Feb. 8, 1966 P. DURAND 3,233,375

VERTICALLY SWINGING EXTENSIBLE CRANE

Filed Feb. 13, 1962

FIG.1

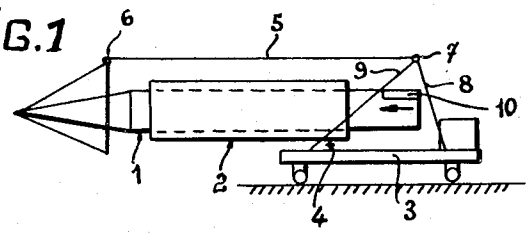


FIG.2

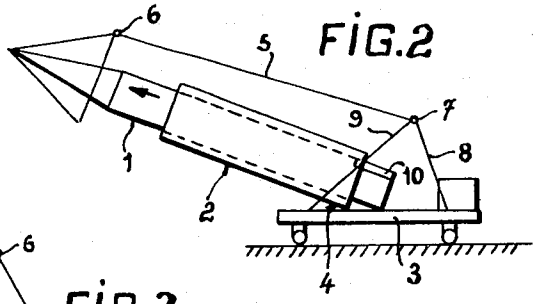


FIG.3

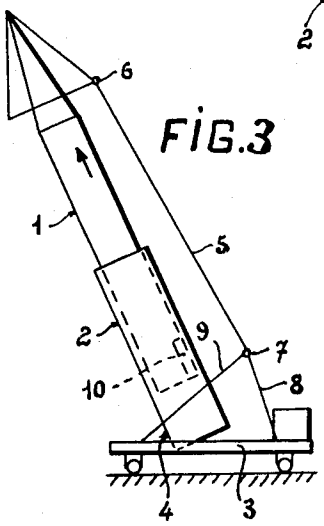
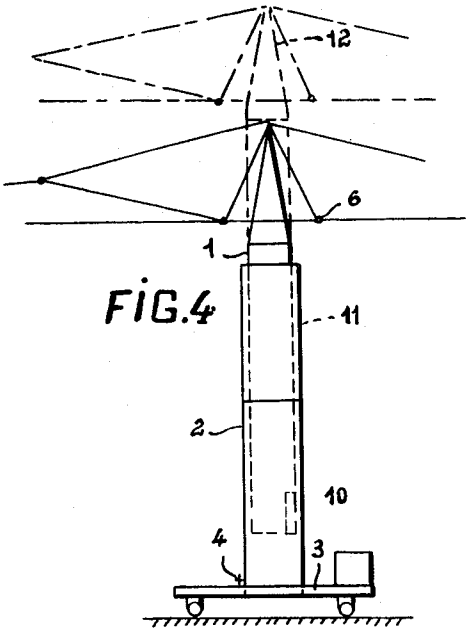


FIG.4



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3,233,375

Patented Feb. 8, 1966

3,233,375

VERTICALLY SWINGING EXTENSIBLE CRANE

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Filed Feb. 13, 1962, Ser. No. 172,988
Claims priority, application France, Feb. 14, 1961, 41,227, Patent 1,280,362
2 Claims. (Cl. 52—118)

Tower cranes for building yards are known, which can be entirely folded back for transportation, while the telescopic axles are collapsed under the crane, and the jibs remain secured to the tower and are laid down with the latter over a chassis. A single control mechanism provides for all the assembling operations of the crane: an auxiliary winch driven by the mechanism driving the hoisting winch of the crane sets the crane tower upright, raises the jibs, sets in the desired position the counterweights and, lastly, opens out the tower sections which have collapsed inside one another, said operations being performed in the desired sequence.

The present invention has for its object the provision of a tower crane of the type described, arranged in a manner such that the opening out of the tower elements produces simultaneously the raising of said tower over the crane chassis which may be wheeled or otherwise.

The following description of the crane is obviously given by way of example and by no means in a binding sense and, in particular, the tower may include a plurality of superposed sections of different cross-sectional areas collapsed inside one another so as to reduce the length of the tower when lying horizontally, or else, only two sections fitted inside each other, one of them being termed hereinafter the post and being rigidly secured to the chassis when the whole system has been raised in position and the other element carrying the jibs of the crane and termed hereinafter the actual tower, has been projected out of the post, the length of which tower may be increased through the superposition of a number of sections having the same cross-sectional area.

It should be remarked that this post may be of a unitary structure without any disconnectable bar, which endows it with a highly satisfactory rigidity, the extensions of the post being constituted in various manners, as required by the applications to be considered.

The accompanying diagrammatic drawing illustrates, by way of example and in a non-limiting sense, a preferred embodiment of said tower crane. In said drawing:

FIGS. 1 to 4 are lateral elevational views of the crane in its folded or collapsed condition, in two intermediate positions and in its upright position, respectively.

In FIG. 1, the tower **1** housed inside the post **2** is laid horizontally over the wheeled chassis **3**. The post **2** is pivotally secured to the chassis **3** along the axis **4**. A connecting rod **5** having a predetermined length is pivotally secured at **6** to the tower and at **7** to a stationary point defined on the chassis by the outer interconnected ends of the struts **8** and **9**. The connecting rod **5** and the struts **8** and **9** may advantageously and without this being essential, be constituted by bars or elements such as cables, chains or the like, to be used subsequently in the construction of the crane. Thus, for instance, the tie connected with the counter-weighted jib on the erected crane, may serve for forming the connecting rod **5**, whereas the struts securing the tower of the chassis may serve for formnig the struts **8** and **9**.

FIGS. 2 and 3 show successive positions of the tower when it has been caused to slide over the post and the corresponding positions of the latter rising upwardly over

the chassis. It should be remarked that the post **2** pivots round the axis **4**, while the pivotal connecting point **6** moves along a circle having as a center the point **7**. At the end of the operation (FIG. 4), the post **2** is secured through bolts or the like means to the frame **3**.

When the connecting rod or rods **5** are rigid, and their length and their pivotal points of connection and also the pivotal axis of the post are suitably selected, the sliding movement of the tower inside the post **2** controls the rising movement of the post until said post is properly seated on the frame **3**.

However, it should be remarked that, if the connecting rods **5** are not rigid, the weight of the post and tower system will have a tendency when the center of gravity of the system constituted by the post **2** and the tower **1** passes beyond the vertical plane passing through the pivotal axis **4**, to make said system drop and bring a sudden end to the rising movement. The provision of jacks or the like means for damping the impact of the post on the chassis **3** lies within the scope of the invention, as defined by the accompanying claims. A suitable selection of the location of the pivotal axis **4** may furthermore prevent the center of gravity of the rising section from moving beyond the vertical plane passing through said axis **4**.

Said system may be associated with a slider which constrains a point of the tower or of the post to move along a predetermined path and also the numbers and the relative positions of the connecting rods, pivotal points of connection and of the pivotal axis referred to hereinabove are only a particular case of the invention which covers all the modifications thereof falling within the scope of the accompanying claims. Thus, it is possible before positioning the pivotal axis of the connecting rod or rods to resort to a slider which, in a first stage, produces a simple horizontal translational movement of the post over the chassis or of the tower inside the post, or both movements in succession or simultaneously, which translational movements have for their object to position these various parts in a suitable position prior to raising them. It is, as a matter of fact, possible, with a view to shortening the length of the crane when laid horizontally for transportation, to modify the relative position of the three parts constituted by the chassis, the post and the tower.

Furthermore, a ballast may be carried by the chassis and further bearing sections may be provided between the chassis and the track or ground with a view to securing a perfect equilibrium of the crane during its erection.

In all cases, when the crane has been finally erected, the post **2** is secured to the frame **3** and the connecting rod **5** is disassembled, while the upward sliding movement of the tower may be continued so as to raise the latter to the upper end of the post, as illustrated in solid lines in FIG. 4, unless such a position of the tower has been already obtained at the end of the actual erecting movement. The post **2** may furthermore include an extension **11** and the tower may be again raised by resorting to the same mechanism **10** which has already produced the sliding of the tower inside the post, until the tower reaches the position **12**. During said time, and as is also apparent from inspection of FIG. 4, the jibs may be readily positioned on the tower without this being however essential.

Obviously, the invention is by no means limited to the sole embodiment of the tower crane which has been disclosed by way of example and it covers, in contradistinction, all the modifications thereof falling within the scope of the accompanying claims, whatever may be, in particular, the number and position of the pivotal points of connection and also the number and position of the connecting rods inserted say between the tower and the wheeled chassis or between the post and the chassis.

Thus, my invention allows collapsing the crane into a small-bulk package, the outline of which is smaller than the maximum gauge allowed by regulations.

It will be remarked that the mechanism producing the sliding of the tower sections with reference to one another may also serve for hoisting the uppermost section of the tower above the actual tower including one or more sections. Said mechanism may be driven by an independent power unit, or else, by one of the power units controlling the operations of the crane, such as hoisting, angular setting, translational movement, modifications in span provided by a shifting of the carriage along the jib or through a rising movement of the latter, the sliding and hoisting movements being obtained directly by last-mentioned power units, or through the agency of all or part of the operative mechanism of the crane, the two mechanisms being possibly interconnected through a clutch, a dog clutch, a yielding transmission with or without a Cardan joint, a belt, a gearing, or again, a shifting of the power unit actuating one of said mechanisms with a view to making it actuate the other mechanism.

Furthermore, the pivotal axes and the pivotal or the like connecting means between the different parts are constituted by spindles or the like readily removable means, so as to allow the package formed by the dismantled crane to be separated into fractions of a reduced weight, which can be readily handled.

The tower sections may, as already mentioned, be shifted over the chassis after dismantling of the pivotal or the like spindles, or the like means, with a view to translationally shifting one or more of said sections so as to obtain a minimum bulk for the crane, said translational movements being controlled, if desired, by means of the mechanism producing the sliding of the tower sections with reference to one another.

What I claim is:

1. A vertically swinging extensible crane comprising a support, inner and outer telescoping crane sections, means mounting one of said sections for vertical swinging movement on said support about a horizontal axis, said support having a portion that extends above and to the rear of said axis, means for extending and retracting the sections relative to each other, and means responsive to extension and retraction of the crane respectively to raise and lower the crane, the last-named means comprising link means pivotally interconnecting the outer end of the other said section and said portion of said support at a point above and to the rear of said axis.

2. A crane as claimed in claim 1, said one section being said outer section, the rear end of said inner section being spaced rearwardly of the rear end of said outer section when the crane is in its lowered position.

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