Oct. 26, 1965 W. BOCZEK 3,213,575

CRANES

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Fig. 1

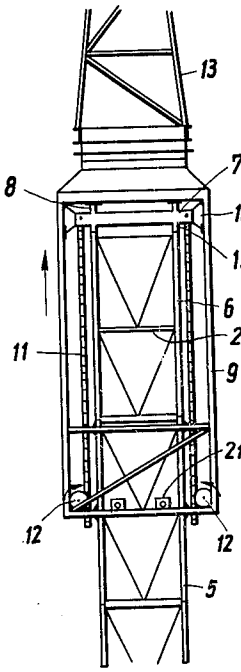



Fig. 2

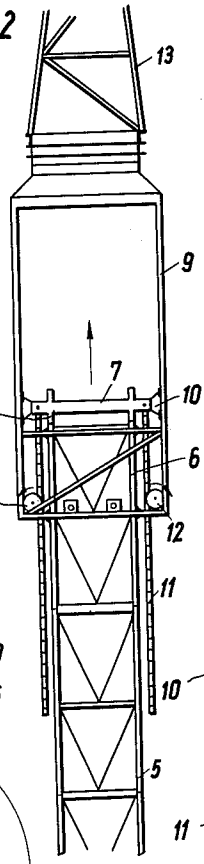



Fig. 3

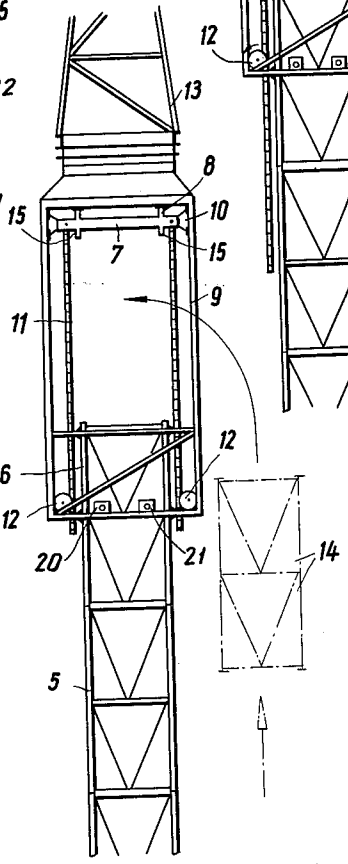



Fig. 4

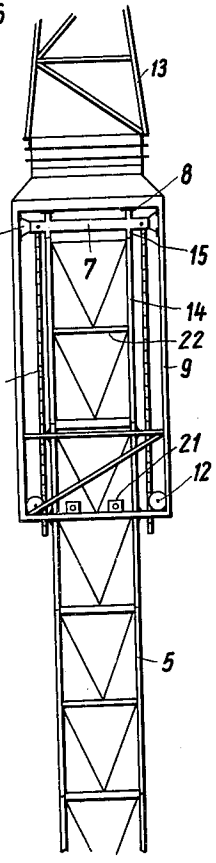
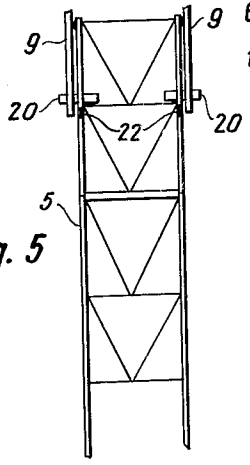



Fig. 5

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# CRANES

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The invention relates to cranes, being a crane in particular which is used for erection purposes and comprises a pillar and an upper head unit which carries the jib of the crane.

It is known in cranes of this kind to build up the pillar from below from a multiplicity of elements or sections, a so-called cage being provided at the head unit of the crane into which the separate pillar sections are mounted. The head unit and cage are then moved upwards, or "climb" in other words. Cranes of this kind are therefore also described as climbing cranes, whose pillar may have a desired length variable in magnitude. The extension of the pillar is carried out by means of a block and tackle for example, in the case of known cranes. In order to secure the head unit and cage during said extension of the crane, as well as in its final position, known locking mechanisms are used which may consist of clamping jaws comprising oblique surfaces operating in conjunction therewith, or which may be formed of cogs or bearing supports.

A main object of the invention is to provide a crane, being an erection crane of the kind hereinbefore specified in particular, wherein simple and safe "climbing" of the head unit complete with cage and jib is possible.

A further object of the invention is to provide a crane, in the form of an erection crane in particular, wherein the head unit of the crane may together with its cage be stopped and held fast in any desired position.

Another object of the invention is to provide a hoisting device for the head unit or the cap unit and cage, for a crane of the kind hereinabove specified.

According to the invention, a crane with a jib comprising a pillar which is built up from a multiplicity of sections, a head unit carrying a cage displaceable relative to the pillar and a bearer unit (for example a frame or girder) mounted on the upper end of the pillar, which bearer unit is connected to the cage carried by the head unit by means of a hoisting mechanism.

That is, the cage is telescopically displaceable along the pillar and carries the jib of the crane. The bearer unit may be displaceably mounted on the pillar.

According to one embodiment of the invention, the hoisting mechanism is formed by a cog drive comprising racks and pinions.

In one preferred embodiment of the invention, the cog drive may comprise two parts displaceable independently of each other, one of which parts carries pinions while the other part carries two or more toothed racks adapted for engagement by said pinions.

Further according to the invention, the pinions may for this purpose be disposed on the cage which is connected to the head unit of the crane, whereas the second part of the cog drive is formed by racks which are connected to a bearer unit which may be mounted on the pillar, preferably the top section of the pillar. The second part of the cog drive may simultaneously act as a guide for the cage or head unit during the hoisting motion.

According to another embodiment of the invention, this second part of the geared drive may comprise a frame which may be releasably mounted on or secured to the top section of the pillar and is provided with guide surfaces on its outer parts whereon the cage or head unit is slidingly guided during its upward displacement.



Further according to the invention, the frame or the part of the cog drive carrying the pinions may be provided with two, four or more guide surfaces, whose outer surfaces are in contact with inner parts of the cage connected to the head unit.

The drive which is subsequently used to control or operate the crane, may be employed to actuate the cog drive, that is to hoist the head unit with its cage.

An auxiliary drive system may be provided to operate the cog drive, by means of which drive the pinions are driven synchronously. This auxiliary drive system may be releasably attached to the outer side of the cage and preferably comprises an electric motor having a belt or chain drive actuating the pinions.

In order that the invention may be more clearly understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings.

FIGURES 1 to 4 respectively show diagrammatic part elevations of the pillar of a crane with a cage and a part of a head unit or of a jib, the figures showing different stages in the "climbing" of the crane. FIGURE 5 is a view transverse to that of FIGURES 2 and 3.

In FIGURE 1, the numeral 5 indicates generally a crane pillar comprising a multiplicity of superposed sections of suitable construction.

On the upper side of the top section 6 of the pillar 5, a frame indicated generally by the reference 7 is mounted, which frame is securely but releasably attached in suitable manner to the top section and which is equipped with bearing supports 8 extending upwardly, on which supports the upper inner side of a cage indicated in general manner by the numeral 9 may bear. The outside of the frame 7 is equipped with a multiplicity of guides 10, along which may slide the inner wall portions of the cage 9 during displacement. The frame 7 carries a multiplicity of racks 11, two are illustrated in the drawings, and in these racks there engage two pinions 12 which are rotatably mounted in and close to the lower extremity of the cage 9. Two racks are adequate for the embodiment of the invention, which racks are appropriately disposed in a central plane of the crane pillar opposite to each other. A head unit indicated generally at 13 and carrying the jib of the crane, is connected to the cage 9.

A device according to the invention operates in the following manner:

Starting from the position illustrated in FIGURE 1 and turning the pinions 12 in the direction of the arrows shown in FIGURE 1 by means of an appropriate drive, the cage 9 rises upwardly together with the head unit 13 and the jib, the teeth of the pinions 12 travelling along the teeth of the racks 11 until the position shown in FIGURE 2 is reached.

The cage 9 and cap unit 13 have thus been moved into an upper position in which one or more additional sections can be accommodated in the cage 9. Before this is carried out however, the cage 9 is secured on the pillar 5 by means of appropriate mechanisms, for example suitable locking devices, so that the cage 9, the head unit 13 and the jib cannot move further upwards. The locking device for securing the cage 9 to the pillar 5 may constitute any known or conventional device such as, for example, pins or keys 20 passing through ears 21 in the cage structure and extending over and resting on an upper structural member 22 of the pillar 5. Alternatively, the pins or keys may extend transversely through aligned holes in parts of the cage 9 and of the pillar 5. In any event, it should be borne in mind that the purpose of the locking device is to temporarily lock the cage 9 against vertical movement relative to the pillars 5 while the cage 9 is in the position shown in FIGURES 2 and 3 and especially while the wheels 12 are turning as shown in FIGURE 2.

The connection between the frame 7 of the cog drive and the top section 6 of the pillar is then released, and the pinions are driven in the opposite direction as shown by the arrows in FIGURE 2. The second part 7 of the cog drive carrying the racks 11 consequently rises upwardly, the racks 11 travelling along the pinions 12 which now operate in a stationary position, until a position is reached in which the frame 7 is brought into contact with the top inner side of the cage 9. This position is illustrated in FIGURE 3, from which it is apparent, that the racks 11 have reached the upper limit of their position relative to the pinions 12. The cage 9 is now ready, in this position, to receive one or more additional sections marked 14, which are inserted into the cage 9 in known manner (see the indicative arrow) and secured safely to the former top section of the pillar 5.

The pinions may then be slightly turned in the opposite direction until downwardly extending bearing supports 15 formed on the frame 7 are brought to bear on the upper side of the newly inserted section or sections 14. The frame 7 or carrier of the racks 11 then being attached to the section 14 of the pillar 5 again if required. This position is illustrated in FIGURE 4. This position in FIGURE 4 fundamentally corresponds to the position in FIGURE 1 with the difference, that one or more new sections 14 have now been fitted on to the pillar 5. The locking connection between the cage 9 and the pillar 5 is then released again as by removing pin 20, and the pinions 12 are turned in the direction shown in FIGURE 1, so that the cage 9 and the head unit 13 can now climb upwardly again (FIGURE 2), the operation being continued until the desired height is reached.

The form of construction according to the invention has the advantage of particular simplicity and safety, since on the one hand the cog drive assures positive displacement of the parts relative to each other, and since on the other hand the entire construction comprises but few individual parts which can be produced in simple manner. Because of the fact, that the second part of the cog drive, namely the frame 7, is equipped with projecting guides, effective guidance is moreover assured at the same time for the cage 9 during its upward displacement together with the head unit 13, as well as excellent guiding of the second part 7 of the cog drive during its upward displacement from the position shown in FIGURE 2 into the position shown in FIGURE 3. Alternate and reciprocal guiding of the cage 9 and the second part of the geared drive is thus attained.

The use of a geared drive is not essential. According to the invention a rope or chain drive or an analogous drive may advantageously be used instead of a cog drive. A hoisting mechanism of this nature would operate in a manner corresponding to that of the cog drive.

A crane according to the invention may advantageously be utilised on different floor levels for example, for which purpose the mechanism contrived for the climbing of the cage may also be used to hoist the crane as a whole from one floor level to the next.

What I claim is:

1. A crane of the type which is erectable in situ, comprising a vertical pillar and a head unit supported at the top end of said pillar, said pillar comprising a plurality of separate sections which are joinable with each other end to end to form said vertical pillar, a frame fixedly attachable successively to each one of said sections, said head unit comprising a cage, which comprises side portions extending downwardly and about the upper end portion of said pillar, lifting means associated with said frame and said cage whereby actuation of said lifting means when said frame is fixedly attached to a one of said sections causes said cage to move vertically relative to said pillar and to said frame, locking means for locking said cage relative to said pillar, said frame being releasable from its fixed attachment with said pillar and being movable vertically relative to said pillar and to said cage a distance slightly in excess of the vertical height of any one of said pillar sections when said cage is locked relative to said pillar whereby an additional one of said pillar sections can be attached atop said pillar below said frame and to the preceding topmost section in said pillar, and drive means for actuating said lifting means.

2. The crane of claim 1, wherein said lifting means comprises a vertically extending rack gear fixedly attached to said frame and a rotary gear rotatably mounted on said cage, said rotary gear intermeshing with said rack gear, and means to rotate said rotary gear.

3. The crane of claim 2, including means to rotate said rotary gear in opposite directions whereby rotation in one direction with said frame being fixedly attached to said pillar will cause said cage to move vertically upward relative to said frame and to said pillar, while rotation in an opposite direction with said frame being released from said pillar will cause said frame to move vertically upward relative to said cage and to said pillar.

4. The crane of claim 1, wherein said frame comprises vertical elements extending along said side portions of said pillar and a transverse bearing member connecting the upper ends of said vertical elements, said transverse bearing member resting on top of said pillar and said cage resting on top of said bearing member.

5. The crane of claim 4, wherein said bearing member comprises lateral guides engaging the side portions of said cage.

6. The crane of claim 4, wherein said transverse bearing member comprises upwardly and downwardly protruding bearing pieces, said cage comprising a transverse portion connecting the upper ends of said cage side portions, said cage transverse portion resting against said upwardly projecting pieces, and said downwardly projecting pieces resting against the upper end of said pillar.

7. The crane of claim 1, wherein said lifting means is actuated by an independent driving means carried on said cage.

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