Nov. 6, 1951 M. O. SOUZA 2,573,997

SAFETY DEVICE

Filed July 15, 1946 2 SHEETS—SHEET 1

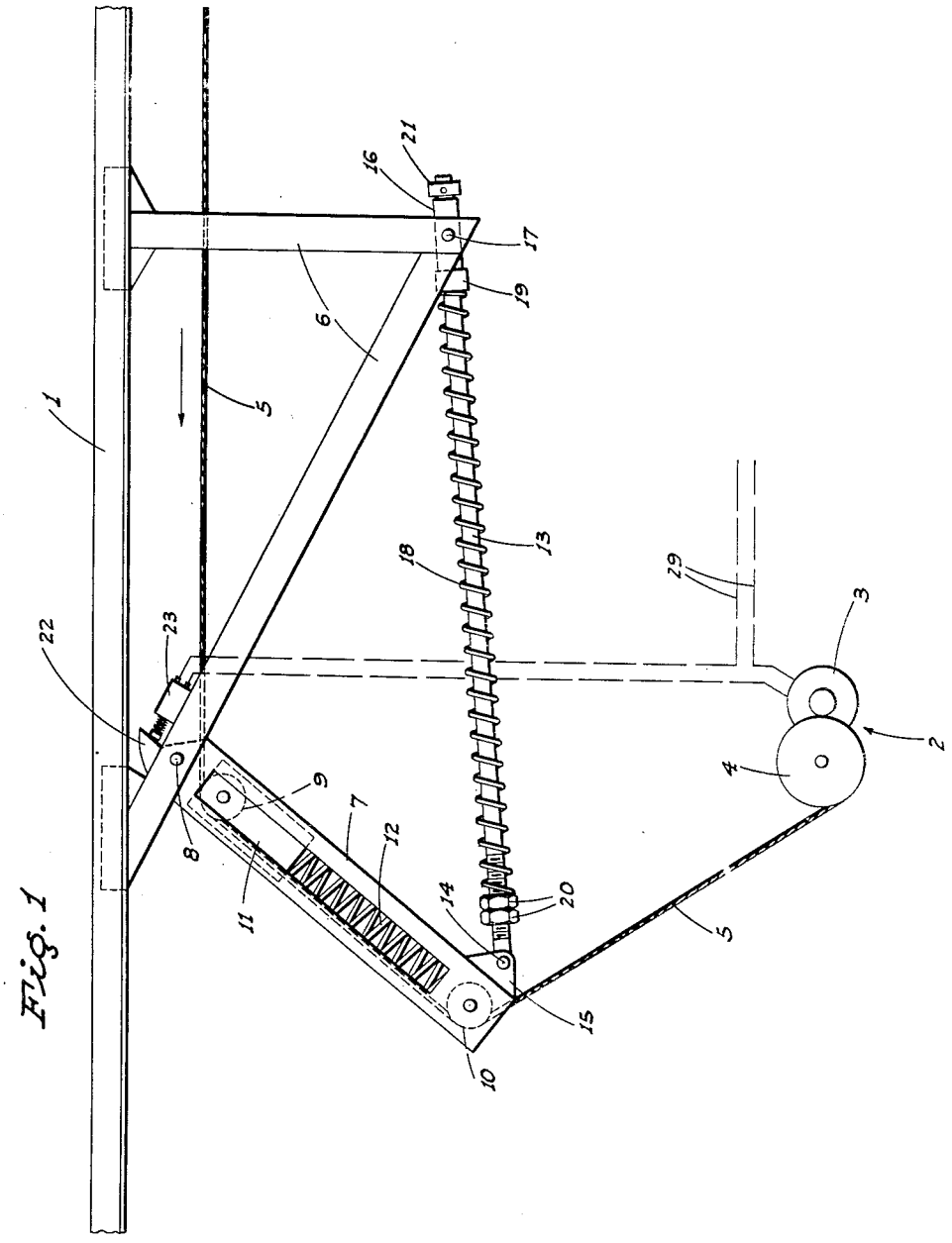


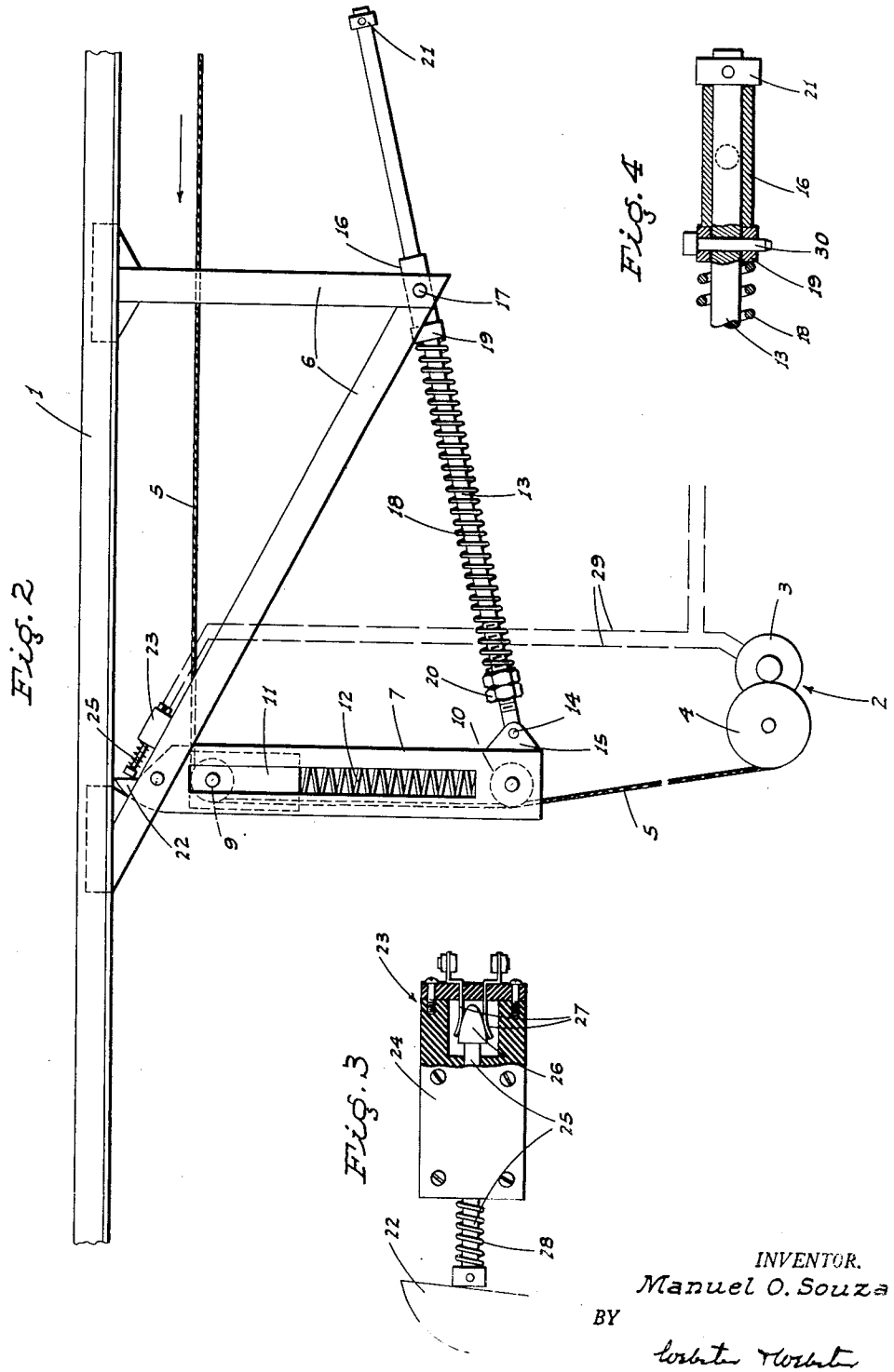
Fig. 1

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SAFETY DEVICE

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4 Claims. (Cl. 254—173)

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This invention relates in general to an improved safety device for an electric motor driven winch and cable system.

In particular the invention is directed to, and it is an object to provide, a novel circuit breaker for the electric motor which drives a cable winch; said circuit breaker being operative upon tension on the cable becoming excessive.

Another object of the invention is to provide a circuit breaker, as above, which includes a sheave carrying member engaging a portion of the cable intermediate its ends, said member being spring-urged in a direction to normally deflect such portion of the cable out of its direct line of pull, and a normally closed switch arranged to be opened by movement of said member caused by excessive tension on said portion of the cable and its resultant tendency to straighten out and assume said direct line of pull.

A further object of the invention is to provide a circuit breaker which is mainly mechanical in structure and does not embody any expensive or complicated electrical apparatus; the switch being of simple make and break type. The circuit breaker is thus rugged and long lived—requiring a minimum of maintenance or repair.

A further object of the invention is to provide a practical safety device, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a side elevation of the circuit breaker with the parts in normal position and the switch closed.

Fig. 2 is a similar view, but shows the position of the parts resulting from excessive tension on the cable, and with the switch open.

Fig. 3 is an enlarged view, partly broken away, of the switch, detached.

Fig. 4 is an enlarged fragmentary elevation, mainly in section, showing the locking arrangement.

Referring now more particularly to the characters of reference on the drawings, the safety device or circuit breaker is here shown suspended from an overhead support 1 disposed some distance above a winch unit, indicated generally at 2, and which includes an electric motor 3 driving a cable drum 4.

A cable 5 is disposed with a working reach thereof substantially parallel to, and below, the overhead support 1, and thence extends downwardly through the circuit breaking mechanism in the manner hereinafter described, and then connects to the drum 4. The device which the working reach of the cable 5 operates is not here shown, but may be, for example, the carriage and hay fork unit of my co-pending application, Serial No. 596,125, Patent No. 2,423,732, July 8,

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1947, entitled Hay Loading Apparatus. In this event the overhead support 1 would of course be the overhead track of the identified application.

A generally triangular frame 6 is fixed in connection with the overhead support 1 and depends therefrom in rigid relation. A switch control arm 7 is pivoted at its upper end, as at 8, in connection with one end portion of the frame 6 for swinging motion in a longitudinal vertical plane.

The arm 7 carries direction changing sheaves 9 and 10 in the upper and lower ends thereof, respectively, and about which sheaves the cable 5 passes. The sheave 9 is vertically resiliently mounted by means of a slide block 11 on the arm 7 urged upwardly by a compression spring 12. The arm 7 is normally swung in a direction to deflect the cable 5, between the sheave 9 and drum 4, out of its direct line of pull; said arm then being disposed at a downward and outward incline, as shown in Fig. 1. The arm 7 is urged to such normal position by means of the following arrangement;

A slide rod 13 is pivoted, as at 14, between ears 15 on the lower end of arm 7, and said rod thence extends substantially horizontally through a guide sleeve 16 pivotally mounted, as at 17, on the lower end portion of the depending frame 6 some distance from the arm 7. A heavy-duty compression spring 18 surrounds the slide rod 13 between a head 19 on the inner end of the guide sleeve 16 and adjustable nuts 20 on the opposite end portion of said rod. A stop collar 21 on the free end of the rod 13 prevents its escape from the guide sleeve 16. It will be seen that with this arrangement the spring 18, bearing against the nuts 20 and head 19, urges the rod in a direction to swing the arm 7 to its normal inclined position, but permitting of movement of said arm toward vertical against the compression of such spring.

At its upper end, and above the pivot, the switch control arm 7 includes a longitudinally projecting finger 22, and a switch 23 is mounted on the frame 6 adjacent said finger.

The switch 23, which is shown in detail in Fig. 3, includes a body 24 having a plunger 25 therein; said plunger carrying a contact head 26 adapted to move between an open position, and a closed position in engagement between switch fingers 27. The plunger 25 is urged by a spring 28 to a switch opening position.

When the switch control arm 7 is in its normal inclined position, the finger 22 bears against the plunger 25, and working against the spring 28 engages the contact head 26 between the switch fingers 27, closing the switch. The switch 23 is interposed in the circuit 29 for the motor 3, and as said switch is normally closed it does not interrupt normal operation of said motor.

The spring 18 is of sufficient strength to resist swinging of the arm 7 under normal tension on the cable 5. However, if excessive tension occurs on the cable the arm 7 is swung toward vertical

by reason of the tendency of the cable to then straighten out and assume its direct line of pull between sheave 9 and drum 4. Upon the arm 7 swinging toward vertical the finger 22 backs away from the switch plunger 25 and the spring 28 opens the switch 23, breaking the circuit. In this manner an automatic circuit breaking is accomplished. When the excessive tension on cable 5 is relieved the device assumes its normal position, and the circuit is reestablished.

By resiliently mounting the sheave 9 on the switch control arm 7, a shock absorber for the cable is provided; such shock absorber serving to prevent momentary stress on the cable from causing operation of the circuit breaker. This shock absorber also acts to minimize cable breakage.

Under certain conditions it may be desirable to lock the circuit breaker against operation, and this is accomplished by the expedient of a locking cross pin 30 adapted for removable engagement through matching holes in the slide rod 13 and head 19, as clearly shown in Fig. 4.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful and upon which Letters Patent is desired:

1. A circuit breaker for the circuit of an electric motor driven winch and cable system, comprising a frame, an arm pivoted adjacent one end on the frame for swinging motion laterally of the cable, one sheave on the arm adjacent its pivot, and another sheave on the arm adjacent its opposite end, the cable being engaged by said sheaves, a spring-urged rod connected to the arm and urging the same in one direction to a position normally deflecting the cable out of a direct line of pull, a normally closed switch in the circuit, and means operative to open the switch upon excess tension on the cable and resultant movement of the arm in the opposite direction as caused by tendency of the cable to then straighten out to said direct line of pull; the cable extending beyond the pivoted end of the arm in said opposite direction, and said one sheave being mounted on the arm for yielding movement toward the other sheave.

2. A circuit breaker for the circuit of an electric motor driven winch and cable system, comprising a frame above the winch, a depending arm pivoted at its upper end to the frame, one horizontal axis sheave journaled on the arm adjacent its upper end, another horizontal axis sheave journaled on the arm adjacent its lower end, a cable extending substantially horizontal and thence passing over said one sheave and extending downward to the winch, spring means yieldably urging the arm in one direction to an inclined position, the other sheave then engaging the cable and deflecting the adjacent portion thereof out of a direct line of pull between said one sheave and the winch, a switch in the circuit, means on the arm normally holding the switch closed when the arm is in said inclined position, and means operative to open the switch upon excess tension on the cable and resultant movement of said arm toward vertical as caused by tendency of said cable portion to straighten out to said direct line of pull; said spring means being a rod engaged with the arm, a guide on the frame for the rod, and a spring acting on the rod to swing the arm to said inclined position.

3. A safety device for the purpose described comprising a fixed support, a motor operated cable winch located below the support, an electric operating circuit for the motor, a control switch in the circuit, a swingable control arm pivoted to and tending to depend vertically from the support, a sheave journaled on a horizontal axis in each end of the arm, the axes of the sheaves being parallel, a load pull cable wound on the winch drum and thence reeved vertically over both sheaves on the same side of the arm and thence extending horizontally, yieldable means pushing the arm to a position at an angle from vertical, such means being yieldable in response to tension on the cable imposed by a load thereon greater than a predetermined maximum whereby the arm will then swing toward vertical position, and means between the arm and switch and operative to open and close the switch as the arm swings to vertical or angled position, respectively; said yieldable means comprising a hanger frame depending from the support at a spaced distance from the arm, a sleeve pivoted in the lower end of the hanger frame, a rod pivoted at one end to the lower end of the arm, said rod being slidably disposed through the sleeve, a stop on the rod spaced from the sleeve and a compression spring about the rod between the sleeve and stop.

4. A safety device for the purpose described comprising a support, a motor operated cable winch located below the support, an electric operating circuit for the motor, a control switch in the circuit, a swingable control arm pivoted to and tending to depend vertically from the support, a first sheave journaled on a horizontal axis in the lower end of the arm, a block slidably mounted in the arm adjacent the opposite end thereof, yieldable means normally pressing the block toward said last named end of the arm, a second sheave journaled on a horizontal axis in said block in parallelism with the axis of the first sheave, a cable wound on the winch drum and thence reeved vertically over both pulleys on the same side of the arm and thence extending horizontally, yieldable means pushing the arm to a position at an angle from vertical, such means being yieldable in response to tension imposed on the cable by a load thereon in excess of a predetermined maximum whereby the arm will then swing toward vertical position, and means on the arm operative to open and close the switch as the arm swings to vertical or angled position, respectively.

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