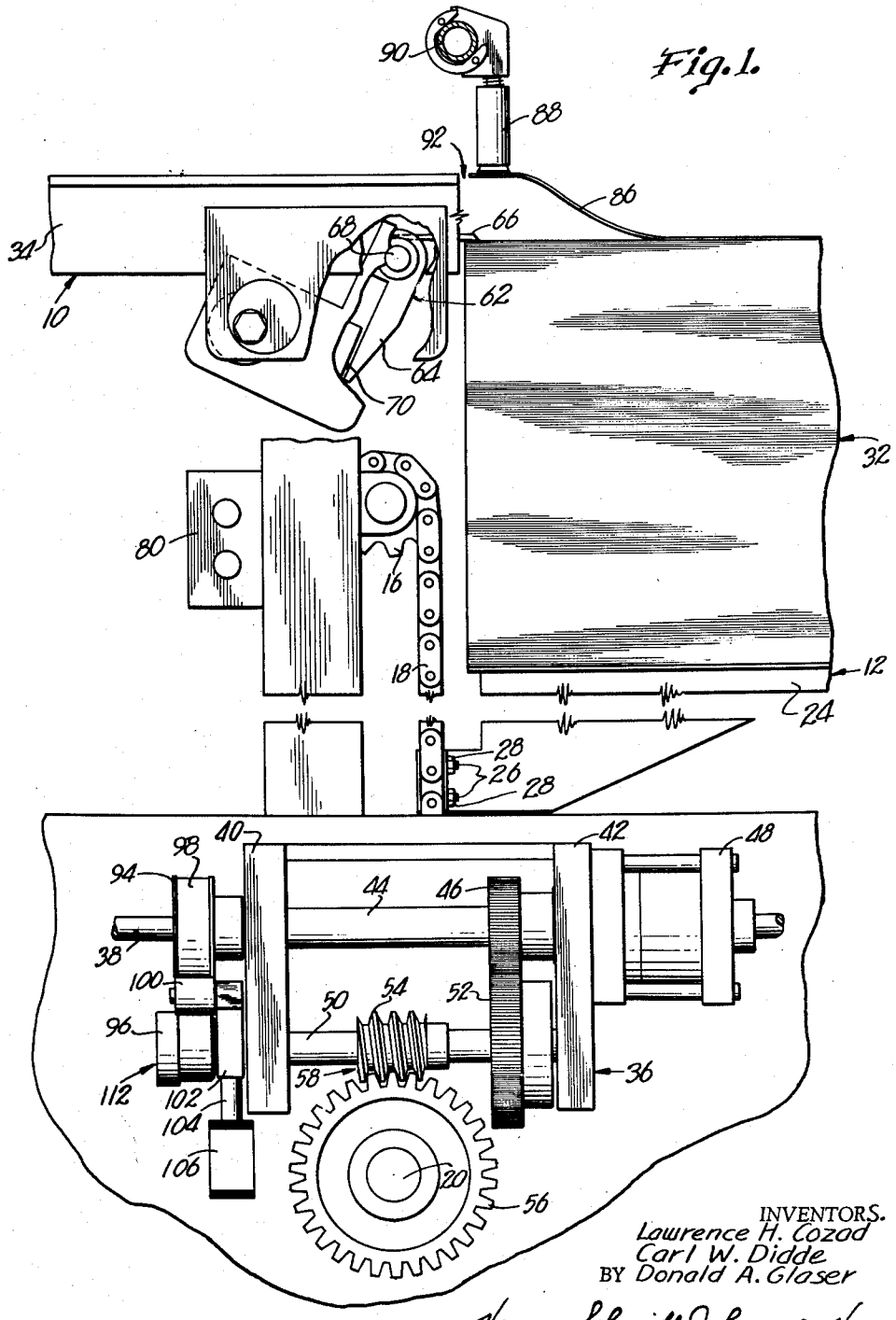
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PILE LIFT ASSEMBLY

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Fig. 1.



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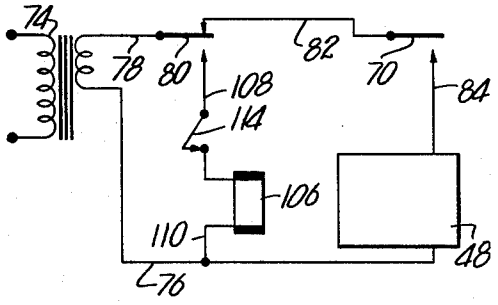


Fig. 3.

Fig. 2.

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PILE LIFT ASSEMBLY

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The present invention relates to a lift assembly and more particularly to a lift assembly having particular utility for a collating machine.

The present invention proposes to provide a lift assembly for use in conjunction with a collating machine or the like wherein a stack of sheet material is supported on a shiftable table which is electrically coupled with means for shifting the table whereby the stack of sheets on the table is maintained at a height relative to the machine so that mechanism on the machine can remove one sheet at a time from the stack and transfer the sheet to other mechanism of the machine. Means are provided which sense the position of the top of the stack at all times relative to the remaining structure of the machine such that whenever the stack has been depleted to an extent where it becomes impossible for the structure on the machine to remove one sheet at a time the system for shifting the table is automatically actuated to lift the pile of sheet materials back to a level where it may again be depleted. Successive operations of the type described can be performed until the stack is entirely removed from the table and at this time structure is provided enabling an operator to move the table from its last position to a position sufficiently removed from the remaining structure of the machine so that the table may be loaded with another stack of sheet material and the same process repeated.

It is therefore an object of the present invention to provide a lift assembly having a shiftable table for carrying a stack of sheet material and structure for intermittently shifting the table relative to structure of the machine wherein the assembly is used and upon which the material is to be transferred, the intermittent shifting being automatically controlled by means provided for this purpose.

It is a further object of the present invention to provide structure of the type described above wherein means are provided to move the table away from the remaining structure of the machine wherein the assembly is used for the purposes of loading the table with a stack of sheet material.

It is another object of the present invention to provide structure of the type above described wherein the driving force in both directions is provided from the same power source.

It is still another object of the present invention to provide structure of the type above described wherein electrically responsive clutching apparatus is provided for selecting the direction that the power source will drive the table.

It is still a further object of the present invention to provide structure of the type described above wherein the clutching means are in part controlled by the automatic switching apparatus for intermittently raising the stack and in which the clutching apparatus may be overridden by a manually operated switch for lowering the table for loading purposes.

In the drawings:

FIGURE 1 is a fragmentary, vertical cross-sectional view through a machine embodying the present invention with portions broken away to show details of construction;

FIG. 2 is a fragmentary, transverse, vertical cross-sectional view through the machine of FIG. 1 with parts broken away to show details of construction; and

FIG. 3 is a schematic wiring diagram of the electrical circuitry of the present invention.

While the present invention is described in terms of its utility in structure of a collating machine, it should be noted at this point that the present invention could have utility in various types of machinery other than collating machines and that the embodiment described is to be considered only as a preferred embodiment. It should be further noted that more than one assembly of the type which will be described as the specification proceeds may be included in one machine, the number being dependent upon the amounts of sheet material to be compiled by any one machine.

Referring now to the drawings and to FIGS. 1 and 2 in particular, there is shown a collating machine indicated generally by the numeral **10**. Shiftable structure for supporting a stack of sheet material is shown in FIG. 1 and indicated generally by the number **12**. The shiftable structure **12** includes a drive sprocket **14** and an idler sprocket **16** about which is trained a conveyor chain **18**. Drive sprocket **14** is fixed upon a drive axle **20** which is driven in a manner which will be described as this specification proceeds. Idler sprocket **16** is rotatably mounted upon an idler axle **22** journaled in the collating machine in a conventional manner not shown. It will be understood that a similar sprocket **14** is provided on shaft **20** adjacent to the opposite side of collating machine **10** and a similar sprocket **16** is provided on the opposite end of shaft **22** and that the similar sprockets **14** and **16** are interconnected by a chain conveyor **18** trained over the sprockets in a manner similar to that described and shown in the drawings, all of which has not been shown to avoid unnecessary duplication. A table **24** is mounted to the chain **18** intermediate the sprockets **14** and **16** in a conventional manner such as by screws **26** and nuts **28** extending through a flange portion **30** of table **24** and through chain **18** in a manner similar to that shown in FIG. 1. It is again to be understood that a similar flange **30** is provided for mounting the table **24** to chain **18** at the opposite side of machine **10**. A stack of individual sheets of material is indicated generally by the numeral **32** and is shown resting upon the table **24**. These individual sheets of material are, in the case of a collating machine, the printed pages of a book or pamphlet or similar article which are to be assembled in the machine into the final pamphlet.

The machine **10** is shown to have a belt conveyor **34** for purposes of collecting individual sheets from stack **32** in a manner which will be described as the specification proceeds. Reversible driving means are shown on the machine and indicated generally by the numeral **36** for driving the chain conveyor on its path of travel about sprockets **14** and **16** and thereby driving table **24** along a preselected path of travel determined by the chain **18** and sprockets **16** and **14** toward and away from the belt conveyor **34** of the collating machine **10**.

The reversible driving means **36** includes a source of motive force indicated generally as the power shaft **38**. Power shaft **38** is rotatably journaled in flanges **40** and **42** and a shaft **44** is shown telescoped over shaft **38** between the flanges **40** and **42**. A drive gear **46** is mounted upon shaft **44** for rotation therewith. Electrically responsive clutch structure **48** of a conventional type is shown mounted upon shaft **38** and flange **42** for the purpose of engaging shaft **38** with telescoped shaft **44** so that motive power may be transmitted to drive gear **46**. A driven shaft **50** is shown rotatably journaled in flanges **40** and **42** of machine **10**, shaft **50** protruding through the flange **40** for a purpose which will be subsequently described. There is mounted on driven shaft **50** a driven gear **52** which is positioned to be in driving mesh with drive gear **46** at all times. Through this arrangement

driving force is transferred from shaft 44 to driven shaft 50 in a conventional manner. A worm gear 54 is fixedly mounted on shaft 50 for rotation therewith in response to rotational movement imparted to shaft 50 by driven gear 52. Drive axle 20 has a transmission gear 56 fixed thereto at one end immediately beneath worm gear 54 such that the transmission gear 56 is in driving engagement with worm gear 54 and receives power therefrom to rotate drive axle 20 and thereby sprocket 14 mounted thereon as previously described. The worm gear 54 of axle 50 and the transmission gear 56 of drive axle 20 comprise reversible transmission means indicated generally by the numeral 58. Shaft 20 and the drive sprockets 14 mounted thereon comprise force transfer means indicated generally by the numeral 60.

Sensing means indicated generally by the numeral 62 are provided mounted on the machine 10 adjacent to the belt conveyor 34 and the top of stack 32 and generally shown in the drawing as a bell crank. The bell crank consists of a finger portion 64 and a feeler portion 66 integral with the bell crank sensing means 62 and pivoted at their common point of juncture to machine 10 by pivot pin 68. An electrical switch 70 is shown mounted upon machine 10 and positioned to be engaged by the finger portion 64 when the stack is in the position shown in FIG. 1. This is permitted by the fact that the stack does not support the feeler portion 66 to hold the finger portion 64 away from the switch 70. Referring to the wiring diagram of FIG. 3, the switch 70 can be seen in its open position when not engaged by finger 64. It will be obvious that if the switch 70 is depressed by the finger 64 an electrical circuit will be formed with clutch 48 energizing the same to engage the power shaft 38 with the telescoped shaft 44 and apply driving force through gears 46, 52, 54 and 56 to shaft 20 to rotate the same in one direction. When the shaft 20 rotates the chain 18 will be rotated in a counterclockwise direction as shown in FIG. 1 to raise the table 24 and the stack 32, thereby lifting feeler 66 and disengaging finger 64 from switch 70, breaking the circuit when the stack has reached the required position.

Referring now specifically to FIG 3, it should be noted that a source of electrical energy of a common variety is shown at 74 and is connected by a wire 76 to electric clutch 48. The opposite pole of the source 74 is connected by a second wire 78 to a single pull double throw switch 80 which is manually operable to connect wire 78 to a third wire 82 which is connected to switch 70. Switch 70 is normally in the solid line position shown in FIG. 3 so that all that is necessary to complete the circuit with clutch 48 is to depress the switch 70 connecting the same through a fourth wire 84 to electric clutch 48.

It will of course be obvious at this point that in order to require the continual shifting of table 24 toward conveyor 34 individual sheets such as indicated by the number 86 must be removed from stack 32 and placed on conveyor 34. For this purpose a vacuum operated sucker 88 is provided on machine 10 which is pivotable about a shaft 90 journaled in machine 10 in a well-known manner. The sucker 88 pivots about shaft 90 and the vacuum therein causes one sheet such as 86 to be picked up by the sucker and lifted sufficiently high so that the conveyor 34 running under the sucker will take the sheet 86 therefrom. It is of course necessary to control the vacuum in sucker 88 to release the sheet 86 and this may be done in any well-known manner such as by the use of ball check valves in the system. Conveyor 34 is provided with openings therethrough in spaced relation to each other and not shown in the present drawings except at 92 to permit the sucker 88 to dip down to the stack 32 at the required intervals.

When the stack 32 is depleted such that the table 24 can be moved no closer to conveyor 34, such as when flange 30 engages idler sprocket 16, it then becomes necessary to reverse the drive on the chain 18 to lower

the table 24 and place a new stack of sheet material thereon. It should be noted at this point that when the table reaches the position just described the finger 64 will continuously engage the switch 70 to close the electrical circuit.

To provide reverse drive for the chain a first pulley 94 is mounted to power shaft 38 adjacent to flange 40 but on the opposite side thereof from quill shaft 44 and a second pulley 96 is mounted on the end of shaft 50 protruding through flange 40 immediately beneath first pulley 94. There is trained about pulleys 94 and 96 a belt 98 which is normally loose and slips over pulley 96 during the driving engagement previously described for shifting the table 24 toward conveyor 34. A belt-tightening pulley 100 is mounted at one end of a crank arm 102 which is pivotable intermediate its ends about shaft 50. The other end of crank arm 102 is connected to the piston shaft 104 of a solenoid clutching member 106. It is of course necessary that the crank arm 102 be positioned so that pivoting of the crank arm will cause pulley 100 to engage belt 98, tightening the same about the two pulleys. Switch 80 previously described with reference to the wiring diagram of 53 is shown in FIG. 1 as a typical on and off button switch and when it is desired to reverse the drive upon table 12 switch 80 is thrown to connect the power source 74 through a fifth wire 108 to solenoid 106. Solenoid 106 is connected at its opposite end by sixth wire 110 to first wire 76, thereby completing a second circuit and energizing the solenoid 106. When the solenoid is energized the piston 104 is drawn downwardly by the magnet, tightening pulley 100 against the belt 98 and causing the driving force of shaft 38 to be transmitted through pulley 96, shaft 50, worm gear 54 and transmission gear 56 to shaft 20. However, in this case, the force is in the reverse direction, causing the chain 18 to move in the clockwise direction and lower the table 24 relative to the conveyor 34. It should be noted that the belt-tightening pulley 100, crank arm 102, piston 104 and solenoid 106, wires 108 and 110 and switch 80 complete an electrically responsive clutch assembly for reversing the force transmitted to the chain 18. This assembly can be broadly designated by numeral 112.

Means are provided for automatically stopping the table when it reaches a position sufficiently far from conveyor 34 so that it may be loaded with a new stack of sheets. These means include a limit switch 114 which is mounted to a flange 116 of pulley 14. Flange 116 extends from pulley 14 beneath the table 24 such that when the table reaches the level of the switch the button 118 is depressed, breaking the circuit established by manual operation of switch 80 and stopping the table at the loading point.

As can be seen by referring to the wiring diagram in FIG. 3 of the drawings, when it is desired to move the table 24 back to position for supplying sheets to the machine 10, it is a simple matter to throw the switch 80, completing the initial circuit. It must be remembered that switch 70 has been depressed all this time by the finger 64 of sensing means 62 and it will remain depressed until the table has raised to a position where the fresh stack 32 engages the feeler 66, lifting the finger from engagement with the switch 70. When the stack reaches this position the pile is again positioned to have individual sheets 86 removed therefrom and the cycle will be completed. It is of course obvious that the cycle may be rerun as often as it is necessary in order to assemble the number of booklets or pamphlets required and it should also be obvious that one such assembly may be provided in a machine for each page of the booklet or pamphlet which is to be assembled.

It will be apparent from the structure and operation described that all of the objects of the invention are accomplished by the structure set forth and it will be further obvious that numerous modifications and substitu-

tion of equivalents may be made to vary the structure hereinabove described without departing from the spirit of the invention or the scope of the claims hereinafter appended.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a lift assembly, the combination of shiftable means for supporting a stack of individual sheets of material including an endless conveyor, and a table supported on said conveyor for movement therewith, said table supporting said stack; reversible driving means coupled with said shiftable means for driving said shiftable means along a preselected path of travel including a source of motive force, reversible transmission means coupled with said source of motive force, and means coupled with said transmission means and said endless conveyor for transferring driving force from said source to said endless conveyor; sensing means responsive to the position of said stack coupled with said source of motive force for intermittently actuating the source to drive said conveyor in one direction; and means coupled with said driving means for overriding said sensing means including an electrical switch, electrically responsive clutching means for reversing said transmission means, and circuit means coupling said switch with said electrically responsive clutching means.

2. In a collating machine having a conveyor for collecting successive pages of printed material, shiftable means for supporting a stack of pages adjacent said conveyor; reversible driving means including a source of motive force, a reversible transmission coupled with said source for receiving driving force therefrom, and force transfer means coupled with said transmission and said shiftable means for transferring driving force from said transmission to said shiftable means for driving said shiftable means along a preselected path of travel toward and away from said conveyor; sensing means responsive to the relative positions of said stack of pages and said conveyor coupled with said driving means for intermittently actuating the driving means to drive said shiftable means toward said conveyor when said sensing means senses said stack is removed from said conveyor a preselected distance; means on said machine for continually depleting said stack of pages by transferring them from said stack to said conveyor; and means coupled with said driving means for overriding said sensing means and reversing said driving means to drive said shiftable means away from said conveyor.

3. The structure as set forth in claim 2 wherein said sensing means includes a pivoted, freely swingable bell crank finger and an electrical switch, said stack of pages normally holding said bell crank finger away from said switch and depletion of said stack by said means for depleting the stack swinging said bell crank finger to engage and energize said switch.

4. The structure as set forth in claim 2, wherein said means on said machine for continually depleting said stack of pages includes a vacuum operated sucker for lifting one page at a time from said stack and transferring it to said conveyor.

5. The structure as set forth in claim 2, wherein said means coupled with said driving means for overriding said sensing means includes a manually operable electrical switch.

6. The structure as set forth in claim 2, wherein said means coupled with said driving means for overriding said sensing means includes a manually operable electrical switch, electrically responsive clutching means for said driving means, and circuit means coupling said switch with said electrically responsible clutching means.

7. In a collating machine having a first conveyor for collecting successive pages of a printed material, shiftable means for supporting a stack of pages adjacent said first conveyor including a second endless conveyor, and a table mounted on said second conveyor for movement therewith, said table supporting said stack of pages; reversible driving means coupled with said second conveyor for driving said second conveyor along a preselected path of travel toward and away from said first conveyor including a source of motive force, a reversible transmission coupled with said source for receiving driving force therefrom, and force transfer means coupled with said transmission and said second conveyor for transferring driving force from said transmission to said second conveyor; sensing means responsive to the relative positions of said stack of pages and said first conveyor coupled with said driving means for intermittently actuating the driving means to drive said second conveyor toward said first conveyor when said stack is removed from said conveyor a preselected distance including a pivoted, freely swingable bell crank finger and an electrical switch, said stack of pages normally holding said bell crank finger away from said switch and depletion of said stack swinging said bell crank finger to engage and energize said switch to actuate said driving means to drive said second conveyor toward said first conveyor; means on said machine for continually depleting said stack of pages by transferring them from said stack to said conveyor including a vacuum operated sucker on said machine for lifting one page at a time from said stack and transferring it to said conveyor; and means coupled with said driving means for overriding said sensing means and reversing said driving means to drive said second conveyor away from said first conveyor including a manually operated electrical switch, electrically responsive clutching means for reversing said reversible transmission and circuit means coupling said switch with said electrically responsive clutching means.

8. The structure as set forth in claim 7, wherein said reversible drive means includes a source of motive force, a reversible transmission, electrically operated clutch structure for coupling said transmission to said source and force transfer means coupled with said transmission and said second conveyor, said clutch structure being electrically coupled to said electrical switch of said sensing means whereby said clutch couples said source and said transmission upon engagement of said bell crank finger and said switch to drive said second conveyor toward said first conveyor and said clutch uncouples said source and said transmission means when said bell crank finger disengages said switch.

9. The structure as set forth in claim 8, wherein said electrically responsive clutching means includes a solenoid; a belt-tightening pulley coupled with said solenoid; and a normally free slipping belt interconnecting said source of motive force and said transmission means whereby manual operation of said switch energizes said solenoid to move said belt-tightening pulley to tighten said belt and reverse the driving force from said transmission to said force transfer means and drive said second conveyor away from said first conveyor.

10. The structure as set forth in claim 9, wherein said circuit means couples said manually operable switch and said solenoid of said electrically responsive clutching means and includes an electrical limit switch positioned in the path of travel of said table on said second conveyor, said table engaging said limit switch to open said circuit and de-energize said solenoid after said table has traveled a preselected distance away from said first conveyor.

11. In a lift assembly, the combination of shiftable means for supporting a stack of individual sheets of material; reversible driving means including a source of motive force, reversible transmission means coupled with said source, and means coupled with said transmission means and said shiftable means for transferring driving force from said source to said shiftable means for driving said shiftable means along a preselected path of travel; sensing means responsive to the position of said stack coupled with said driving means for intermittently actuating the driving means to drive said shiftable means in

one direction along said path of travel; and means coupled with said driving means for overriding said sensing means and reversing said driving means to drive said shiftable means in a direction opposite to said one direction along said path of travel, said means coupled with said driving means for overriding said sensing means including an electrical switch; electrically responsive clutching means for said driving means; and circuit means coupling said switch with said electrically responsive clutching means.

12. The combination as set forth in claim 11 wherein said shiftable means includes an endless conveyor; and a table supported on said conveyor for movement therewith.

13. The combination as set forth in claim 11 wherein

said sensing means includes a freely swingable finger; and drive actuating means, said stack of material normally holding said finger away from said actuating means; and depletion of said stack of material swinging said finger to contact and energize said actuating means.

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