United States Patent

Hamilton

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[54] SKID INVERTING DEVICE

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[52] **U.S. Cl.** .....**214/1 Q**
[51] **Int. Cl.** **B65g 7/00**
[58] **Field of Search** .....214/1 R, 1 A, 1 S, 147, 652

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[57] **ABSTRACT**

A device for inverting a generally planar object which comprises a means for holding said object on its upper plane and its lower plane, means for tilting said object about a fixed axis so that said planes are generally vertical, said object and said holding means being rotatable about the vertical axis of said object 180° and means for re-tilting said object so that said object returns inverted to its original position.

11 Claims, 3 Drawing Figures

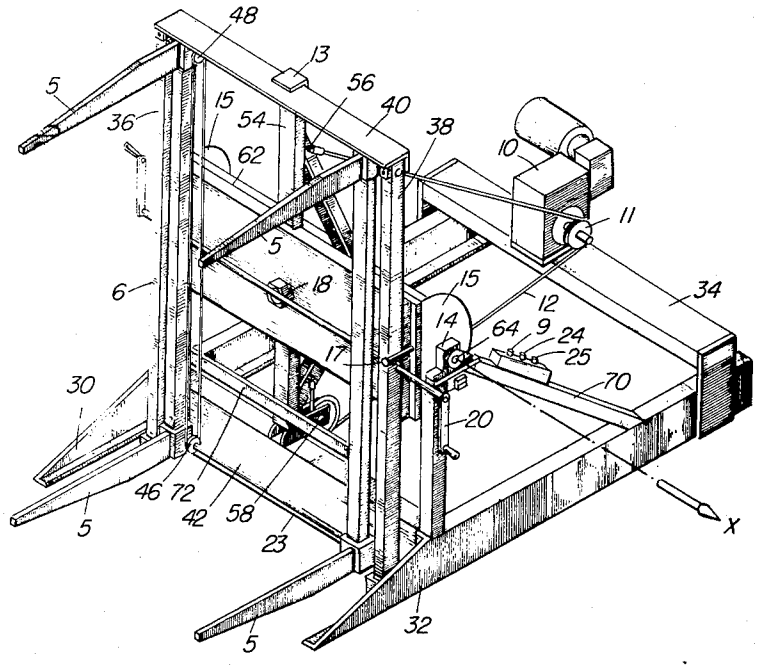


FIG. 1

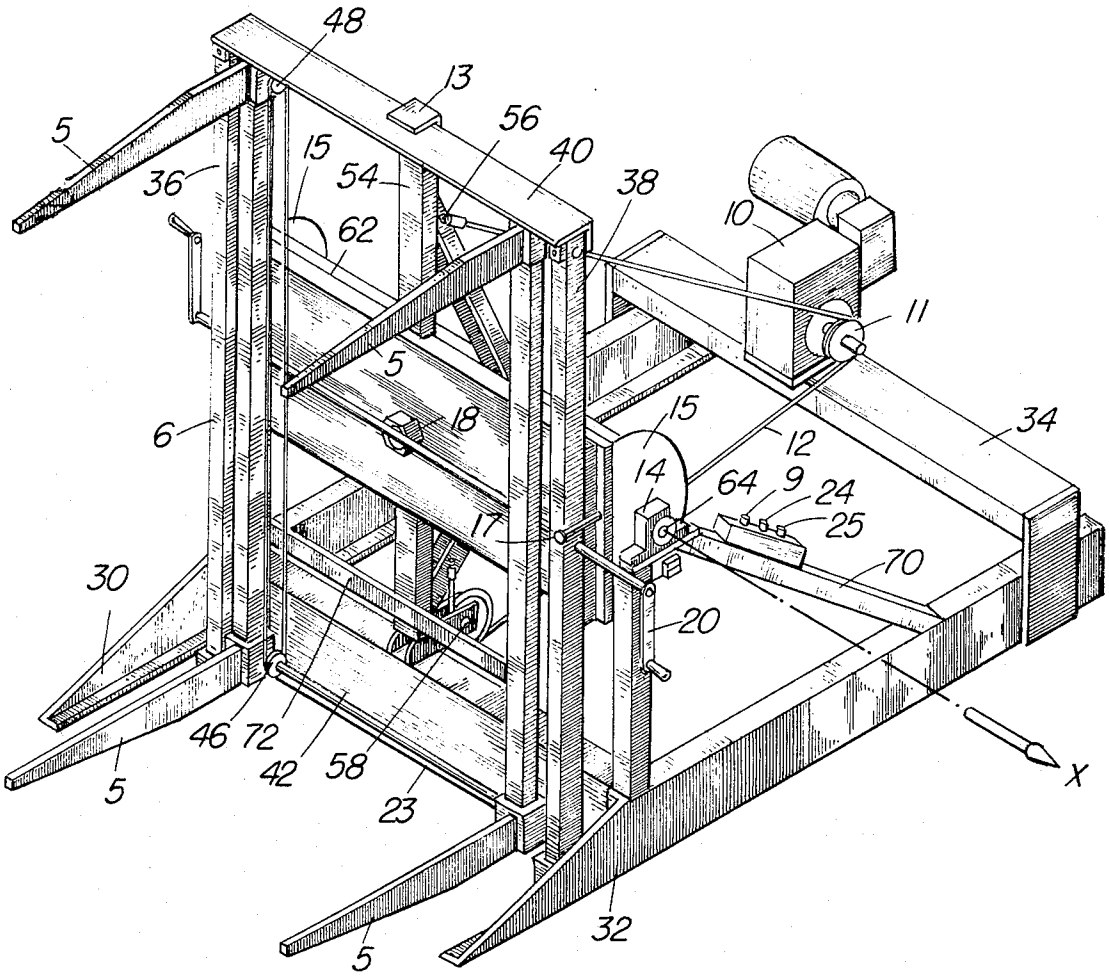

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FIG. 2

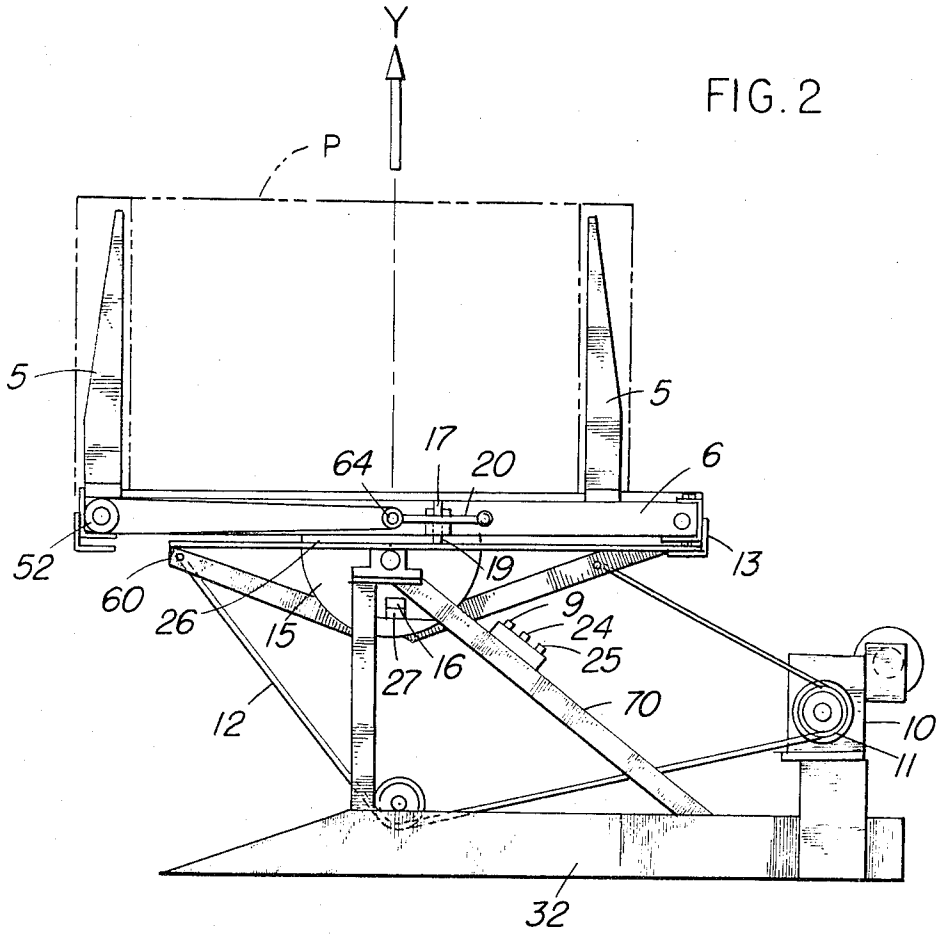
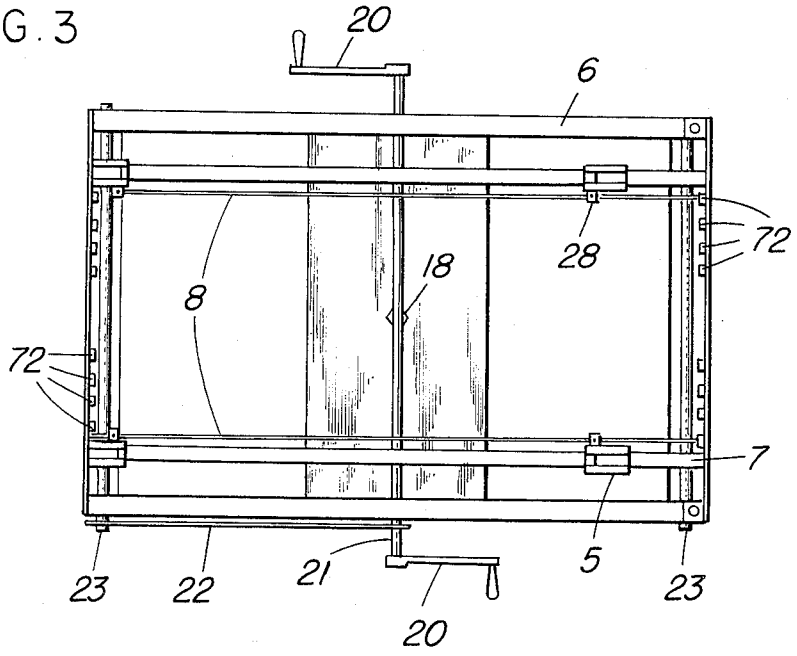

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FIG. 3


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SKID INVERTING DEVICE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention relates to a printing accessory. More particularly, this invention relates to an inverting device for inverting stacks of paper so that they are inverted perfectly, i.e., there is no displacement of individual sheets of paper.

2. DISCUSSION OF THE PRIOR ART

The Graphic Arts Industry is comprised of many different sizes of printing companies, some of whom specialize in specific types of printing, such as book printing, outdoor poster printing, metal decorating, etc. However, the majority of the companies are engaged in job shop sheet fed printing and a very large percentage of their work is printed on both sides of the sheet, one side at a time. It is normal practice to manually invert the stack before it can be printed on the blank side. This manual operation is undesirable because it is not only tedious work with the potential for error in the alignment of the sheets, but very time consuming adding to the already-high labor cost. Thus, it is desirable to provide a simple, low cost mechanical device which will quickly and easily invert the stack of printed materials.

Several devices have heretofore been proposed. One such device hydraulically clamps the stack of paper with great pressure. It then completely revolves the clamped stack 180° about a horizontal axis. Because it requires high pressures to clamp the printed stack, the use of the device is limited to inverted stacks of paper wherein the print has thoroughly dried for some period of time. Additionally, such device because it incorporates high pressure means generally costs too much for the ordinary print shop.

Another such device is the subject of U.S. P at No. 2,862,629 to R. Aberle of Dec. 2, 1958 entitled Inverting Mechanisms. Such device operates by tilting the paper stack so that the planes of the paper are vertically disposed. The tilting operation is accomplished by rolling a turntable along a track positioned on the floor. The original horizontal axis is substantially rearwardly displaced by the rolling operation. The paper stack is then rotated about its vertical axis 180° which has been substantially displaced by the rolling operation. When rotated, it is re-rolled to the original position. The device is generally massive requiring fixed tracks on which massive rolling side members roll. Because of the complexity of the device to perform the inverting function, it, too, is generally unavailable to the small print shop operator who requires less massive, less complex, sturdy devices which do not require large tracks to be bolted to the shop floor.

SUMMARY OF THE INVENTION

Broadly, this invention contemplates a device for inverting a generally planar object which comprises means for holding said object on its upper plane and its lower plane, means for tilting said object about a fixed axis so that said planes are generally vertical, said object and said holding means being rotatable about the vertical axis of said object 180° and means for re-tilting said object so that said object returns inverted to its original position. In the aforesaid description, the term "object" is intended to contemplate any generally rectangular object especially stacks of paper or other sheet material such as metal, plastic, laminates and the like. The objects generally being inverted are generally delivered to the device on a skid or wheeled dolly in which case a second skid or wheeled dolly is placed on top of the sheet material and the entire assembly—sheet material and skids are inverted.

In a particularly desirable embodiment, this invention contemplated a device for inverting a generally planar object which comprises means for holding said object on its upper plane and its lower plane, said holding means affixed to a turntable which is rigidly but horizontally rotatably mounted to a pair of vertically rotatable semi-circular turntable supporting members maintained generally about the same horizontal axis about which said object and said holding

means rotate, means for tilting said object about said horizontally axis, disengaging means maintaining said turntable rigidly to said semi-circular turntable supporting members when engaged, but permitting horizontal rotation with respect thereto when disengaged and means for re-tilting said object so that said object returns inverted to its original position. Preferably, the means for tilting and re-tilting the turntable comprise a gear motor which rotates a sprocket about which is engaged a chain affixed at one end to a top portion of the turntable support frame and at the other end to a bottom portion of the turntable support frame. The gear motor has a reversing phase so that the turntable can tilt and re-tilt.

The device of the present invention preferably embodies a means for engaging the lower and upper plane of the object to be inverted. Preferably the device for engaging the object to be inverted comprises a pair of vertical columns each having a pair of forked arms facing one another, one at the top of said column and the other at the bottom of said column, said forked arms rideable on said column, each forked arm on a single column attached to an endless belt mounted about a pair of opposed rollers, one of said arms connected to one side of said belt and the other connected to the other side of said belt, at least one set of similarly positioned rollers for each column being joined by a common axis, movable by a third belt affixed to and movable by a crank arm. Preferably, the crank arm passes through the device and at its opposed end form a second crank handle.

Preferably, the rollers employed are sprocketed wheels which engage chains. The third belt can be a chain or other endless belt although it is preferred that it, too, be a chain engaging a sprocket wheel sharing the axis of the shaft engaging the other roller members or sprocketed wheels.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be more readily understood and appreciated by reference to the accompanying drawings in which:

FIG. 1 is an isometric view of the skid inverting device showing turntable 6 in a lowered position, ready to receive a skid of paper.

FIG. 2 is a side elevation showing the turntable 6 and the paper skid P, raised to the horizontal position.

FIG. 3 is a plan view of the turntable only when the device is in the position shown in FIG. 2.

DESCRIPTION OF SPECIFIC EMBODIMENT

A specific and preferred embodiment is shown in the accompanying figures in which the same numeral is used to indicate similar parts. The device comprises a frame having base supports 30 and 32 over which is mounted winch supporting brace 34 bearing gear motor 10 rotatably mounted to sprocket 11 about which there is engaged chain 12. The device comprises a turntable 6 having side members 36 and 38, top member 40 and bottom member 42. Running generally parallel to members 36 and 38 are square tubes or columns 7 about which are positioned fork arms 5 which in turn are pinned to chains 8. A chain 8 is provided for each column 7. The upper forks 5 are pinned to the same side of the chains 8 and the bottom forks 5 are pinned to the same side of the chain 8. The chains rotate about sprocket wheels such as sprocket wheels 46 and 48 seen in the isometric view of FIG. 1. The sprocket wheels rotate since a set of similarly positioned sprocket wheels has a common wheel axis shaft 23 about which is a sprocket 52 positioned externally on which is engaged a third chain 22. Chain 22 is rotated by virtue of its engagement with shaft 21 having crank handles 20 on either side of the device. This assembly allows vertical adjustment of the fork arms from either side of the device before and after the inverting operation.

Turntable 6 is rigidly yet rotatably mounted to a pair of vertically rotatable semi-circular turntable supporting members 15, one each positioned generally against a side member 36 or

38. A disengaging member in the form of a sliding bolt 17 insertable in hole 19 holds turntable 6 to the semi-circular members 15 for the initial tilting. When disengaged, turntable 6 comprising plate 26 connecting sides 36 and 38 can rotate about pivot pin 18.

The chain 12 is connected to a top portion of turntable support frame 6 on vertical brace 54 at 56 and via pulley or sprocket 58 to the bottom portion of cross member 72. The chain then fastens to vertical brace 54 at 60. Vertical brace 54 in turn is connected to latches 13; brace 54 is fastened to the semi-circular members 15 which themselves are interconnected by brace 62 as seen in FIG. 1. Semi-circular members 15 vertically rotate about pins 64 forming axis X located through pillow blocks 14. Each member 15 has affixed thereto a planar stop member which engages a brace 70 to insure that when turntable 6 is tilted, it is not tilted beyond the point at which it is perfectly horizontal.

The electrical portions of the device comprise an "up" button 9 which energizes the gear motor to begin the tilting. When the tilting has ceased, a recess in a semi-circular plate 15 trips the limit switch 16 stopping gearmotor. When the horizontal rotation is completed, "down" button 24 is pushed energizing the gear motor in the opposite direction to return the fork arms and object to the original but inverted position. A safety stop button 25 is provided which overrides all the electrical control switches making it possible to stop the machine at any point in its full cycle. A down limit switch 27 is provided which is engaged when the position returns to the original but inverted position. When switch 27 is engaged, the gear motor is de-energized and the machine is at rest.

As seen in FIG. 3, means are provided for lateral adjustment of the fork arm assemblies through members 72. Pins 28 which lock the forks 5 to chains 8 can be pulled and the upper forks 5 can be raised to facilitate removal of the skid.

The operation of the device is simple. The stack of paper is delivered to the device on a skid or wheeled dolly. It is placed over the lower fork arms 5. Another skid member or wheeled dolly is placed over the stack of paper. The upper forks arms 5 are then lowered to contact the upper skid or wheeled dolly. No special pressure need be applied. The arms exert sufficient holding or retaining pressure. Button 9 is pushed, energizing motor 10, turning sprocket 11, moving chain 12 to pull the top of turntable support member 54 which in turn tilts turntable through latch 13. This causes turntable 6 to revolve about pins 64 and axis X. When turntable 6 is horizontal, a stop on member 15 engages brace 70 as an "up" limit switch 16 is engaged by a recess in semi-circular member 15. Sliding bolt 17 is then removed from hole 19 leaving turntable 6 free to rotate about axis Y and pivot pin 18. Turntable 6, comprising plate 26, is rotated 180° about axis Y. A duplicate sliding bolt 17 is reinserted into hole 19 thus locking turntable 6 for the re-tilting or lowering operation. A sliding bolt 17 is provided for each side of the turntable 6. Down button 24 is engaged, energizing the gear motor 10 in an opposite direction, causing sprocket 11 to pull chain 12 from point 60. When the turntable 6 reaches the vertical or down position, half circle plate 15 trips "down" limit switch stopping motor 10. The stack is inverted. The now upper forks 5 can be released by moving sprocket wheel 48 to facilitate removal of inverted stack. The operation is over. The device is simple, but a very sturdy machine which has the paper skid under control at all times, not dependent on load distribution or center of gravity. It is portable and needs no ramps, recessed floor, or tie down bolts. Rotating the turntable is done by hand. Shifting a less than maximum size skid from one end of the turntable to the other is accomplished by hand with the help of mechanical advantage.

These two factors help keep the machine simple in design and low in cost; thus making it possible for even the smallest print shop to enjoy the advantages of time and labor saved, and to turn thousands of sheets quickly and without damage thereto.

The foregoing is set forth for the purpose of illustrating the invention, not for the limitation thereof. It is recognized that various modifications and changes are possible within the scope and spirit of this invention.

I claim:

1. A device for inverting a generally planar object which comprises a means for holding said object on its upper plane and its lower plane, a gear motor with a reversible phase for tilting and re-tilting said object about a fixed axis so that said planes are generally vertical when said object is tilted, said motor having an external shaft on which is affixed a sprocketed wheel, a chain affixed at one end to an upper portion of a turntable over which said means for holding said object rotates, said chain affixed at its opposite end to a lower portion of said turntable, said chain being engaged on the sprocket teeth of said sprocketed wheel, said object and said holding means being rotatable about the vertical axis of said object 180°. .

2. A device according to claim 1 wherein said holding means is affixed to a turntable which is rigidly but horizontally rotatable mounted to a pair of vertically rotatable semi-circular turntable supporting members maintained generally about the same horizontal axis about which said object and said holding means rotate.

3. A device according to claim 2 comprising a disengaging means maintaining said turntable rigidly to said semi-circular turntable supporting members when engaged but permitting horizontal rotation with respect thereto when disengaged.

4. A device according to claim 3 wherein said disengaging means comprise at least one pin insertable within a hole on a vertically rotatable member.

5. A device according to claim 4 wherein at least one of said semi-circular turntable supporting members is provided with an externally disposed stop member adaptable to engage a brace when said turntable is horizontal and at least one of said semi-circular turntable supporting members has a recess therein which engages a limit switch when said turntable is horizontal whereby the tilting operation is stopped by de-energizing said gear motor.

6. A device according to claim 4 wherein said turntable is rotatable about a pivot pin functioning as the vertical axis.

7. A device according to claim 4 embodying a device for engaging the lower and upper plane of the object to be inverted said device comprising a pair of vertical columns each having a pair of forked arms facing one another, one at the top of said column and the other at the bottom of said column, said forked arms rideable on said column, each forked arm on a single column attached to an endless belt mounted about a pair of opposed rollers, one of said arms connected to one side of said belt and the other connected to the other side of said belt, at least one set of similarly positioned rollers for each column being joined by a common axis movable by a third belt affixed to and movable by a crank arm.

8. A device according to claim 7 wherein said rollers are sprocketed wheels and said belts are chains which are engaged by the teeth of said wheels.

9. In a device for inverting a generally rectangular object having an upper plane and a lower plane, a device for engaging the lower and upper planes of the object to be inverted, means for inverting said object, said device comprising a pair of vertical columns each having a pair of forked arms facing one another, one at the top of said column and the other at the bottom of said column, said forked arms rideable on said column, each forked arm on a single column attached to an endless belt mounted about a pair of opposed rollers, one of said arms connected to one side of said belt, at least one set of similarly positioned rollers for each column being joined by a common axis movable by a third belt affixed to and movable by a crank arm.

10. A device according to claim 9 wherein said rollers are sprocketed wheels and said belts are chains which are engaged by the teeth of said wheels.

11. A device for inverting a generally planar object which comprises a means for holding said object on its upper plane and its lower plane, means for tilting said object about a fixed axis so that said planes are generally vertical, said object and said holding means being rotatable about the vertical axis of said object 180°, said vertical axis and said fixed axis being in the same plane, means for re-tilting said object so that said object returns inverted to its original position and support means generally parallel to the vertical axis of rotation to provide support during rotation of said holding means 180°.

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