Nov. 13, 1962 P. FONTANA 3,063,575

INVERTING APPARATUS FOR STACKED SHEET MATERIAL

Filed Oct. 14, 1959

2 Sheets-Sheet 1

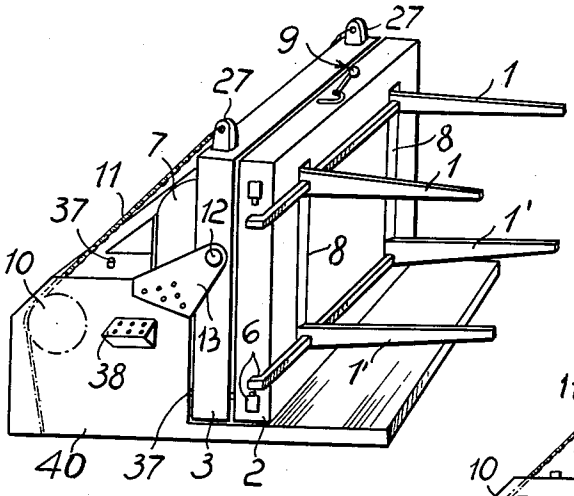

Fig. 1

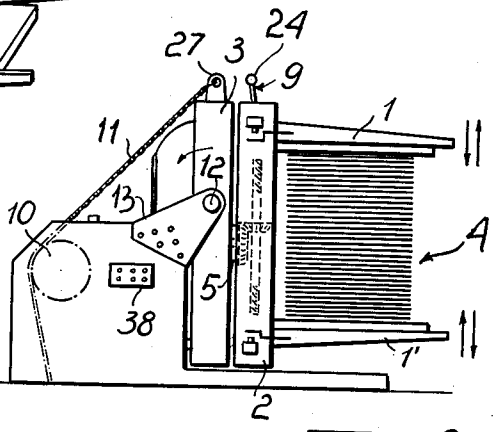

Fig. 2

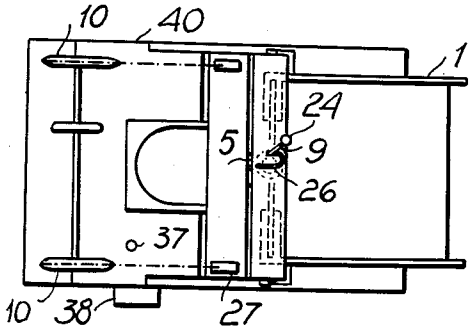

Fig. 3

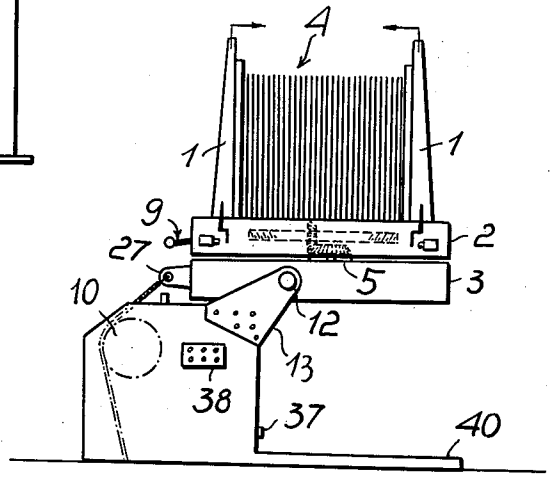

Fig. 4

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2 Sheets-Sheet 2

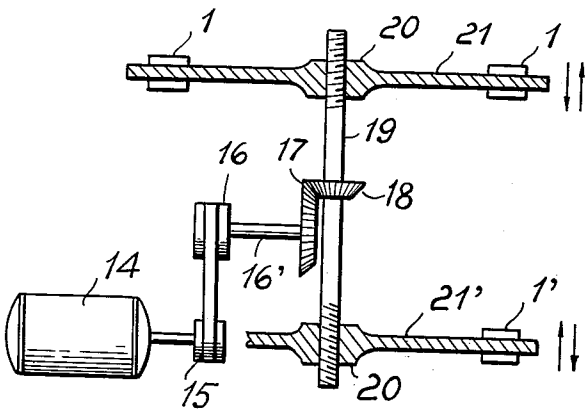

FIG. 5

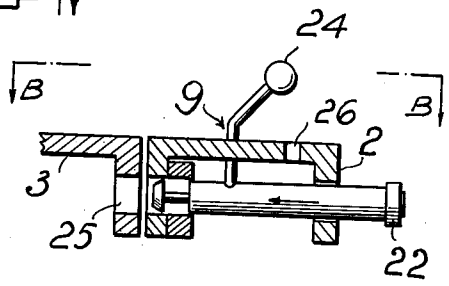

FIG. 6

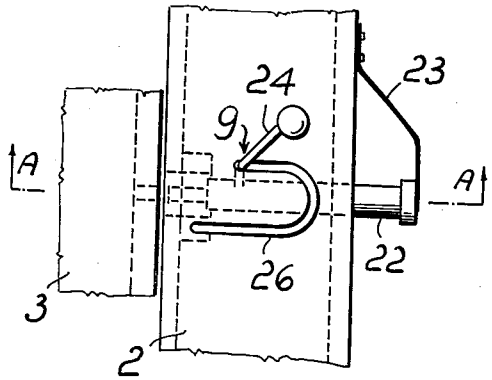

FIG. 7

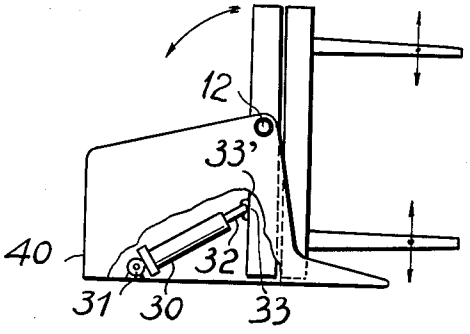

FIG. 8

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United States Patent Office 3,063,575 Patented Nov. 13, 1962

3,063,575 INVERTING APPARATUS FOR STACKED SHEET MATERIAL

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Claims priority, application Italy Oct. 15, 1958
1 Claim. (Cl. 214—1)

This invention relates to an inverting apparatus capable of rapidly overturning and setting in order piles or skids of stacked sheets of, for instance, printing paper.

The difficulties of inverting piles or stacks of sheets delivered to printing machine beds for printing the sheets on their reverse side are known.

This inverting operation may be carried out manually or by means of mechanical devices which generally impart to the stack a rotation of about at least 180° about a horizontal axis, or a movement of only one or two degrees of freedom.

The main drawbacks of the manual method are obvious; whereas in the case of the known inverting machines, their great complexity, high cost, and encumbering nature constitute their disadvantages.

An object of the invention is to eliminate the above-mentioned drawbacks and to provide a device which allows the carrying out in a very short time period, and with excellent results, of the inversion of piles of sheets of any size and weight, and which returns the same stack of sheets to the same bed of the machine, perfectly centered and aligned with respect to the other carrying beds.

Another object of this invention is to effect a complete inversion of the piles of printing paper with such a composite rotation that the rotation in a vertical plane occurs only through an angle of 90° and after the complete inversion, the pile is again positioned in the starting position.

These and other objects are attained by a machine, according to the invention, which is characterized in that it comprises a platform member carrying the pile of sheets; the platform member being mounted so as to be able to rotate both about a first axis perpendicular to the plane of the platform and about a second axis parallel to that plane, in order to allow a complete turnover of the piles by means of a first rotation of the platform member through approximately a quarter of a revolution in one direction about said second axis, a second rotation of about half a revolution about said first axis and a third rotation of approximately a quarter of a revolution again about said second axis, but in opposite direction to said first rotation, so as to replace the pile completely inverted in the same starting place.

This invention will now be more fully described with reference to a preferred embodiment shown by way of example in the accompanying drawing in which:

FIG. 1 is a perspective view of the machine according to the invention;

FIG. 2 is a lateral-elevational view of the said machine, in the starting or loading position;

FIG. 3 is a plan view of the machine illustrated in FIG. 2;

FIG. 4 is a lateral-elevational view of the machine in the inverted stage of the stack;

FIG. 5 is a diagrammatic view of a device for the self-centering of the operated complex;

FIG. 6 is a cross-sectional view taken along line A—A of FIG. 7, of a locking device;

FIG. 7 is an elevational view taken along line B—B of FIG. 6;

FIG. 8 is an elevational view illustrating a modification of the driving means for the platforms.

With reference to the drawings, the machine according to the invention comprises clamping means, particularly self-centering jaws, constituted by slidable cantilever arms 1, 1', which are supported by a rotating member 2, in the form of a platform of convenient size, which platform is provided with means allowing it to rotate about an axis perpendicular to the plane of the platform 2, as will be described below.

A self-centering device is associated with the clamping device and is so arranged that the resistant forces are minimum. Particularly, to transmit rotational movement to the platform 2 about this axis, which is perpendicular to the platform, it is possible to use the mechanical combination represented diagrammatically in the drawing; the drive means is mainly constituted by a rod 19, driven in any known manner, for instance by means of an electrical motor 14, with double reduction through a V-belt transmission 15, 16 and gears 17, 18, the rod 19 is oppositely threaded at the ends thereof and engages at said ends, in internally threaded bores of screw-nut members 20. These screw-nut members are an integral part of elements which drive the cantilever arms 1, 1', and which are advantageously made in the form of two transverse bars 21, 21', one of which entrains the lower cantilever arm 1' and the other of which entrains the upper cantilever arms 1. The rotation of the threaded rod 19 causes the approaching and spreading of the jaws 1, 1' in a convenient way and consequently the centering of the stack 4 of sheets inserted between the jaws. It will be understood that when the threaded rod 19 is locked, the rotation of gear 17 (see FIG. 5) will cause the rotation of platform about the axis 5 thereof.

In the illustrated apparatus the self-centering device proper is arranged conveniently within the interior of the rotating platform 2, while the driving means, particularly the electrical motor and the reduction gear transmission, are conveniently arranged partially in the housing 7 and partially in the platform itself, the transmission shaft 16' passing through the hollow pin 5. Pin 5 is rigidly secured to a tilting platform 3 and permits the rotation of platform 2 about its axis.

Limit switches 6 stop the drive motor when the jaws have reached their maximum spread, while an excessive compression of the center pile may be avoided by the provision of known compression sensitive means adapted to stop the motor when a desired pressure on the pile is reached. The same result may be obtained by a maximum-current play relay inserted in the supply circuit of the electric motor.

The cantilever arms 1, 1' constituting the clamping member of the machine, project through slots 8, provided within the rotating platform 2, and are conveniently guided and supported in the platform 2 by the threaded rod 19 and transverse bars 21. The rotating member 2 is supported by a tilting platform 3, with the aid of supporting means adapted to allow a rotation of the carrying platform 2 together with the stacked pile in a dynamically and statically safe and stable manner.

The above mentioned means comprise the hollow pin 5, a thrust bearing, not shown and finally a locking device indicated at 9 and represented more particularly in FIGS. 6 and 7.

This locking and stiffening device serves to rigidly but removably connect the two platforms in convenient mutual positions and to provide a greater stability to the system. In the embodiment shown in FIGS. 6 and 7 this locking device comprises a sliding cylindrical member 22, which is maintained in the locking position by means of a spring, and is provided with a control lever 24. Said sliding cylindrical member is adapted to engage in a slot 25 of suitable shape, thereby locking the platform 2 on the tilting platform 3, and is maintained in the locking

position by means of the spring 23; the lever 24 is guided within a curved slot 26 which allows a free action of the spring 23 on the locking member 22 in the locking position thereof and prevents the action of the spring when the connection of the two platforms has to be released.

The bearing supporting the rotating platform (e.g. a thrust bearing) may be of any known type and should be adapted to support heavy loads. It may conveniently be a ball bearing whose balls distribute the load onto other balls, said balls being arranged and guided in a conventional manner.

The rotation of the carrying platform 2 about the axis of the hollow pin 5, which rotation occurs with the platform in a horizontal position so as to allow the complete turnover of the stacked pile by means of a tilting rotation of only 90°, may be carried out by means of the above described electrical motor 14, and gears 16, 17, 18, when the threaded rod 19 is locked. It is however obvious that this rotation may be carried out by means of other convenient devices and if desired also manually, since this rotation takes place in a horizontal plane and the resisting friction forces are low.

The tilting platform 3, supports the carrying platform 2, which is superposed and pivoted thereon, is in turn rotatably supported on a rigid base 40, by pins 12, so as to be able to rotate about the horizontal axis of the pins 12, through an angle of approximately 90°.

The pins 12 are fixed in supporting brackets 13, fixed on the base 40.

The rotation through about 90°, which is a main feature of the lower platform 3, allows an easy squaring and alignment of the paper pile and simplifies the following turnover movement, the squaring and alignment being carried out when the superposed platforms are in an horizontal position, as shown in FIG. 4.

The tilting or swinging movement of the platform 3 may be obtained by means of any convenient driving device, but in the embodiment shown, the tilting of the platform 3 is obtained via sprocket chain 11, engaging a sprocket 10 driven through a transmission by a motor not shown in the drawing.

Limit switches 37, of any known kind, may automatically stop the action of the driving source, in order to prevent shocks when the platform reaches its extreme position.

Conveniently the limit switches may be controlled by the movement of the tilting platform itself.

According to the invention, the mutual position of the rotation axis of platforms 2 and 3 are so arranged as to allow the movable complex to automatically return by gravity action, from the horizontal position in the starting or loading position of the movable complex, braking means being provided in the movable complex in order to damp the return movement of said movable complex.

In the modification shown in FIG. 8, the tilting of the platforms 2, 3 is carried out by means of a hydraulic or pneumatic jack comprising a power cylinder 30 at the bottom part of which is hinged at 31 at the base 40 of the machine, whereas the piston rod 32 of the jack is hinged at its free end 33 on the tilting platform 3 of the turnover machine at a location situated below the pivot 12, when the platform 3 is in its vertical position. In this way the extension of jack 30 will cause the platforms 2, 3 to rotate from the vertical position thereof towards the horizontal position thereof. It will also be understood that, when returning by gravity action from the horizontal position in the vertical position, the jack 30 will damp the lowering of the plates so that no auxiliary braking means will be necessary for this purpose.

From the above description the functioning of the inventive machine will be obvious. The normal operating cycle may be summarized as follows, pointing out only the main features of the operation:

(*a*) The loading of the paper pile 4, with platforms 2 and 3, in a vertical position;

(*b*) Self-centering of the paper pile, by actuation of the jaws 1, 1' so as to sufficiently but not excessively clamp the stack of printing paper;

(*c*) A rotation through an angle of about 90° of the group constituted of the two platforms 2 and 3, about the axis of the pins 12, until the two platforms reach a horizontal position;

(*d*) A rotation through an angle of about 180° of the upper platform 2 about the pin 5;

(*e*) A rotation of the group formed of the two platforms 2 and 3, again about the pins 12, but in the opposite direction, thereby returning the overturned pile in its initial position;

(*f*) The unloading of the pile 4, which is now completely overturned.

A switchboard 38 is provided to facilitate the control of the operation by means of convenient push buttons. It is obvious that the operation stages may be sequentially operated in an automatic way by known electromagnetic means.

It is obvious that the invention may obtain various modifications which will be evident to those skilled in the art, which all lie within the scope of the invention defined by the following claim.

I claim:

An inverting apparatus for stacked sheet material comprising a base; a first platform member pivoted to said base intermediate two opposite extremities of said first platform member for angular motion about a fixed first axis; a second platform member rotatably journaled to said first platform for rotation in a plane generally parallel thereto about a second axis perpendicular to said first axis; clamping means on said second platform member for seizing stacks of sheet material, said clamping means including at least two clamping arms extending generally perpendicularly from said second platform member and slidably mounted thereon, a lead screw on said second platform member having a pair of oppositely threaded extremities each respectively engaging one of said arms, a drive shaft journaled in said first platform and extending generally perpendicularly therefrom for rotation about said second axis, said lead screw and said drive shaft being provided with mating bevel-gear means, and motor means on said first platform member for rotating said drive shaft, thereby reciprocating said arms toward and away from each other; and actuating means for displacing said first platform member about said first axis, said bevel-gear means comprising a first bevel gear on said shaft and a second bevel gear on said lead screw intermediate said threaded extremities in mesh with said first bevel gear in all angualr positions of said second platform member.

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