This invention relates to extensible-jib cranes particularly in which a hydraulic motor is provided for operation of the winching drum. Such cranes are frequently employed as mobile cranes owing to the facility with which a hydraulic pump may be provided upon the mounting vehicle and operated thereon to feed working liquid to the hydraulic motor.

The object of this invention is to provide, in hydraulically driven cranes of the kind referred to above, simple means whereby effective operation of the hydraulic motor will be halted automatically when, during a lifting operation, the crane hook or the link or block by which it is secured to the lifting cable reaches the permissible top limit of its travel, irrespective of whether the jib is fully or partly extended and irrespective of the inclination of the jib as may vary during lifting operations and the like.

The invention provides, in an extensible-jib crane of the kind incorporating a winching drum operable by a hydraulic motor, a lifting cable trained about a pulley on the free end of the jib and adapted to the wound upon said drum, a pump hydraulically circulated with the motor by way of a working fluid inlet to the motor and an outlet from the motor, and mechanism for operating said pump; means for halting said motor comprising, a tubular loop shunted across said inlet and outlet, a self-closing valve in said loop, a striker element carried by the portion of said cable suspended from said pulley, and means including an obstructive element disposed in the path of said striker element for opening said valve when said striker element bears against said obstructive element.

An example of the invention is illustrated in the drawings herewith:

FIG. 1 is a side elevation (partly broken away) of an extensible jib;
FIG. 2 is an end view looking in the direction of line 2—2 in FIG. 1;
FIG. 3 is an incomplete section taken on line 3—3 of FIG. 1; and
FIG. 4 is a hydraulic circuit diagram.

Referring first to FIG. 4, a hydraulic motor 5 is provided which is hydraulically circulated with a pump 6 by way of a control valve 7, in conventional manner. A tubular loop 8 is shunt-connected to the working fluid inlet 9 and exhaust pipe 10 of the motor and this shunt loop includes a selector valve 11 substantially of conventional kind having two effective positions; that is, an open position in which liquid may flow freely around the shunt loop and a closed position which prevents such flow.

In one embodiment of the invention (not illustrated) the selector valve is mounted on the outer end of the outermost portion of the telescopically extensible jib and the selector valve, which is spring loaded so as to influence it always to remain in or to assume its closed position, is operable by a striker button which lies in the path of a lug or the like provided on the crane hook or on the yoke or block which carries that hook. Alternatively, a striker lever or trigger may be provided which is fulcrumned on the outermost end of the jib and which lies in the path of a striker lug or the like so that upon depression of the trigger the trigger then depresses the valve opening button. It will be appreciated that in such an arrangement the pipe shunt loop could consist of a pair of flexible hoses which loop freely from the jib; for preference however the loop is carried inside the jib and is also extensible in the same manner as the jib. To this end the two arms of the loop leading to the selector valve may each consist of a plurality of tubes telescopically assembled one inside the other and each having O-rings or other sealing means at the ends thereof so that each arm of the loop is freely extensible, with the volumetric capacity of the loop remaining substantially constant quite irrespective of the extension thereof.

When the crane is performing a lift and the crane hook nears the top limit of its travel, the selector valve is operated to move into open position so that effective drive of the hydraulic motor is halted by reason of the working fluid being by-passed through the open selector valve. If the crane hook is loaded, such halting of the motor will tend to allow the hook to fall, but in that action the spring loaded selector valve will close itself, thus to restore effective drive to the hydraulic motor and thus by a hunting action the hook is maintained effectively elevated.

It will be appreciated that where the jib is luffed or otherwise operated in a manner tending further to tension the cable portion extending from the winching drum to the fully retracted crane hook, it is necessary for the drive to the drum to be one which will permit the cable to unwind from the drum by the amount necessary to permit the required luffing or similar action. In other words, the drive to the winching drum must not be one which will forbid unwind motion of the drum; for example, the drive should not include a worm reduction gear unless the worm tooth angle is one which will permit the worm wheel to rotate the worm pinion.

As an alternative to the use of telescopically shunt-loop arms reaching to a selector valve on the outermost end of the jib, the said shunt arms may be inextensible and connected to a selector valve mounted on the innermost end portion of the jib.

This is a preferred form of the invention, being that illustrated by FIGS. 1 to 3 (and 4) of the drawings.

Referring to the illustrated embodiment, the main or innermost end portion 12 of the jib carries a single extension 13 borne in portion 12 in conventional manner. Jib portion 12 carries the motor 5 which through a suitable reduction gear (indicated at 14) is able to operate the winching drum 15. Cable 16 extends from drum 15 about guide pulleys 17, on jib portion 13, through lifting hook pulley block 18, and has its end 19 anchored to a suitable point on the jib portion 13.

A bell crank striker lever is mounted on the jib. It consists of an elongated boss in two parts 20 and 21 respectively rotatable in bearings 22 and 23 on the two parts of the jib. This boss is telescopically adjustable in the same manner as the jib; part 21 being slideable within part 20 but incapable of rotation relative thereto; for example, by part 21 being a square shaft slidably homing in a square bore in part 20.

Bos's part 20 carries a bell crank arm 24 which is coupled to the press button or plunger 25 of selector valve 11. Bos's part 21 carries a bell-crank arm 26 which is adapted to be actuated when the block 18 reaches the top of its permitted travel range. Arm 26 could easily be arranged to be actuated by being raised through direct contact with block 18; in such case it would be necessary for the selector valve to be moved to open position upon outward movement of its plunger 25. Alternatively, the selector valve plunger may be reversely set so that the valve will be moved to open position upon inward movement of the plunger. This would necessitate lowering arm 26 upon close approach thereto of block 18. Any common mechanical linkage or striking gear may be used for this purpose. For example, a striker lever or trigger fulcrummed at 27 on the outermost end of the jib; this lever.
having an arm 28 disposed as an obstruction in the upward path of striker lugs 29 on the block 18 and a second arm 30 linked to the bell-crank arm 26.

I claim:

In an extensible jib-crane of the kind incorporating a winching drum operable by a hydraulic motor, a lifting cable trained about a pulley on the free end of the jib and adapted to be wound upon said drum, a pump hydraulically circuited with the motor by way of a working fluid inlet to the motor and an outlet from the motor, means for operating said pump, means for halting said motor comprising a tubular loop shunted across said inlet and outlet, a self-closing valve in said loop, a striker element carried by the portion of said cable suspended from said pulley, and means for opening said valve comprising a bell-crank having a telescopically adjustable boss rotatably mounted on the crane jib, an arm at one end of said boss operatively associated with said valve, and an arm at the other end of said boss movable to open said valve in response to upward movement of said striker element.

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