

Oct. 17, 1944.

J. STURDY

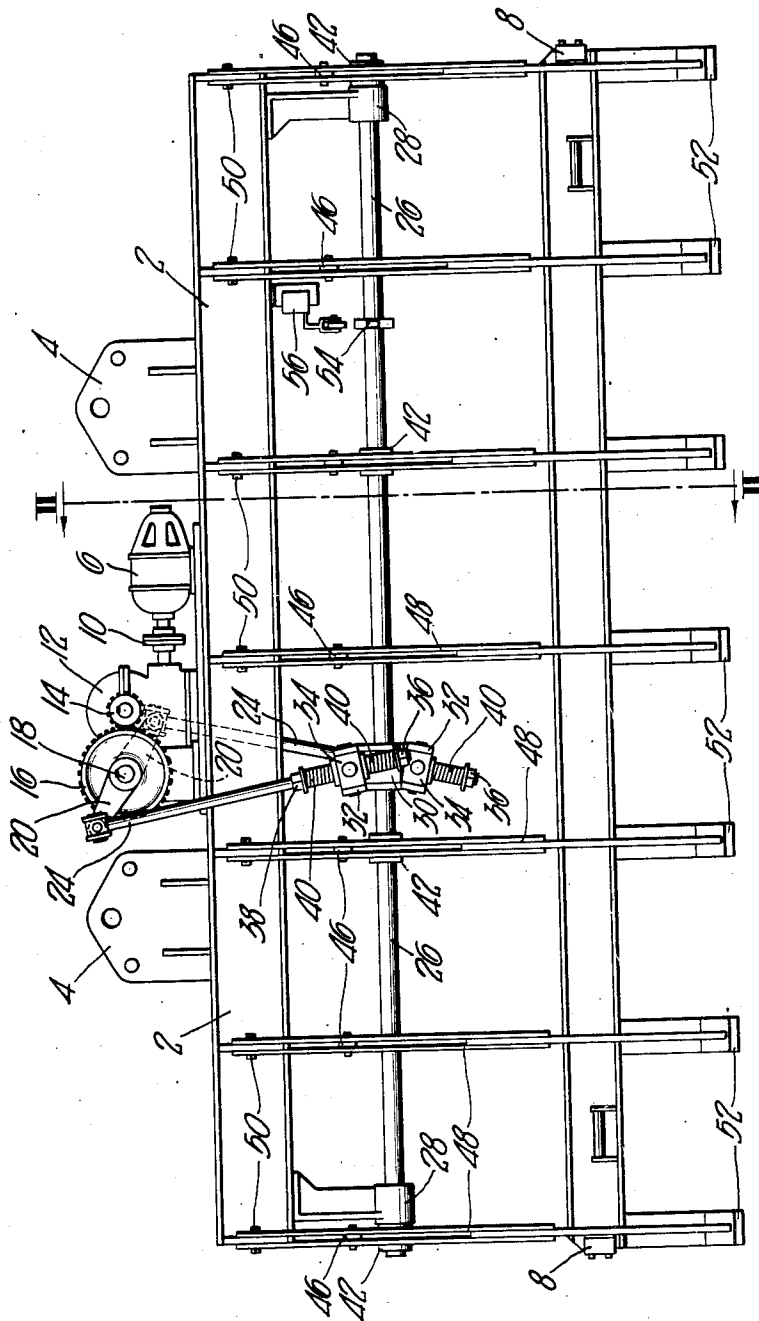
2,360,740

DRIVE FOR SHEET PACK LIFTER

Filed Sept. 21, 1943

3 Sheets-Sheet 1

FIG. 1-



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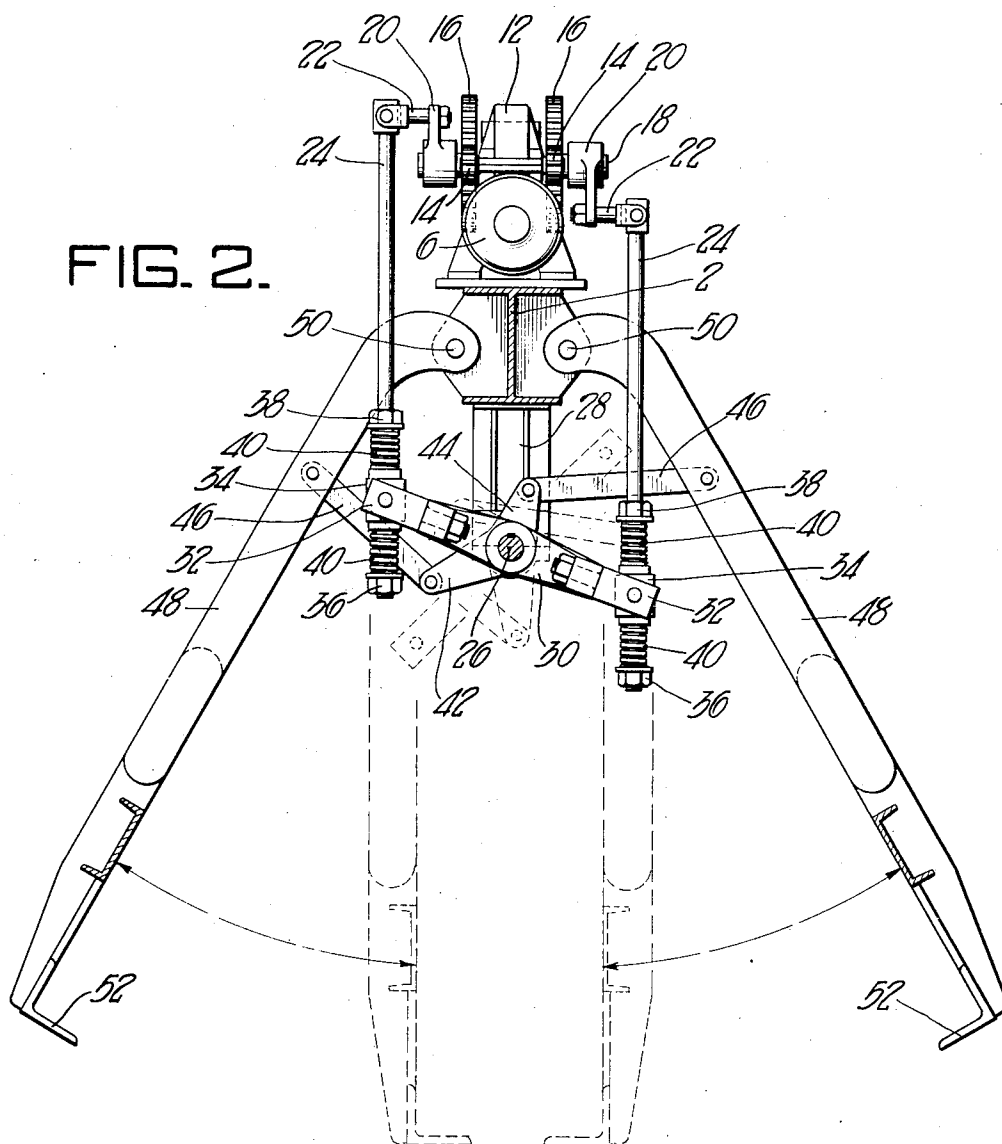
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3 Sheets-Sheet 2

FIG. 2.



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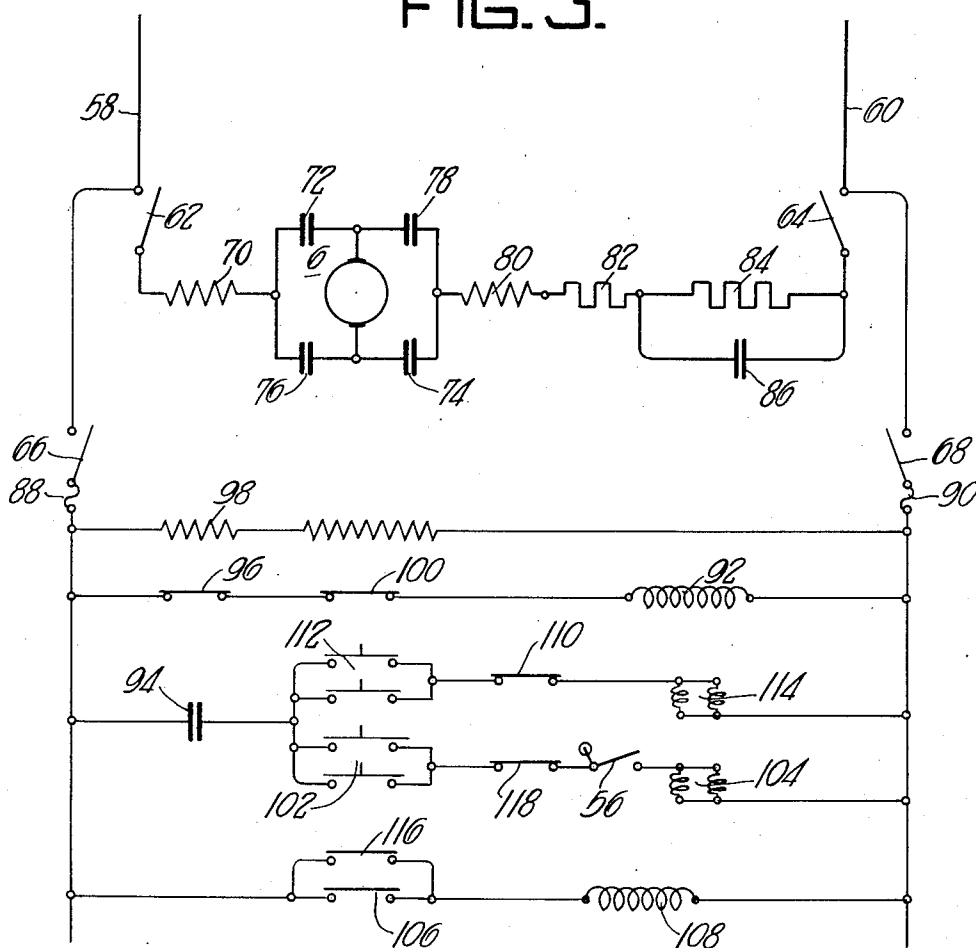
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DRIVE FOR SHEET PACK LIFTER

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3 Sheets-Sheet 3

FIG. 3.



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DRIVE FOR SHEET PACK LIFTERS

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Application September 21, 1943, Serial No. 503,269

7 Claims. (Cl. 294—67)

This invention relates to a drive for a sheet pack lifter of the type disclosed in the patent to Cullen, No. 2,256,896. This type of lifter has a pair of opposed complementary jaws which are carried by a supporting element and which are shiftable to and from one another into and out of engagement with the side margins of the sheets, by means of gearing driven by a reversible motor. To prevent damage due to shock or impact, there is a lost motion spring-type driving connection in the gearing and a slip-type coupling is provided to protect the motor from overload. A brake prevents the jaws from swinging inwardly from extended position due to the action of gravity. The drive disclosed in the above mentioned patent to Cullen, is suitable for handling light loads, but has proved to be unsuitable for handling heavy loads.

One object of the invention is to provide a lifter which is capable of handling heavy loads.

Another object of the invention is to provide a drive having an improved lost motion device.

A further object of the invention is to provide improved means for holding the jaws in extended position.

A still further object is to provide a jam load relay for the motor and thereby eliminate the mechanical overload protective device of the Cullen drive.

These and other objects will be more apparent after referring to the following description and attached drawings, in which:

Figure 1 is a front elevation of the pack lifter; Figure 2 is a sectional view on the line II—II of Figure 1; and

Figure 3 is a simplified wiring diagram of the motor circuit.

Referring more particularly to the drawings, the reference numeral 2 indicates the frame of a pack lifter with brackets 4 welded to the top thereof. The brackets are designed so that they may be grasped by a crane to be lifted thereby. Mounted on the frame 2 between the brackets 4 is a reversible electric motor 6 which may be actuated by means of push button switches at a switch station 8 located at each end of the lifter. The electrical circuit for the motor will be described later. The coupling 10 connects the motor 6 to a non-reversible worm gear reducer 12 which carries pinions 14 on each end of its shaft. Each of the pinions 14 drives a gear 16 which is mounted on a shaft 18. On the outer end of the shaft 18 are mounted crank arms 20. Pins 22 attached to the outer end of crank arms 20 are fastened to connecting rods 24 which extend downwardly on each side of a shaft 26 which is mounted in bearings 28 suspended from the frame 2. A cross arm 30 is fastened to the shaft 26 and carries a yoke 32 at each end. The yokes are arranged to revolve on their axes at the ends of

the cross arm 30 and are pinned to blocks 34 through which the connecting rods 24 extend. The lower end of each of the rods 24 is threaded to receive nuts 36 and 38 which act as abutments for springs 40 which surround the shaft 24 between nuts 36 and 38 and the block 34. The shaft 26 carries a plurality of arms 42 and 44 which have links 46 pivotally mounted on the outer ends thereof. The free ends of the links 46 are pivotally connected to the load-carrying arms or jaws 48 which are pivotally connected to the frame 2 by means of pins 50. The lower end of the arms 48 have angles 52 welded thereto for supporting the pack of sheets. Between the bearing 28 the shaft 26 carries a bracket 54 which is adapted to trip a limit switch 56 when the jaws 48 are moved into the outer position shown by solid lines in Figure 2.

Figure 3 discloses a schematic wiring diagram for the reversible motor 6. The power lines 58 and 60 are provided with conventional line switches 62, 64 and control switches 66 and 68 which are closed when operating. In the motor armature circuit are overload protection coil 70, forward contactors 72, 74, reverse contactors 76, 78, the series field 80, permanent resistance 82 and resistance 84. The contactor 86 closes after a certain motor speed is attained thus shunting out the resistance 84. The resistance 82 is in series with the motor armature when running and decreases the maximum torque of the motor to prevent damage to the mechanical equipment. The resistance 84 prevents the overload protection coil 70 from acting too quickly. Fuses 88 and 90 protect the control circuits and the shunt field. 92 is a low voltage protection coil which closes contactor 94 when proper operating voltage is applied to the coil 92. In case of overload at protection coil 70, the contactor 96 opens and causes coil 92 to open contactor 94 and in case of failure of the shunt field, the field protective relay 98 opens the contactor 100 and causes coil 92 to open contactor 94.

The operation of the device is as follows:

The pack lifter is adapted to grasp a pack of sheets between the jaws 58 when they are in the dotted line position shown in Figure 2. When it is desired to release the pack, proper operating voltage is applied to the coil 92, which closes the contactor 94. One of the reverse switches 102, which are located at switch stations 8, is then closed, this energizing coil 104 which closes contactors 76 and 78 to admit current to the motor armature. At the same time contactor 106 is closed, energizing coil 108, this opening contactor 86. Contactor 110 is also opened, which opens the forward control circuit and prevents damage in case one of the forward push buttons should be operated when the motor is running in reverse. After a certain motor

speed is obtained contactor 86 closes, thus shunt-out resistance 84.

As the motor operates in reverse it drives the gear reducer 12 which rotates the pinions 14 to drive the gears 16 causing the crank arms 20 to rotate. As crank arms 20 rotate, the right-hand connecting rod 24, as seen in Figure 2, is lowered and the left-hand connecting rod raised. Motion is transmitted to the cross arm 30 through the pressure on springs 40. The shaft 26 is rotated through about 70° in a clockwise direction, causing the arms 42 and 44 through the links 46 to raise jaws 48 to the position shown in full lines in Figure 2. The pressure on the springs 40 determines the force required to open and close the jaws 48, the pressure being adjustable by means of nuts 36 and 38. The springs 40 and associated mechanism act as shock absorbers with the shock due to accidental locking of jaws 48 being transmitted directly thereto without straining any intermediate gears or other working parts. When the lifting jaws 48 reach their extreme outer position shown in full lines in Figure 2, the limit switch 56 opens the reverse circuit stopping the movement of the arm. In this position the worm gear reducer 12 acts as a brake to prevent the legs 48 from coming together.

When the jaws are to be brought together to engage a pack of sheets, one of the forward push buttons 112 located at switch station 8, is closed, this energizing coil 114 which closes contactors 72, 74 and 116 and opens contactor 118. The closing of contactors 72 and 74 admits current to the motor armature and the closing of contactor 116 energizes coil 108 which opens contactor 86. The opening of contactor 118 opens the reverse control circuit and prevents damage in case one of the reverse push buttons should be operated while the motor is running forward. With the motor running in the forward direction, the shaft 26 is rotated in a counterclockwise direction in a manner similar to that in which it was rotated in a clockwise direction with the motor rotating in the reverse direction. This causes the jaws 48 to be moved together to the dotted line position shown in Figure 2. The operator stops the movement of the jaws inwardly at the desired position by operating a push button switch at one of the switch stations 8. The springs 40 provide a time interval between the engagement of the jaws 48 with a pack of sheets and the stoppage of the motor 6.

While one embodiment of the invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A lifter of the class described comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a worm gear reducer driven by said motor, a pair of crank arms driven by said reducer, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, and a lost motion connection between each rod and said cross arm.

2. A lifter of the class described comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a relay

to protect the motor from damage due to overload, a pair of crank arms driven by said motor, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, and a lost motion connection between each rod and said cross arm.

3. A lifter of the class described comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a relay to protect the motor from damage due to overload, a worm gear reducer driven by said motor, a pair of crank arms driven by said reducer, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, and a lost motion connection between each rod and said cross arm.

4. A lifter comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a pair of crank arms driven by said motor, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, a yoke carried at each end of said cross arm, a block pinned to each yoke, one of said rods sliding in each of said blocks, a pair of abutments on each rod, and a spring between each of said abutments and the block.

5. A lifter comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a worm gear reducer driven by said motor, a pair of crank arms driven by said reducer, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, a yoke carried at each end of said cross arm, a block pinned to each yoke, one of said rods sliding in each of said blocks, a pair of abutments on each rod, and a spring between each of said abutments and the block.

6. A lifter comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a relay to protect the motor from damage due to overload, a pair of crank arms driven by said motor, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, a yoke carried at each end of said cross arm, a block pinned to each yoke, one of said rods sliding in each of said blocks, a pair of abutments on each rod, and a spring between each of said abutments and the block.

7. A lifter comprising in combination a pair of oppositely facing complementary jaws mounted to move to and from one another, a reversible electric motor, a relay to protect the motor from damage due to overload, a worm gear reducer driven by said motor, a pair of crank arms driven by said reducer, a rod connected to each crank arm, a revolving cross arm connected to said jaws operative to move them to and from one another, a yoke carried at each end of said cross arm, a block pinned to each yoke, one of said rods sliding in each of said blocks, a pair of abutments on each rod, and a spring between each of said abutments and the block.

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