Nov. 6, 1962 H. CLAESSON 3,062,383

LUFFING CRANE MECHANISM

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Fig.1

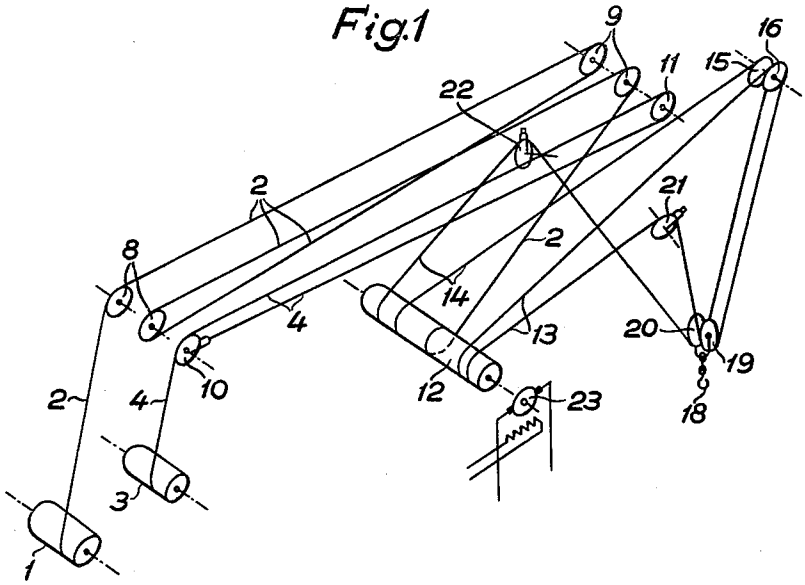
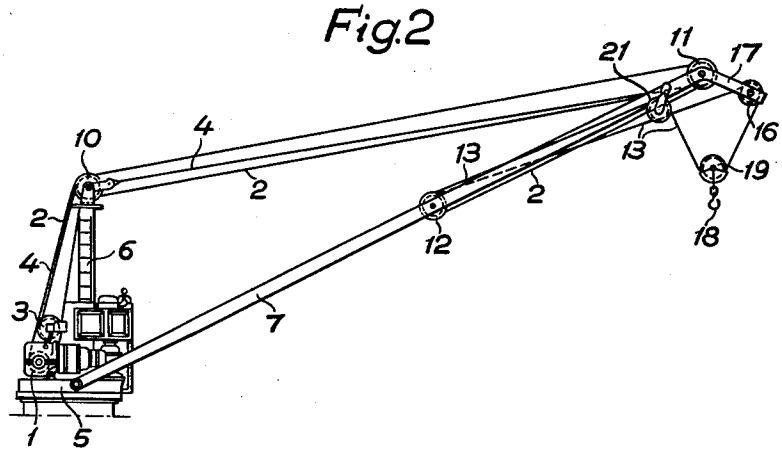


Fig.2



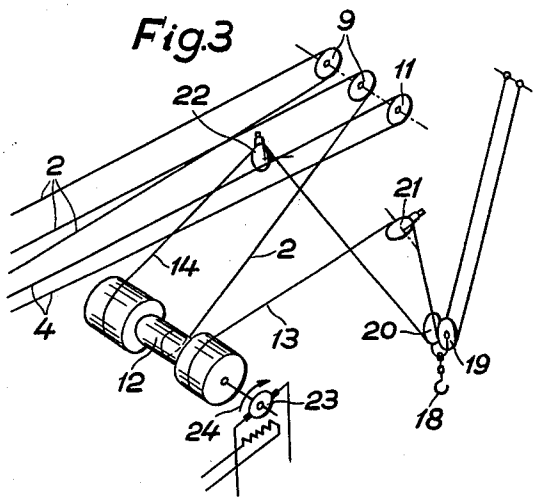
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Fig.3



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LUFFING CRANE MECHANISM

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4 Claims. (Cl. 212—58)

This invention relates to a mechanism for luffing cranes with horizontal conveyance of loads during luffing movements of a boom carried by a mast or supporting structure at the heel portion of which are mounted winch drums for a hoist cable and a luffing cable, the said cranes being particularly adapted for use aboard ships as turnable deck cranes, the said heel portion thereby providing a turnable platform of relatively small diameter for the mounting of compact winch machinery. Conventional cranes of this type generally have a single hoist cable and a single luffing cable, the said hoist cable passing over a pair of sheaves at the tip end of the boom as well as over a pair of sheaves at the top end of the mast, while the luffing cable generally passes over a single sheave at the boom tip and the mast top. It is desirable to arrange horizontal conveyance of the load during luffing movement and therefore the winding and unwinding speed respectively of the hoist cable on its winch drum is held at a certain ratio in relation to the unwinding and winding speed respectively of the luffing cable on its winch drum, so that the load is always conveyed horizontally and in the same plane during luffing movements.

A big drawback in these conventional cranes with a single hoist cable is the absence of dampening means for the pendulum motion or undesired swinging movement of the load hanging in the cargo hook of the hoist cable. This said drawback is eliminated according to the invention through the mounting of two load-carrying cables in a three point suspension or triangular arrangement at the tip end portion of the boom, which two cables pass around sheaves carrying a cargo or lifting hook, at least one end of said cables being fastened to a drum mounted on the boom itself, which drum is driven by the aforesaid hoist cable of said winch machinery.

The arrangement of a drum on the boom itself, the said drum thereby being driven by the hoist cable of the winch machinery, makes it possible to use the compact arrangement and machinery of the conventional crane constructions with a single hoist cable and horizontal conveyance of load during luffing movement, the said horizontal conveyance being obtained by giving the drum on the boom the same overall diameter and at the same time fastening both ends of said two load-carrying cables to said drum so that said load-carrying cables are wound onto or unwound from said drum simultaneously, or by giving the sections of the boom drum which take up said load-carrying cables a circumference twice the circumference of the section of the drum which takes up the said hoist or driving cable, one end of said load carrying cables thereby being fastened to the drum while the other is fastened to the boom tip.

In the embodiment of the invention which comprises a boom drum with the same diameter all over, the load-carrying cables from said drum pass over a pair of sheaves placed close together at the boom tip, the said sheaves thereby representing in fact a single suspension point for said two cables according to the close arrangement of said sheaves, the said cables from these sheaves passing downwardly and around a pair of sheaves carrying a cargo hook, and further upwardly in a diverging way over laterally spaced sheaves mounted on opposite sides of the boom and finally back to said boom drum. The last mentioned sheaves are mounted at a relatively great mutual distance so that these sheaves spaced longitudinally from the boom tip, together with those at the boom tip, secure an effective triangulation for the two load-carrying cables, thereby retarding pendulum motion of the load.

In the embodiment of the invention in which the boom drum sections have different circumferences, the said load-carrying cables are at one end fastened close together at the boom tip, the cables passing downwardly and around the sheaves which carry a cargo hook, upwardly in a diverging way over the said sheaves mounted at opposite sides of the boom and finally to the drum sections with twice the circumference of that of the section of the drum on which the said hoist cable is wound.

By locating the two load-carrying cables at the boom tip portion and their drum at the boom itself, the necessity of an increase in the number of cable parts between the winch carrying platform and the mast top, and between the mast top and the boom tip is avoided. Should the two load-carrying cables be extended down to a common drum or separate drums mounted on the platform at the mast's heel, bulky machinery would be the result, especially with a common drum which would have an overall length far exceeding the relatively small diameter of the platform. In other words, the arrangement according to the invention makes it possible to use the hitherto well known and effective cranes with single hoist cable and compact hoist and luffing winch machinery together with the new features of our invention to reach the desired retardation of the pendulum motion of the load by a triangular suspension of the load-carrying cables at the boom tip.

According to the invention the hoist cable of the winch machinery at the platform effects only the raising movement of the hook while the hook of its own weight effects the lowering movement, and to ensure this lowering movement also when the hook does not carry any load an additional weight may be provided for the hook. However, preferably a small electric motor should be operatively connected to the boom drum to help the lowering movement of the drum and the hook.

An embodiment of the invention is shown in the accompanying drawing in which FIGURE 1 in a schematical way shows the arrangement of two load-carrying cables being fastened to the boom drum at both their ends, and FIGURE 2 shows a side view of a luffing crane. FIGURE 3 shows in the same way as FIGURE 1 the cable arrangement at the boom tip in another embodiment of the invention.

In FIGURES 1 and 2, **1** denotes the hoist cable drum, **2** the hoist cable, **3** the luffing cable drum and **4** the luffing cable of the crane, the drums **1** and **2** being mounted close to a turnable platform **5** supporting a mast **6** and a boom **7** for steering about a vertical axis, the said boom being hinged for luffing movement in relation to said mast. The hoist cable **2** is passed over pairs of sheaves **8** and **9** at the mast top and boom tip respectively and the luffing cable **4** is passed over a sheave **10** and **11** at the mast top and the boom tip portion. An additional cable drum **12** is mounted on the boom itself and one end of the hoist cable **2** is fastened to said drum **12** which has the same diameter all over, and both ends of said load-carrying cables **13** and **14** are fixed to said drum **12**, so that by winding up the said hoist cable on the winch drum **1**, the said cables **13** and **14** are wound onto said drum **12** from both their ends. The load-carrying cables **13** and **14** are passed from the drum **12** outwardly over a pair of sheaves **15** and **16** placed close together on an extension **17** of the boom **7** and from these sheaves downwardly and around two sheaves **19**

and 20 which carry a cargo hook 18, the said sheaves and hook constituting a pulley block, and further from these sheaves 19 and 20 upwardly in a diverging way over sheaves 21 and 22 mounted on opposite sides of said boom and finally back to said drum 12 on the boom 7. The sheaves 21 and 22 constituting a pulley block are laterally spaced at a relatively great mutual distance so that the sheaves 15, 16, 21 and 22, together with the blocks 18, 19 and 20 constitute an effective triangular suspension of said two load-carrying cables, thereby eliminating undesired swinging movement of the load hanging from said hook 18.

If only one end of said load-carrying cable is to be fastened to the boom drum 12, the sections of the drum onto which the cables are wound have a circumference twice that of the section of the drum taking up the said hoist cable 2. This embodiment of the invention is shown schematically in FIGURE 3 in which the other ends of the load-carrying cables 13 and 14 are fastened at the same spot on the boom tip as the sheaves 15 and 16 are mounted in FIGURE 1.

The suspension of the load-carrying cables in a triangular fashion could be changed within the scope of the invention, for example the sheaves 15 and 16 could be mounted directly on the boom itself and between the drum 12 and the sheaves 9 for the hoist cable 2, while the sheaves 21 and 22 could be longitudinally spaced on the boom in relation to the position of the said sheaves 15 and 16, and preferably at the boom tip, the said sheaves 21 and 22 being thereby mounted on one, possibly two, extensions fixed to said boom.

In the embodiment of the crane shown in FIGURE 2, the boom has the shape of a ladder with a pair of girders mutually converging in the direction of the boom tip and the drum 12 is mounted between said pair of girders. To ensure a perfect lowering also when the hook 18 does not carry any load a small electric motor 23 of common type could be operatively connected to the boom drum 12. The operative direction of rotation of this auxiliary motor is indicated by an arrow 24.

I claim:

1. A crane mechanism with horizontal conveyance of the load during luffing movements comprising a turnable platform, a mast supported by said platform, a boom hinged on said platform, a hoist cable drum, a hoist cable connected at one end to said drum, a luffing cable drum, a luffing cable connected to said drum, load carrying cables, guiding means for said load carrying cables

arranged to provide a three point suspension therefor at the free end of the boom, a load engaging means, sheaves connected to said load engaging means and engaging the load carrying cables, a boom drum mounted on the boom, at least one end of each load carrying cable being connected to the boom drum, the other end of the hoist cable being connected to the boom drum whereby winding of the hoist cable on the hoist drum rotates the boom drum to wind the load carrying cable thereon.

2. Mechanism as claimed in claim 1, in which said boom drum is of constant circumference, both ends of each of said load carrying cables being fastened to said boom drum, said guiding means for the load carrying cables including further sheaves mounted at the tip end of said boom, said load carrying cables passing around one pair of such further sheaves from said drum, downwardly around such sheaves connected to said load engaging means, upwardly around another pair of said further sheaves which are laterally spaced and are mounted at a relatively great distance from each other on opposite sides of said boom, and back to said boom drum.

3. Mechanism as claimed in claim 1, in which said boom drum has a circumference at the points where said load carrying cables are attached to it which is twice that of the circumference where said hoist cable is attached thereto, one end only of each of said load carrying cables being attached to said boom drum, said guiding means for said load carrying cables including further sheaves mounted at the end of said boom, said further sheaves including a pair of sheaves laterally spaced apart and mounted at a relatively great distance from each other on opposite sides of said boom, said load carrying cables passing from said boom drum over said laterally spaced sheaves, downwardly around said sheaves connected to said load engaging means and upwardly to said boom, the other end of each of said load carrying cables being fastened to said boom.

4. Mechanism as claimed in claim 1, in which an electric motor is operatively connected to said boom drum, and said motor being operative only during downward motion of said load-engaging means.

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