Feb. 7, 1967 V. POROLI 3,302,801

GANTRY CRANE WITH EXTENSIBLE BRIDGE GIRDER CARRYING LEGS

Filed Feb. 17, 1965 2 Sheets-Sheet 1

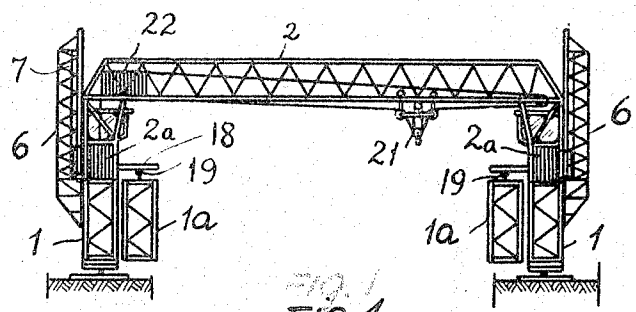


FIG. 1

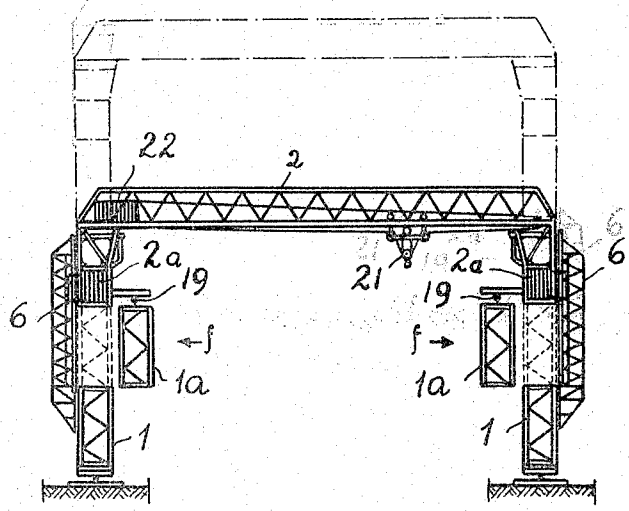


FIG. 2

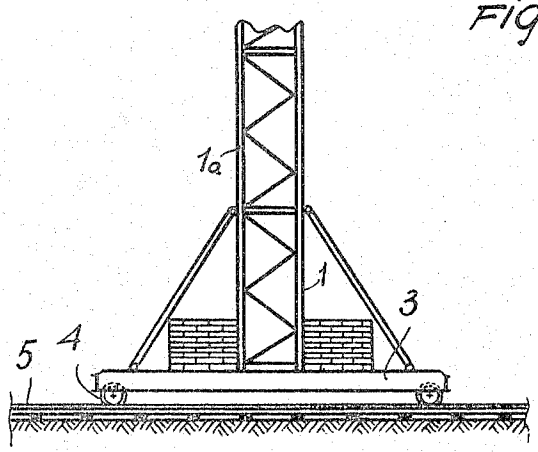


FIG. 3

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GANTRY CRANE WITH EXTENSIBLE BRIDGE GIRDER CARRYING LEGS

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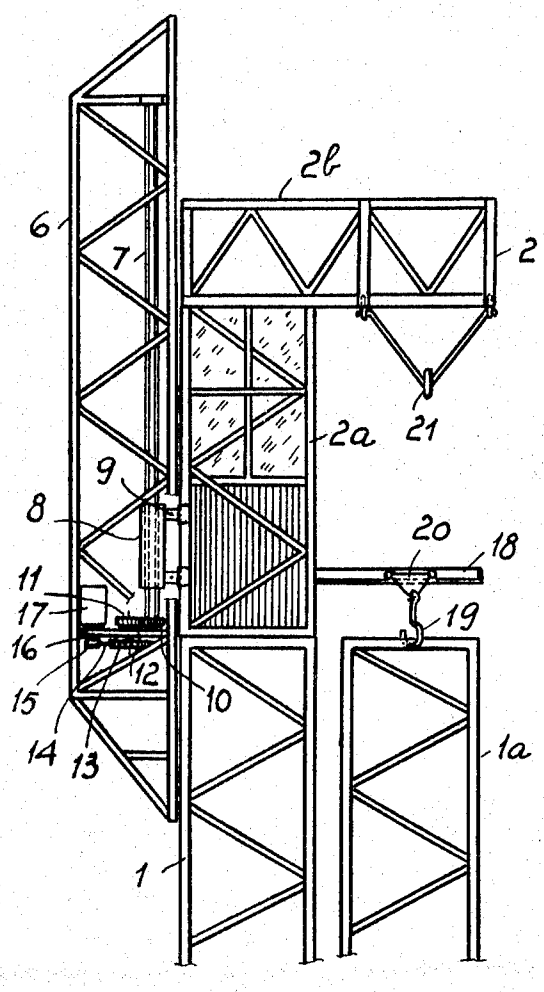


Fig. 4

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3,302,801

GANTRY CRANE WITH EXTENSIBLE BRIDGE GIRDER CARRYING LEGS

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This invention relates to cranes of the so-called gantry type, and more specifically to a gantry crane in which the bridge girder carrying legs are vertically extensible.

An object of this invention is to provide simple, practical, reliable and easily operable means for vertically extending the legs of the gantry crane, which will be of low cost and which will operate in a self-lifting manner.

These and other objects, which will appear from the following description, are attained by a gantry crane comprising at least one bridge girder and trussed legs carrying the bridge girder, said trussed legs comprising a plurality of vertically superposed trussed sections removably connected together in a vertical direction, lifting means at each of said trussed legs for lifting at least one of said trussed sections and additional trussed sections at each of said trussed legs to be interposed between two trussed sections when one of them is lifted.

Further characteristics and advantages will become more apparent from the following detailed description of a preferred non-limiting embodiment of the gantry crane with vertically extensible trussed legs according to this invention taken in conjunction with the accompanying drawing in which:

FIG. 1 diagrammatically shows said ganty crane in front elevation view in one of its vertical working positions and in one of its self-lifting stage,

FIG. 2 shows still the same ganty crane in an analogous view as in FIG. 1, but in a subsequent self-living stage thereof,

FIG. 3 shows in enlarged scale a detail of the support part or base in lateral elevation and

FIG. 4 shows again in an enlarged scale a detail relating to the lifting equipment of the ganty crane in a side view and according to a modified embodiment relating to the association of the horizontal beam with the expansible trussed legs.

As mentioned above, the structure of the presently known cranes comprises essentially two legs or posts or uprights or column-like parts of predetermined height, made of two members which are articulated with each other on the upper part, and one beam, carried horizontally like a bridge by said columns. Usually, said upperly articulated members forming the columns are associated on the lower part with a respective structure provided with wheels rolling over fixed rails, and the horizontal bridge beam carries the lifting devices and the controls for said lifting devices.

According to this invention, the aforesaid columns or legs or column-like parts are provided as a structure, which is self-extensible over vertical sections. In the embodiment represented by way of example in the drawing, the structure, is made of reticular or trussed members or sections 1, which may be vertically superposed in such a way as to vary the vertical position of the horizontal reticular or trussed beam or bridge 2 depending upon working requirements. The base members or sections 1 of each leg are associated on the lower part with a rigid

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frame 3, provided with wheels 4, adapted to roll over rails 5, in a guided manner. The rails 5 are fastened to the ground in a per se known manner (see FIG. 3). Such frame 3 with wheels 4 forms a movable platform which supports the corresponding extensible columns, and the whole leg assembly is supported in an instable manner when considered separated from the remaining structure of the gantry crane, whilst the combination of both frames 3–4 with said horizontal beam or bridge 2 interconnected through the column members 1, as will be better seen below, provides a crane assembly which is essentially rigid with movably guided stable support base.

From FIGS. 1–2 and 4 it may be seen that the assembling of the trussed columns or legs which may be self-extensible by the vertical superposition of a corresponding plurality of truseed members 1 is obtained with the aid of an auxiliary trussed structure member 6 with prevailing vertical development provided at each of said columns or legs. To said auxiliary structure 6 the horizontal bridge girder or beam 2 is movably correlated in the direction in which said members 6 vertically extend. According to the embodiment shown in the figures of the accompanying drawing, such correlation is realized by a vertical threaded spindle 7 rotatably carried by the part 6, and an elongated nut member 8, which may be removably fastened by any known fastening means such as bolts 9 and the like to a trussed head section or structure 2*a* fixed at the lower part of the bridge 2 above the legs and with dimensions which are almost equal to those of the trussed sections 1 and capable to receive the operator's cab. On the lower part of each vertical screw or threaded spindle 7 there is keyed a toothed wheel 10 with which a toothed pinion 11 engages, which is keyed on a vertical pin 12, on which in turn a pulley 13 is keyed, over which a drive belt 14 is passed, which is also passed around a driving pulley 15, keyed on the shaft 16 of a driving motor 17, carried by the corresponding member 6 (see FIG. 4). The pulleys 13 and 15 and the toothed wheels 10 and 11 build a reduction transmission assembly of the r.p.m. from driving motor shaft 16 to vertical screw 7.

It will be understood that the spindle 7 and the elongated nut member 8 define a jack means having a first jack member 7 and a second jack member 8, movable relative to each other. It will be further understood that the electromotor 17, the pulleys 13 and 14, the toothed wheels 10 and 11 define power and transmission means for imparting a rotary motion to said spindle 7.

The horizontal beam or bridge 2 may be connected with the members 6 directly by engaging its opposite ends therewith as shown in the embodiment represented in FIGS. 1–2, or it may be advantageously carried by overhanging arms 2*b* projecting horizontally from the plane passing through the two self-extensible columns as shown in FIG. 4 which is a view in the direction of extension of bridge 2, i.e. rotated 90° with respect to FIGS. 1 and 2. Opposite ends of the bridge may advantageously externally overhang beyond the span determined by said columns. In this case the auxiliary member 6 is arranged laterally to the bridge 2. With each cab part 2 there is associated a corresponding support device comprising a horizontal bracket member 18, to which the additional trussed members or sections 1*a* of the respective column to be lifted may be fastened. Said support devices comprise the hanging hook 19, associated with a small carriage 20 horizontally movable along the bracket member 18. The lower end of the hook 19 is in the reach of the

level of the lower end of said trussed head section. The horizontal sliding movement of said carriages **20** is carried out by driving means of any well known type whatsoever, comprising for example individual electrical motor means which are not shown in the drawing. The driving means for carriages **20**, as well as the motors **17** are advantageously provided with mutually synchronized controls. On the aforementioned horizontal bridge **2** there is movably supported the trolley with the lift devices generally indicated with **21** and control means **22** of said lift devices **21**, all of well known type as used in connection with gantry cranes.

The operation for changing the vertical working position of the bridge **2**, i.e. for extending the carrying columns or legs is the following. Starting for example from the position shown in FIG. 1 with the movable auxiliary member **6** fastened by bolt and/or clamp means of well known type not shown in the drawing to the base sections **1** of the columns and with the bridge **2** carried by said members **6** in its lowest position thereof with respect to such members **6** further with the corresponding trussed head sections **2***a* removably fastened in known manner to said base sections **1**, by means of the lift means **21–22** of the same crane the additional column sections **1***a* to be mounted on said base sections **1** are picked-up and suspended on the bracket **18** and relevant support means **19–20** of the bridge **2** itself. When this is accomplished, the aforesaid trussed head sections **2***a* of the bridge **2** are released or disconnected from the base sections **1** and the two side motors **17** are actuated in such a way as to impart rotation via the pulleys **13–15** the drive belt **14** and the toothed wheels **10** and **11**, to the vertical screw or threaded spindle **7** causing through the nut member **8** vertical upward movement of the bridge **2** until bringing it to the position shown in FIG. 2, in which stopping of said motors **17** occurs for example through not shown electric limit switches inserted in the supply circuit of the driving motors **17** themselves. At this point, the small carriages **20** with suspension hook **19** are caused to roll over the bracket member **18** in the direction of arrows *f* (see FIG. 2) thus bringing the sections **1***a* above the base sections **1**. Then said sections **1***a* are rigidly locked by known removable fastening means whatever to said base sections **1** and to the parts **2***a* of the bridge **2** situated above the sections **1***a*. Subsequently the members **6** are released or disconnected from said sections **1** and the motors **17** are actuated in such a way as to cause rotation of the vertical screws or threaded spindle in a contrary direction to the preceding one, so as to cause the parts **6** to vertically slide upwardly in respect to the bridge **2** thus allowing said members **6** to be fastened with their bottom part now to the sections **1***a*. From this new vertical position said bridge **2** may be gradually lifted still further depending upon working requirements, proceeding in the manner now described with the automatic mounting of the column sections **1***a*. By such a self-mounting crane structure unquestionable practical and economical advantages not feasible with the crane types known heretofore may be attained.

Most evidently, the above embodiments are given only by way of example, and it is therefore obvious that in the spirit of the above-described invention several changes and modifications may be carried out in this self-mounting crane structure, without departing from the scope of the invention.

I claim:

1. A gantry crane comprising at least one bridge girder and trussed legs carrying the bridge girder, said trussed legs comprising a plurality of vertically aligned and superposed trussed sections removably connected together,

at each of said trussed legs: a vertically extending and vertically movable auxiliary trussed structure laterally arranged with respect to said trussed legs and having a lower end removably connected with one of said trussed sections,

at each of said trussed legs: a jack means having a first jack member and a second jack member movable relative to each other, said first jack member being vertically rigid with said auxiliary trussed structure and said second jack member being vertically rigid with said bridge girder, power means for actuating said jack means, thereby to vertically move relative to each other said auxiliary trussed structure and said bridge girder, and

additional trussed sections to be interposed between said auxiliary trussed structure and said bridge girder when spaced from one another.

2. A gantry crane according to claim **1**, wherein said jack means is a screw jack, said first jack member is a screw threaded spindle rotatorily supported on said auxility trussed structure, said second jack member is an elongated nut member rigidly connected on one of said trussed sections near said bridge girder, and said power means is an electromotor supported on said auxiliary trussed structure and having transmission means for transmitting rotation from said electromotor to said spindle.

3. A gantry crane acording to claim **1**, further comprising a bracket member, fastened on one of said trussed sections for slidably supporting said additional trussed sections.

4. A gantry crane comprising at least one bridge girder and trussed legs carrying the bridge girder, said trussed legs comprising a trussed head section fixed to said bridge girder and a plurality of vertically aligned and superposed trussed sections removably connected together and to the lower end of said trussed head section,

at each of said turssed legs: a vertically extending and vertically movable auxiliary trussed structure laterally arranged with respect to said trussed legs and having a lower end removably connected with one of said trussed sections,

at each of said trussed legs: a vertical threaded spindle rotatorily supported on said auxiliary trussed structure, an electromotor at the lower end of said spindle and supported on said auxiliary trussed structure, transmission means between said electromotor and said spindle for transmitting rotation from said motor to said spindle, an elongated nut member fixed laterally on said trussed head section and coaxial with said spindle and in screwing engagement therewith,

additional trussed sections to be interposed between two of said vertically superposed trussed sections when spaced from one another.

5. A gantry crane comprising at least one bridge girder and trussed legs carrying the bridge girder, said trussed legs comprising a trussed head section fixed to said bridge girder and a plurality of vertically aligned and superposed trussed sections removably connected together and to the lower end of said trussed head section,

at each of said trussed legs: a vertically extending and vertically movable auxiliary trussed structure laterally arranged with respect to said trussed legs and having a lower end removably connected with one of said trussed sections,

at each of said trussed legs: a vertical threaded spindle rotatorily supported on said auxiliary trussed structure, an electromotor at the lower end of said spindle and supported on said auxiliary trussed structure, transmission means between said electromotor and said spindle for transmitting rotation from said motor to said spindle, an elongated nut member fixed laterally on said trussed head section and coaxial with said spindle and in screwing engagement therewith,

additional trussed sections to be interposed between two of said vertically superposed trussed sections when spaced from one another,

a bracket member fixed on said trussed head section and laterally projecting therefrom in the direction opposite to said auxiliary trussed structure, at least one carriage slidable on said bracket member and a hook suspended on

said carriage for suspending thereon said additional trussed sections, the lower end of said hook being in the reach of the level of the lower end of said trussed head section.

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