engagement, the movement of one of said grip heads is locked.

5. The device as claimed in claim 4 including guide means connected to one of said grip heads and over which guide means said control member passes, said control member between said guide means having a substantially horizontal connection and said locking means including a vertical locking bar operably connected to the other grip head and pivotable between two stop members on said one grip head above the horizontal extension of the control member viewed in the direction of movement of the latter, and said locking means, during the movement in a direction against each of said grip heads, being adapted to engage a hold in the control member so that the movement of said one grip head after a predetermined distance of such head is retained by said control member and during a movement apart of said grip heads, the locking means is disengaged from the control member, said locking means then being moved against the other of said stop members by a spring-loaded ball.

6. The device as claimed in claim 5 in which the step length is set selectively by making at least one of the openings of the control member inoperative by mounting the locking means at different levels relative to the other grip head.

7. The device as claimed in claim 1 including winding means for said flexible elongated control member and means connecting the winding means to the jack.

8. A method for controlling the traveling distance of a plurality of climbing jack each climbing stepwise on a separate smooth climb rod comprising controlling the step length of each of the climbing jacks by a flexible elongated control member connected to the climb rod and stretched in parallelism to the rod by the climbing jack and having equally spaced openings therein cooperating with locking means on the climbing jack to define the length of the successive steps of the jack, and making each of the control members of different jacks substantially identical whereby the same step length is imparted to the different jacks.

9. The method as claimed in claim 8 comprising hydraulically effecting the climbing step simultaneously of the different climbing jacks.