United States Patent [19]

Quick

[11] **3,863,406**

[45] **Feb. 4, 1975**

[54] **DRIVE MECHANISM FOR JIB CRANES**

[75] Inventor: **Donald J. Quick,** West Bundaberg, Queensland, Australia

[73] Assignee: **International Harvester Company,** Chicago, Ill.

[22] Filed: **Oct. 9, 1973**

[21] Appl. No.: **404,550**

[30] **Foreign Application Priority Data**

Oct. 9, 1972 Australia 748/72

[52] **U.S. Cl.** **52/115,** 52/118, 52/121, 212/144

[51] **Int. Cl.** **B66c 23/64**

[58] **Field of Search** 52/111, 114, 117, 115, 52/118, 116, 121; 212/55, 144; 214/141, 761, 762

[56] **References Cited**

UNITED STATES PATENTS

1,611,326	12/1926	Abbe	212/55
2,703,634	3/1955	Lee	52/115
2,992,710	7/1961	Thompson	52/114
3,055,459	9/1962	Eitel	52/115
3,236,393	2/1966	Girardi	212/55
3,319,803	5/1967	Northcott	212/55
3,346,281	10/1967	Thompson	52/115 X
3,465,904	9/1969	Pensa	214/141 X
3,480,109	11/1969	Eitel	212/55
3,670,465	6/1972	Cheze	52/115
3,800,965	4/1974	Barron	212/55 X

FOREIGN PATENTS OR APPLICATIONS

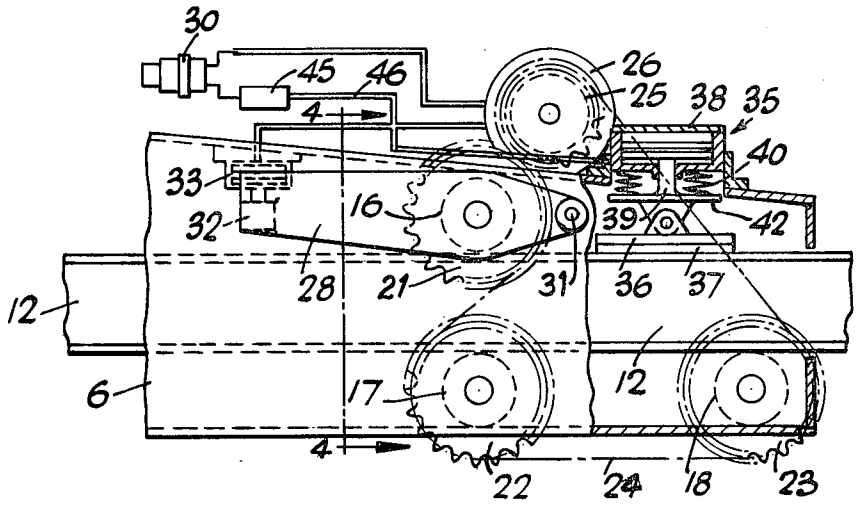
970,879	9/1964	Great Britain	52/111

Primary Examiner—Ernest R. Purser
Assistant Examiner—Leslie A. Braun
Attorney, Agent, or Firm—Raymond E. Parks; Floyd B. Harman

[57] **ABSTRACT**

An extensible jib for a crane comprising two jib sections arranged in telescopic relation with a pair of driven rollers engaging the inner section and operable to extend or retract the jib. Brake means are provided to hold the jib sections in any selected position, the brake means being operable in response to operation of the driven roller to release the brake when the rollers are driven and apply the brake when the rollers are not driven.

3 Claims, 4 Drawing Figures



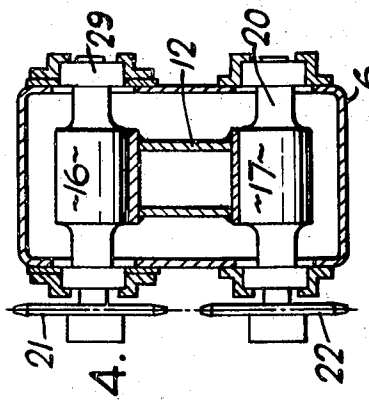


FIG. 4.

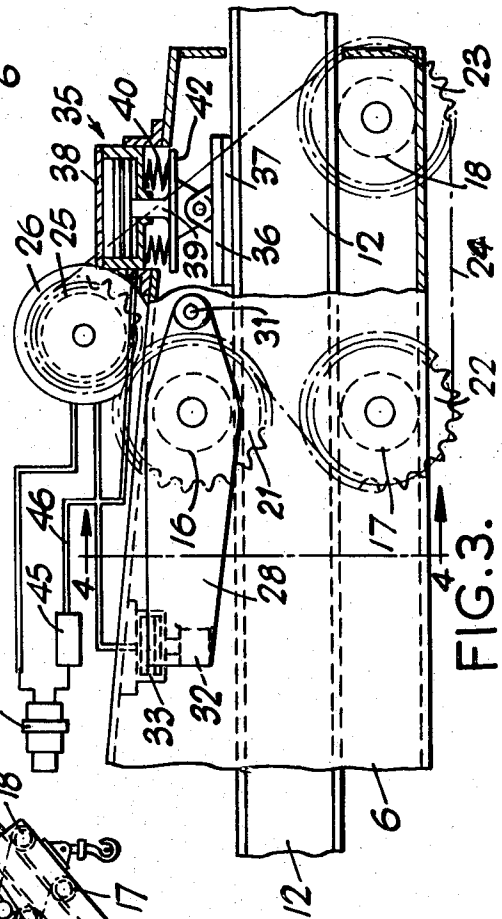


FIG. 3.

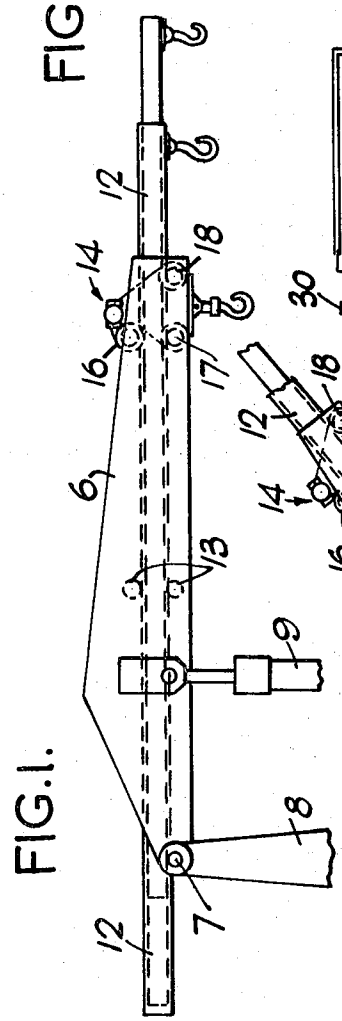


FIG. 1.

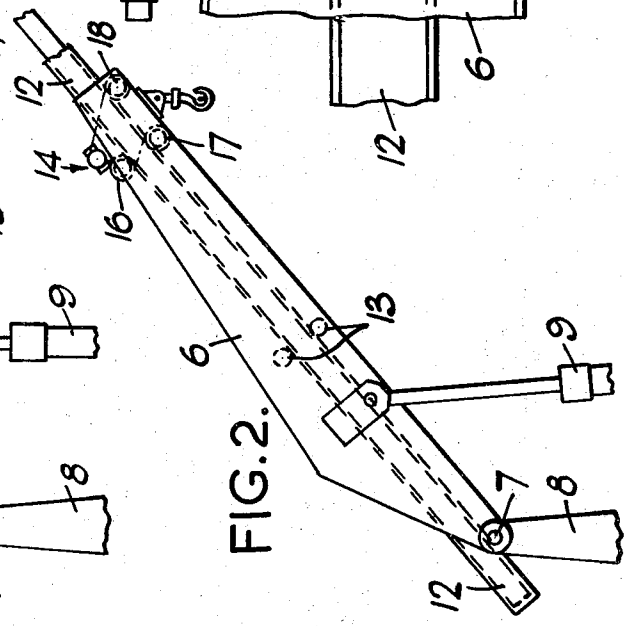


FIG. 2.

DRIVE MECHANISM FOR JIB CRANES

This invention relates to an extension drive for a crane jib.

Many cranes are provided with an extendable jib, usually of a telescopic construction with rollers or slides provided at the front end of the main jib to support the extension portion. Hydraulic cylinders are usually mounted in line with, and behind the jib extension to effect extension and retraction thereof, and this restricts the practical length of the jib extension.

It is an object of the present invention to provide a means for effecting the movement of a jib extension which allows a maximum length of extension to be used.

Thus according to the present invention there is provided a drive mechanism for an extensible crane jib having a main jib section and an extension jib section arranged in a telescopic relation, said drive mechanism comprising at least two spaced rollers engaging opposite faces of the extension jib section, drive means coupled to at least one roller to effecting movement of the extension jib section relative to the main jib section to extend or retract the extension jib section, and brake means operable to lock the extension jib section relative to the main jib extension and releasable in response to energisation of the drive means.

It is preferred that the drive means includes an hydraulic motor and the brake means is adapted to be hydraulically released, the hydraulic circuits of the motor and brake means are interconnected so that the brake means is released when the motor is energised.

In the case where a hydraulic motor is used, the pressure required to operate the hydraulic motor is also fed to a piston operated brake pad. The application of pressure releasing the pad from contact with the extension. In its normal position the brake is pressed against the extension jib section by a compressed spring. Thus if the hydraulic motor is switched off or if a sudden pressure drop should occur, the brake is immediately applied.

In a practical arrangement there is provided the hydraulic motor which is operated by fluid pressure from the crane pump, and a valve is provided to control the direction of rotation of the motor. A chain and sprocket drive connects the motor with a roller disposed on the upper side of the extension jib section and two rollers disposed on the lower side thereof. The upper roller is supported on a frame pivotally supported on the main jib section and is connected to a hydraulical cylinder which is alos connected to the pressure line of the motor, so that when the motor is operating the upper roller is pressed into driving contact with the extension jib section. As an alternative arrangement, this hydraulic cylinder may be replaced by a spring load of sufficient force to maintain the required driving contact.

The jib of the crane may be raised by increasing the inclination of the jib to the horizontal. As the inclination to the horizontal is increased, the motor torque required to extend it will also increase, and the contact pressure between the rollers and the extension section would decrease. By the use of the hydraulic cylinder to apply clamping pressure to the roller, the grip on the jib extension is maintained by the hydraulic pressure in the motor circuit.

It can be seen from the above that the present invention provides an extendable job drive mechanism which avoids the need for a hydraulic extension cylinder and allows for the incorporating of a longer extension section. Also the weight of the extension jib section, and hence the stability of the crane is not varied by the weight of the hydraulic fluid or the extension of the hydraulic ram as with prior art cranes.

The invention will be more readily understood from the following description of one practical arrangement of a crane jib incorporating a drive and brake mechanism in accordance with the present invention. This arrangement of the jib is depicted in the accompanying drawings wherein:

FIG. **1** is a diagrammatic representation of a typical extendable crane jib located in the normal horizontal position;

FIG. **2** is a view similar to FIG. **1** with the jib in an elevated position;

FIG. **3** is an enlarged view of the forward end of the jib, partly in section, showing the drive and brake mechanisms;

FIG. **4** is a sectional view along line **4**—**4** in FIG. **3**.

Referring now to the drawings, the jib crane comprises a main jib **6** pivotally supported at **7** to the crane frame **8** with the lift cylinder **9**, connected between the main jib **6** and a portion of the frame not shown, so that the main jib may be pivoted relative to the frame by extending or retracting the cylinder **9**.

Slidably supported within the main jib **6** is the jib extension **12** which may be extended or retracted in a telescopic fashion to vary the effective length of the jib. The jib extension **12** is supported in the main jib **16** and guided during its movement by the stabilizing rollers **13** supported in the main jib and the rollers **16**, **17** and **18** forming part of the drive mechanism **14** at the forward end of the main jib **6**. The jib extension **12** rests on the rollers **17** and **18** so that the latter engage the underface of the jib extension and the roller **16**, which is substantially vertical above the roller **17**, engages the top face of the jib extension.

The main jib **6** is of a generally box type construction with the jib extension **12** located therein in a telescoped relation. The two rollers **17** and **18** engaging the underside of the jib extension **12** are supported in respective pairs of bearings **20** mounted in opposite sides of the main jib. The roller **16** is supported in bearings **29** carried in respective arms **28** located externally of the main jib **6**. Each of the arms **28** are pivoted to the main jib **6** on a common axis **31**, parallel to the axis of the roller **16**. At the other end the arms **28** are interconnected by a cross member **32** extending through the main jib **6**.

The single acting hydraulic cylinder **33** is attached to the main jib **6** with the piston rod thereof connected to the cross member **32** so that when fluid is applied to the hydraulic cylinder **33**, the arms **28** pivot relative to the main jib **6** to cause pressure engagement between the roller **16** and the upper face of the jib extension **12**. The reaction to the pressure applied through the roller **16** is taken by the rollers **17** and **18** so that in effect the application of pressure to the hydraulic cylinder **33** causes pressure contact between the three rollers and the jib extension **12**. The hydraulic cylinder **33** is interconnected with the hydraulic circuit of the motor **26** so that when the motor is operated fluid under pressure is delivered to the hydraulic cylinder **33** so as to establish

pressure contact between the rollers and the jib extension during the driving operation.

Each roller has an axial extension at one end carrying respective sprockets **21, 22** and **23** coupled by the chain **24** to the sprocket **25** mounted on the shaft of the hydraulic motor **26.** The chain **24** is engaged by the sprocket **21** driving the roller **16** on the external side of the chain, whilst the sprockets **22** and **23** driving the rollers **17** and **18** engage the innerside of the chain so that rollers **17** and **18** rotate in the opposite direction to the roller **16.** As the roller **16** engages in opposite face of the jib extension, the three rollers in fact drive the jib in the same direction. The hydraulic motor **26** is reversible and is controlled by the valve **30** so that the jib extension may be extended or retracted by the operation of the hydraulic motor **26** driving the rollers **16, 17** and **18.**

The brake mechanism **35** comprises the back plate **36** carrying the friction pad **37,** and the hydraulic cylinder **38** connected via the piston rod **39** to the back plate **36.** The hydraulic cylinder **38** is rigidly attached to the main jib **6,** and the pair of pressure springs **40** are interposed between the cylinder and the pressure plate **42** carried by the piston rod **39.** The springs **40** urge the friction pad via the back plate **36** and pressure plate **42** into frictional contact with the upper face of the jib extension **12,** and thus acts as a brake to hold the jib extension **12** in the desired position relative to the main jib **6.** The hydraulic cylinder **38** is a single acting cylinder with hydraulic fluid being admitted to the underside of the piston as viewed in FIG. **3,** to raise the piston, and hence raise the back plate and friction pad, against the action of the springs **40** to release the jib extension for extending or retracting movement relative to the main jib.

The hydraulic cylinder **38** which releases the brake mechanism **35** is connected to the hydraulic circuit of the motor **26** so that whenever the motor is operated to extend or retract the jib extension, fluid pressure is applied to the underside of the piston to raise the friction pad, and thus release the brake on the jib extension.

It will be appreciated that if the jib is upwardly inclined the extension would tend to retract under gravity without operation of the motor. However in order to release the brake, pressure is required in the hydraulic circuit of the motor. Accordingly the one way pressure valve **45** is provided in the return line **46** of the motor hydraulic circuit so that any rotation of the motor will develop pressure in the return line sufficient to release the brake, and cause the rollers to grip the jib extension. This arrangement ensures that retraction of the jib extension is at all times under the control of the motor.

I claim:

1. In a crane having an elongated cantilevered main jib of the box type construction, an extendable and retractable elongate extension jib of uniform rectangular cross section telescopically mounted within the main jib, hydraulic power means including means for selectively energizing the power means for telescopically extending and retracting the extension jib, and securing means for holding the extension jib in place following telescopic movement, the improvement comprising:

a U-shaped lever having the ends of the extending arms of the U hinged to the lateral sides of the main jib and the cross-member of the U passing transversely through the lateral sides of the main jib;

a first roller mounted on a first shaft passing transversely through the lateral sides of the main jib and being journalled to the arms of the U-shaped lever, the first roller sitting on top of the extension jib;

a second roller mounted on a second shaft passing transversely through and being journalled to the latteral sides of the main jib and supporting the bottom of the extension jib, the axis of the second shaft being vertically aligned with the axis of the first shaft;

a third roller spaced horizontally from and parallel with the second roller and being mounted on a third shaft passing transversely through and being journalled to the lateral sides of the main jib and supporting the bottom of the extension jib;

a pulley wheel keyed to each shaft including a continuous belt means drivingly connecting the pulley wheels to the hydraulic power means for rotating the rollers in unison and telescopically moving the extension jib upon energization of the hydraulic power means;

a brake shoe sitting on top of the extension jib in the space between the vertical planar axes of the second and third shafts;

first and second hydraulic power ram means mounted on the main jib and each having first and second piston rod means respectively and being hydraulically connected to the hydraulic power means for simultaneous energization of the piston rod means with the power means, the first piston rod means being connected to the brake shoe for lifting the brake shoe from the extension jib upon energization thereof, the second piston rod means being connected to the cross-member of the U for swinging the arms of the U upon energization thereof and squeezing the extension jib between the rotating rollers; and

spring means between the brake shoe and the first piston rod means for pressing the brake shoe against the top of the extension jib upon the simultaneous de-energization of the hydraulic power means and piston rod means for halting the movement of the extension jib.

2. In the combination, as claimed in claim **1,** wherein the three rollers are of identical diameter and the pulley wheels for each shaft are of identical diameter.

3. In the combination, as claimed in claim **2,** wherein the pulley wheels comprise sprocket gears of identical size and the endless belt is a chain trained about the sprocket gears, and the hydraulic power means includes a sprocket gear drivingly connected to the chain.

* * * * *