

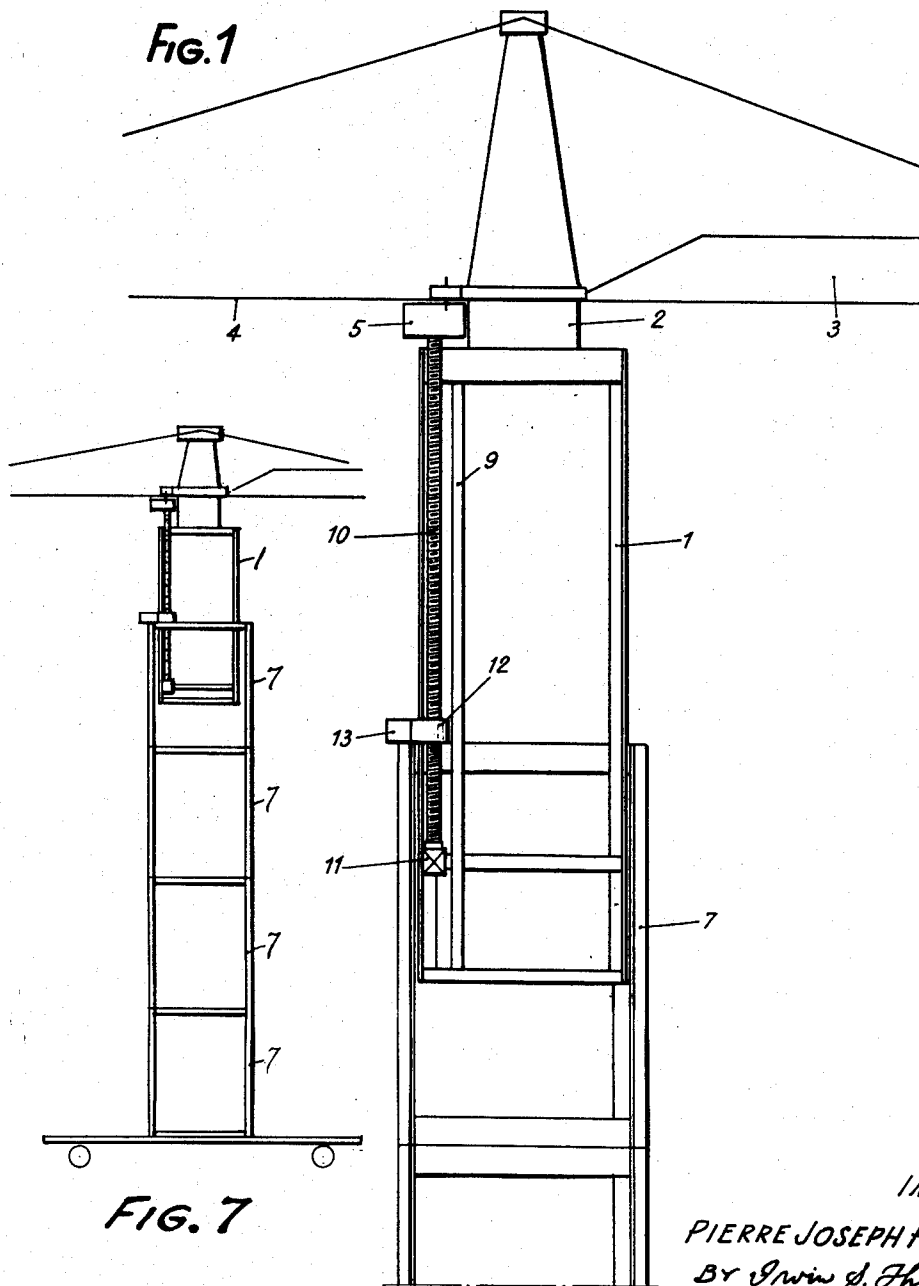
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P. J. PINGON
ROTARY TOWER CRANE

3,106,299

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4 Sheets-Sheet 1



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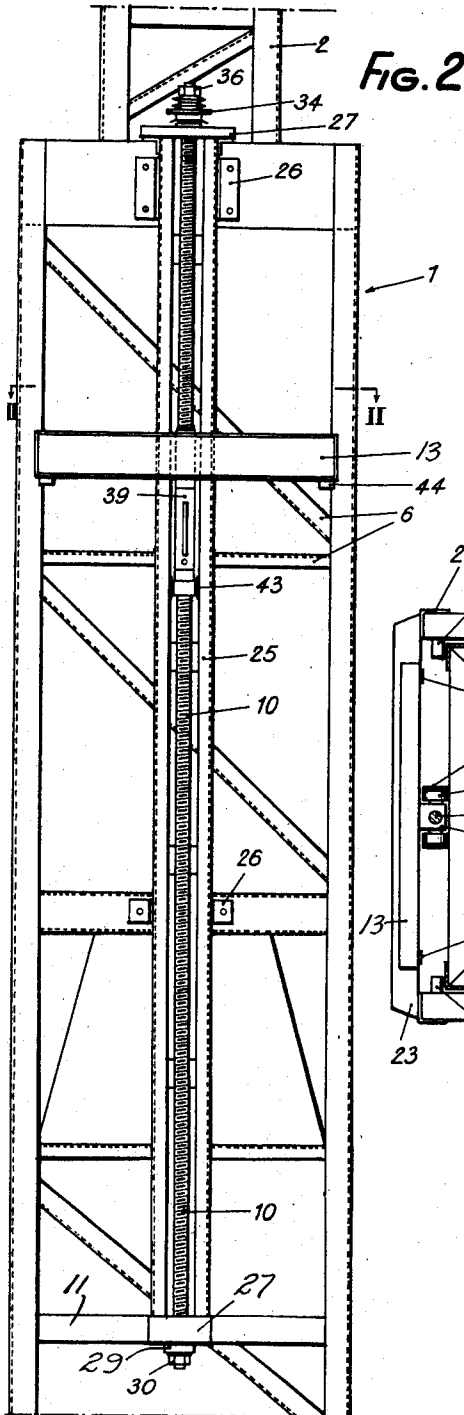
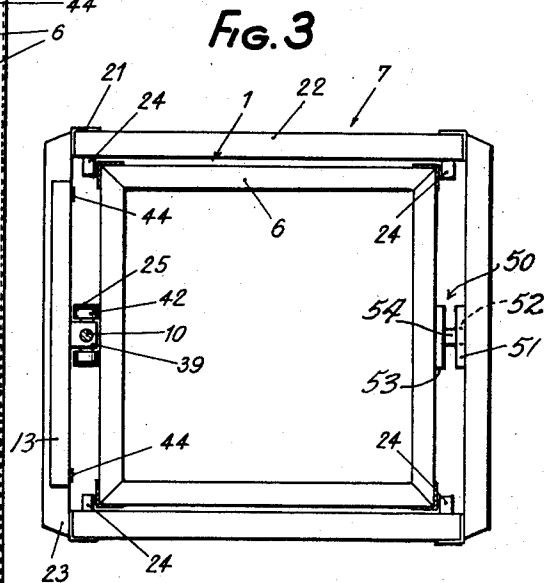


FIG. 2



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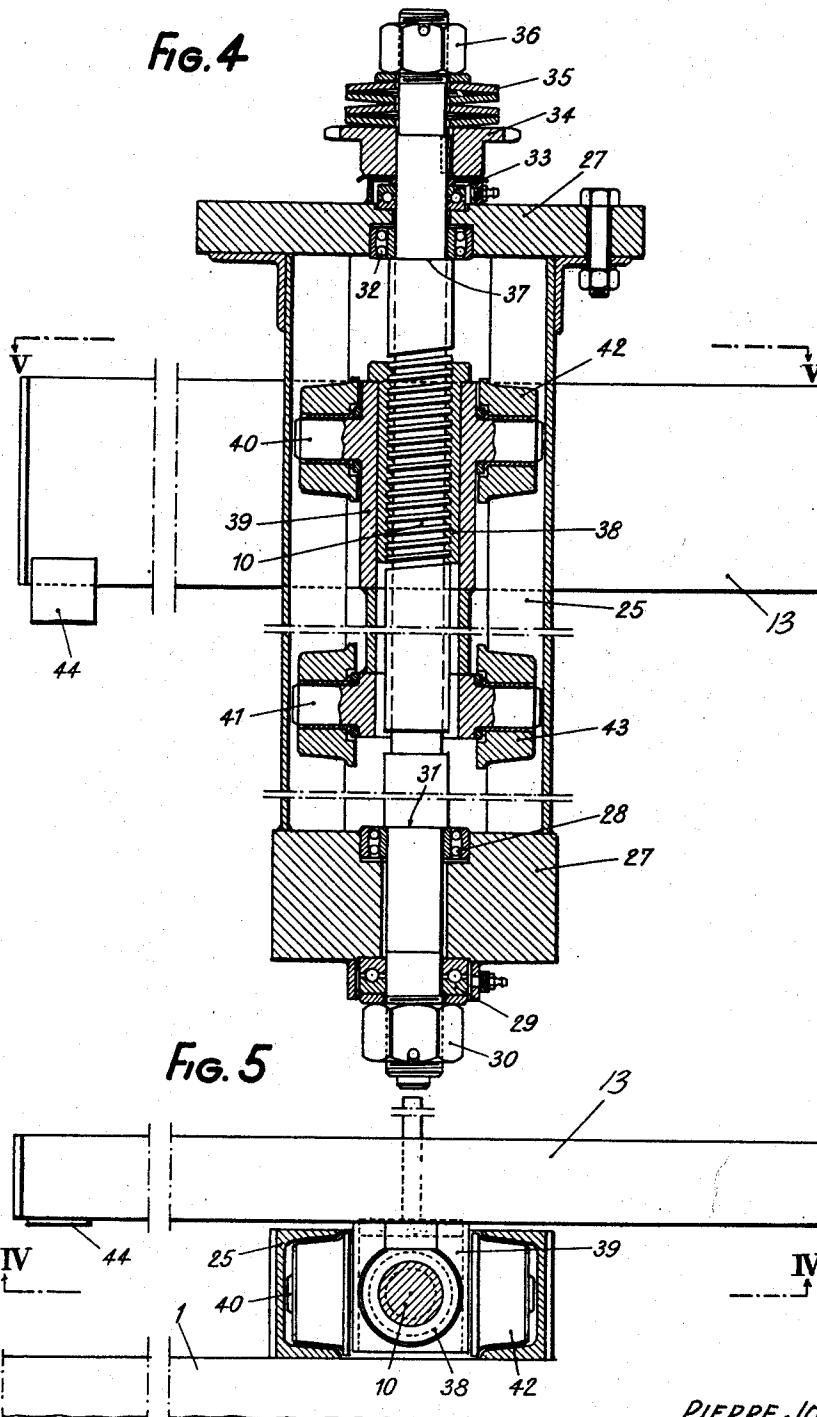
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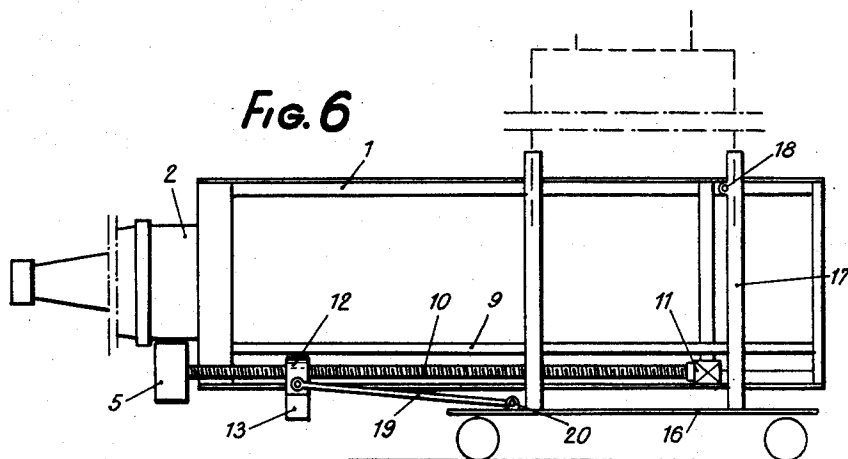
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ROTARY TOWER CRANE

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11 Claims. (Cl. 212-46)

The present invention relates to the erection of cranes the mast or tower of which is made up of superimposed elements and is fitted at its upper end with a jib and a counter jib.

It is known for erecting crane masts to arrange for an end element having a constant length and carrying the pivot, the jib and the counter jib to be slidably received in standardized mast elements which surround said end element as disclosed and illustrated in French Patent No. 1,215,656, filed September 26, 1958, and in French Patent of Addition No. 75,869, filed June 10, 1959. The end element is then raised by abutting the same to the last outer standard element, whereupon there is provided around the thus raised end element a further standard element which is used as a support for further lifting the end element and so forth until the mast has acquired the desired height.

The invention relates more particularly to a device utilizable for ensuring said raising motion of the end element by abutting the same every time to the last standard element adapted to the mast.

An object of the invention is to provide a new or improved device for the erection of cranes whose mast is made up of superimposed elements for permitting the end element slidably mounted with respect to the last standard element of the latter to be raised, said device comprising a screw or screw-threaded stem having a length longer than that of a standard element and axially rigid with the end element adjacent its lower end and positively rotated and a nut fitted upon said screw and connected to members that may be removably supported upon the last standard element of the crane mast, whereby rotation of the screw causes, owing to a tractional stress exerted upon the point of lower rigid axial attachment, an axial lift of the end element with respect to the nut supported upon said last standard element.

Another object of the invention is to provide a device as aforesaid wherein the lower end of the stem is arranged, through the medium of a ball or roller bearing and an axial thrust bearing, in a member secured to the end element, bracing of said end element being inwardly offset at least on one side so as to provide ample space for receiving the screw or alternatively said bracing being so arranged as to provide enough space for the screw which may be disposed under the jib orientating reducer from which it is selectively and angularly driven through the medium of suitable dog means.

A further object of the invention is to provide a device as aforesaid wherein the support means advantageously comprises an outer cross member to which the nut is connected, which cross member may be merely supported upon the upper edge of the last standard element mounted to the mast, the cross member being preferably associated with similar parts cooperating with slideways provided upon the end element so as properly to guide the same during its motion, whereby when said end element has been raised to the proper height, it is locked in position with respect to the last standard element, whereafter the outer cross member is raised in turn to the required height before a further standard element is fitted about the thus raised end element, the cross member being then applied to the last standard element following the erection.

It is known that for transportation purposes the end

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element is often folded down upon the crane frame, wherefor said end element may be pivotally fitted to a basic element carried by the frame, whereby its rocking motion brings it to the desired straightened up position.

According to a feature of the invention, there is provided in such a case a skid or like member interposed between the aforesaid outer cross member or the nut and a stationary point on the frame, whereby rotation of the screw and consequently axial motion of the nut cause, through the medium of the skid, a straightening up motion of the end element about its pivotal axis.

With these and such other objects in view as will incidentally appear hereafter, the invention comprises the novel combination of parts that will be now described with reference to the accompanying drawings exemplifying the same and forming a part of the present disclosure.

In the drawings:

FIGURE 1 is a fragmentary diagrammatic elevational view of a suitable embodiment of the invention.

FIGURE 2 is a fragmentary elevational view of the end element of a crane fitted with the erection device in question.

FIGURE 3 is a plan view showing the position of the the end element inside the mast, looking in the direction indicated by the arrow II—II in FIG. 2.

FIGURE 4 is a sectional view on the line IV—IV of FIG. 5 assuming some parts to be broken away.

FIGURE 5 is a sectional view on the line V—V in FIG. 4 with some parts broken away.

FIGURE 6 is a diagrammatic elevational view showing the method of erecting the end element on the crane frame.

FIG. 7 is a diagrammatic illustration of a number of standard elements and an end element in the process of erecting a crane mast.

As illustrated, 1 designates generally the end element of a crane mast or tower of known type which supports the pivot 2 and the jib 3 and counter jib 4. A reducing gear 5 normally serves for controlling the orientation of the jib and counter jib equipment 3—4 upon the end element of the crane mast. Said end element 1 is braced in known fashion and is slidably mounted inside a standard mast element 7 which is braced externally. The element 7 visible in the showing constitutes the last standard element of the crane mast upon which the end element must be supported for being raised so as to provide under the jib and counter jib equipment 3—4 enough space for accommodating a further standard element in known fashion.

According to the constructional form shown in FIG. 1, the bracing structure of the end element is inwardly offset under the reducing gear 5 as shown at 9, whereby the available space is occupied by a screw 10 the length of which is longer than that of a standard element 7. Said screw 10 is operatively connected by a dog clutch means with the reducing gear 5 in a manner which is not shown and is fitted adjacent its lower end by means of a ball or roller bearing and a thrust bearing (not shown) to a cross member 11 rigid with the end element. It will be seen that the screw 10 is offset to one side of the end element outside its bracing system.

A nut 12 is mounted for shifting motion upon the screw 10. Said nut is operatively connected to an outer cross member 13 suitably guided heightwise on the end element 1.

In order to raise the end element, the cross member 13 is supported (as shown in FIG. 1) upon the upper end of the last standard element 7 of the mast. If the screw 10 is then angularly moved in the proper direction by means of the reducing gear 5, it has a tendency to be axially moved upwards in the nut 12. However as it is connected with the end element by the bottom cross

member 11, it exerts upon the latter a tractional stress which moves the end element 1 upwardly. It will be understood that, in such a case, the screw 10 works by traction in a highly favorable manner, thereby permitting a fairly large raising height economically to be obtained. When the end element 1 has reduced the desired position, it is locked by locking device 50 upon the last standard element 7, whereafter the screw 10 is rotated in the reverse direction for raising the movable cross member 13 and a further standard element is fitted about the raised standard element 1. Upon the upper end of said further standard element the cross member 13 may be then supported for the next raising phase.

The locking device 50 can take the form shown in applicant's French Patent No. 1,225,759 such that a plate 51 having a number of apertures 52 disposed therein is mounted on one side of each standard element 7. A body member 53 is mounted on one of the cross structural members 6. A spring biased bolt member 54 is reciprocally mounted in body member 53 in order to be moved into and out of engagement with any of the apertures 52 of plate 51 by any well known means such as a solenoid or similar means.

In FIG. 2 there is shown in a more detailed fashion the end element 1 of the crane mast associated with its bracing system 6 whereas in the showing of FIG. 3 there is illustrated the position occupied by said end element inside the crane mast 7 in the constructional form as shown. In this form the mast 7 comprises companion angle members 21 having oppositely located faces which have an internal bracing system and oppositely located faces having an outer external bracing system. Guiding cleats are provided as shown at 24 inside the mast for guiding the end element. It will be easily seen from FIG. 3 that this arrangement provides inside the mast enough space for erecting the device sidewise with respect to the end element 1.

In the present embodiment, a pair of U-shaped angle members 25 provide oppositely located rolling tracks and are axially secured to the end element 1, for example by square members 26. Said angle members 25 are connected at their lower and upper ends to parts 27. The screw or screw-threaded stem 10 of the device is supported in the lower part 27 by means of a ball or roller bearing 28 and an axial thrust bearing 29 and it is axially locked by means of a nut 30 which clamps a lower shoulder 31 of the screw against the cupped race of the ball or roller bearing 28. At its upper end the screw 10 is rotatably supported in the part 27 by means of a ball or roller bearing 32 and is provided with an axial abutment 33 which is downwardly urged upon the associated part 27. It carries over said axial abutment 33 a toothed wheel 34 which normally meshes with the reducing gear 5 by which the jib is orientated. Springs of the so-called Belleville type 35 complete the stack of parts which is held down by a nut 36 the clamping of which tightens a shoulder 37 on the screw against the ball or roller bearing 32.

The nut 12 constitutes an elongated sleeve 38 housed inside a part 39 having a pair of arm sets 40, 41 forming oppositely located trunnions which carry rollers 42, 43 capable of rolling along the U-shaped angle members 25. The upper section of the part 39 is axially rigid with the cross member 13 which is adapted to rest against the upper part of the last installed standard element 7 of the crane mast. Lugs 44 welded to said cross member 13 are abutted sidewise from within against the spider 23 as shown by FIG. 3.

The operation of this device is similar to the one previously described namely: When screw 10 is angularly driven from the jib orienting reducer 5, it moves axially within the nut 12 sustained in turn from the outer mast so as to exert a tractional stress by its lower end upon the end element 1 of the crane, thereby moving the same upwards with respect to the mast 7.

In the showing of FIG. 6, the crane frame is designated generally by 16. It will be seen that said frame carries a basic element 17 upon which the end element 1 is pivotally supported at 18 so as to be foldable for transportation purposes. Straightening up of said end element 1 about its pivotal axis brings it to normal position as shown by dot and dash lines.

For facilitating such straightening up action, a rod 19 is mounted as shown between the nut 12 or the cross member 13 and a stationary point 20 on the frame. It will be easily understood that the position of the screw 10 axially rigid with the end element 1 by the cross member 11 causes, through the medium of the rod 19, a straightening action of said end element until the desired position has been reached.

Minor constructional details may be varied without departing from the scope of the appended claims.

What is claimed is:

1. Apparatus for moving an end element carrying a jib and counter jib of a crane relative to a mast composed of standard elements to lengthen as well as shorten said mast comprising screw means rotatably mounted on said end element, said screw means having a length longer than each of said standard elements, nut means mounted on said screw means to be movable therealong upon rotation of said screw means, cross member means connected to said nut means for engaging the upper end of the last of the standard elements to define a support to move said end element relative to the last standard element upon rotation of said screw means, driving means operatively connected to said screw means to rotate same, and locking means disposed between said end element and said mast to lock said end element thereon to move said nut and cross member means along said screw means.

2. Apparatus according to claim 1 wherein guide means are mounted on said end element in which said nut means is guided in its movement along said screw means.

3. Apparatus according to claim 1 wherein said driving means include gear means mounted onto said screw means, said gear means being operatively connected to reducer gear means mounted on said end element adjacent said jib and counter jib to orient same.

4. Apparatus according to claim 1 wherein said nut means include a nut member engaging said screw means, said nut member carrying at least a pair of roller means, runway means mounted on said end element adjacent said screw means in which said roller means are movably mounted to guide said nut member in its movement along said screw means.

5. A device for mounting standard elements to erect a mast or tower for cranes comprising an end element having at least three sides, screw means mounted along one side of said end element, said screw means having a length longer than each of said standard elements, driving means operatively connected to said screw means to rotate same, support means operatively connected to said screw means, to be movable therealong upon rotation of said screw means, said support means engaging the upper end of the last of said standard elements to move said end element relative to the last of said standard elements upon rotation of said screw means, and locking means disposed between said end element and said mast to lock said end element thereon to move said support means.

6. A device according to claim 5 wherein said support means includes a nut member operatively mounted on said screw means and a cross member means connected to said nut member.

7. A device according to claim 6 wherein guide means are mounted on said end element adjacent said screw means, said nut member including engaging means disposed in said guide means to guide said nut member along said screw means.

8. A device according to claim 7 wherein said engaging means include at least one pair of roller means.

9. A device according to claim 5 wherein said end

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element carries a jib and counter jib, reducer means mounted on said end element operatively connected to said jib and counter jib to be oriented thereby, gear means mounted on said screw means, said driving means operatively connected to said reducer means and gear means to respectively drive same.

10. A device for mounting standard elements to erect a mast or tower for cranes comprising a movable base member including a vertical framework thereon, an end element for carrying a jib and counter jib, said end element being pivotally mounted on said vertical framework for movement into a position to erect said mast and a position to transport said end element, said end element including at least three sides, screw means longer than each of said standard elements mounted along one side of said end element, driving means operatively connected to said screw means to rotate same, support means operatively connected to said screw means to be movable therealong upon rotation of said screw means, said support means engaging the upper end of the last of said standard elements to move said end element relative to

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the last of said standard elements upon rotation of said screw means, and locking means disposed between said end element and said mast to lock said end element thereon.

11. A device according to claim 10 wherein means are operatively connected between said movable base member and said support means to move said end element into said position to erect said mast and said position to transport said end element upon rotation of said screw means.

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