

[54] **ELEVATOR APPARATUS**

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[51] Int. Cl. **B65h 1/14**

[58] Field of Search **271/164, 162, 147, 152, 271/153, 154, 155, 156, 157, 158, 159, 214, 215, 216, 217, 218; 214/8.5 A, 6 H, DIG. 10; 187/1 R; 254/4 R, 4 B**

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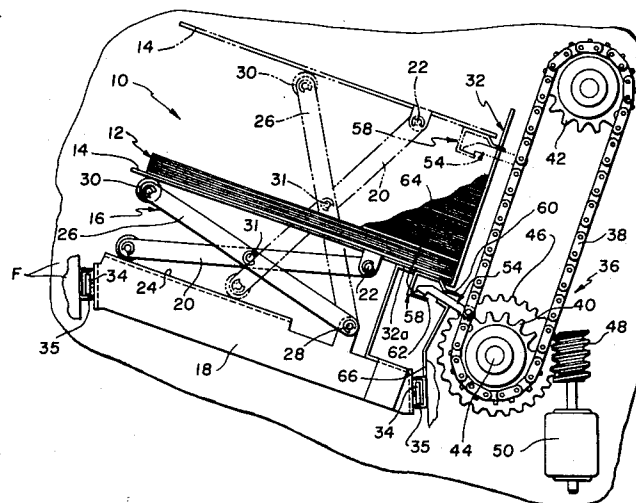
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[57] **ABSTRACT**

Elevator apparatus for raising and lowering a platform guided in a predetermined orientation along a predetermined path. A lift mechanism, movable along a path parallel to the platform path, is coupled to the platform through an elongated member pivotally connected to the lift mechanism. The elongated member detachably engages the platform at two points, one on each side of the member, such that the pivoting movement of the member is restricted and a lifting force can be transmitted therethrough from the lift mechanism to the platform. When access to the platform for loading is desired, the platform is moved to an independently supported position and the elongated member is pivoted out of engagement with the platform so that the platform can be moved relative to the lift mechanism.

7 Claims, 3 Drawing Figures



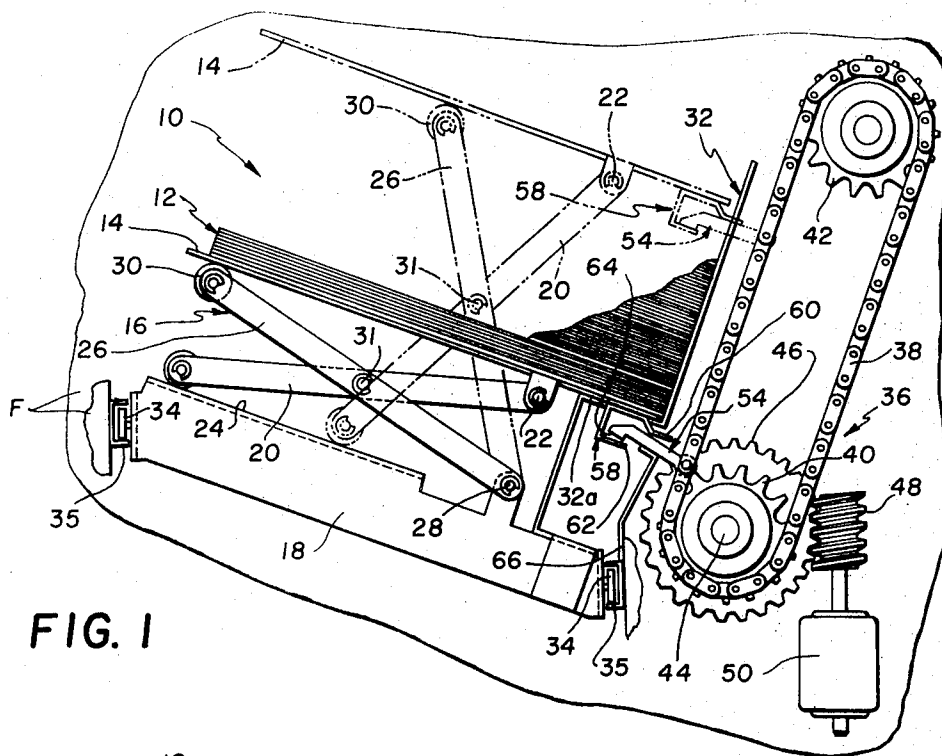


FIG. 1

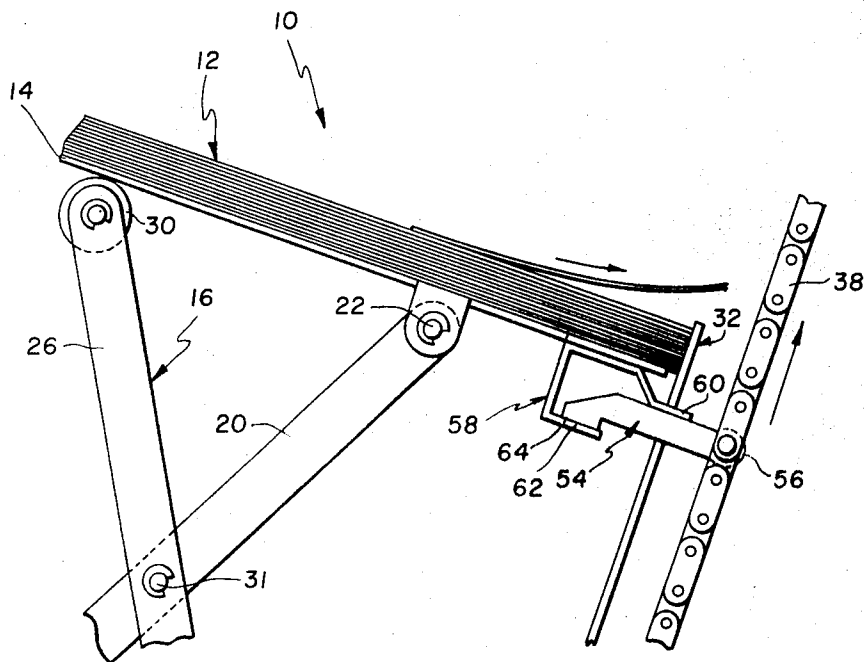
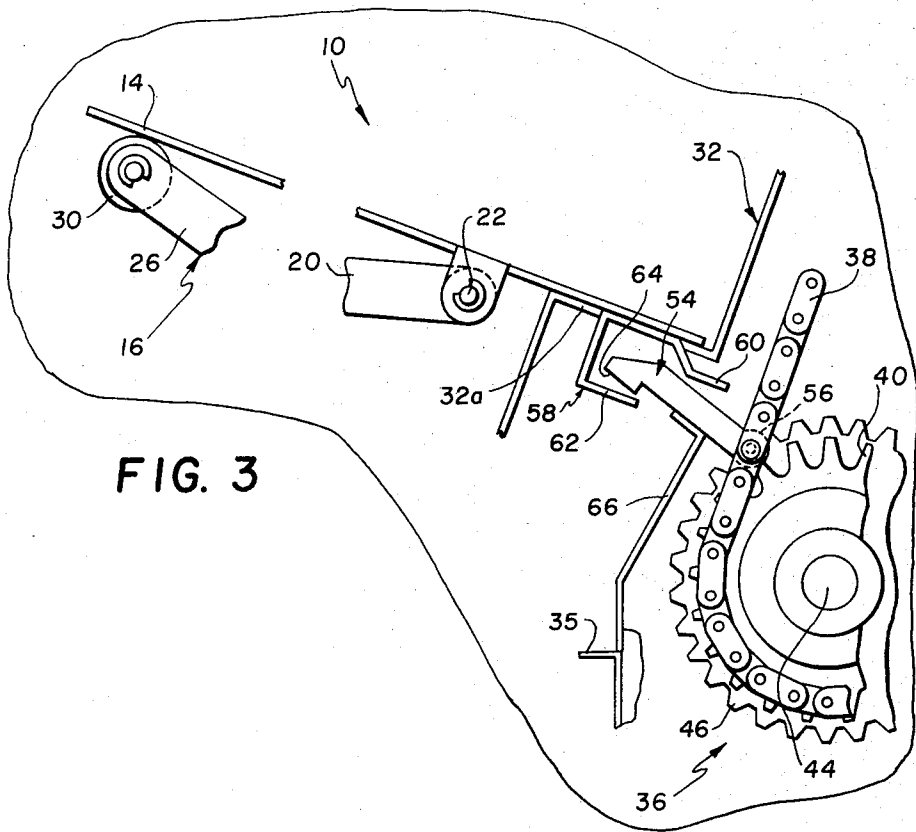


FIG. 2



ELEVATOR APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to elevator apparatus for raising and lowering a platform along a predetermined path.

2. Description of the Prior Art

In supplying individual sheets from a stack of material to apparatus such as printing presses, office copiers, or bindery equipment, it is often desired to maintain the top of the stack at a desired height and in a fixed plane. In general, the stack of sheets has been supported on a platform which has its elevation controlled by a chain or gear drive or by a scissors-type linkage. The chain or gear drive permits height of the platform (and thus the height of the stack which it supports) to be accurately maintained within very discrete limits while the use of scissors-type linkages permits the orientation of the platform to be precisely controlled. In apparatus of the above character, due to the complex arrangement of parts, difficulties have arisen in providing ready access to the platform area to replenish the stack of sheet material supported thereon.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide an elevator apparatus for accurately controlling the raising and lowering of a platform without inhibiting ready access to the platform to replenish a stack of material on the platform.

It is further an object of this invention to provide an elevator apparatus wherein the platform to be raised and lowered is readily disengageable from the lifting mechanism to facilitate access to the platform.

Accordingly there is herein provided an elevator apparatus having a lift mechanism movable along a path parallel to a predetermined path for a stack supporting platform. An elongated member pivotally connected to the lift mechanism engages the platform at two points, one on each side of the member, such that the pivoting movement of the member is restricted. Thus a lifting force by the lift mechanism can be transmitted through the elongated member to the platform. When the platform is supported independently of the elongated member, the elongated member may be pivoted about its connection with the lift mechanism to be disengaged from the platform. The platform may then be moved relative to the lift mechanism to a position where ready access thereto for replenishing the stack can be accomplished.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the elevator apparatus according to this invention, the apparatus being shown in its lowermost position (solid lines) and in its uppermost position (phantom lines);

FIG. 2 is an enlarged view of a portion of the elevator apparatus showing the elongated member coupling the lift mechanism to the platform; and

FIG. 3 is an enlarged view of the elongated member similar to FIG. 2, with the elongated member in its disengaged position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 shows an elevator apparatus 10 for raising and lowering a stack of sheet material 12 along a predetermined path to a height so as to permit the topmost sheet in the stack to be removed by a sheet feeding mechanism, such as a vacuum feeder (not shown), for feeding individual sheets of material to a printing press, office copier or other bindery equipment. The stack 12 is supported on a platform 14 which is connected at opposite sides (only one side shown), through scissors linkage 16, to a base 18. The scissors linkage 16 has a first arm 20 which is connected at one end to the platform 14 by a pivot pin 22 and slidably engages the base 18 through roller 24 at the opposite end. A second arm 26 is connected at one end to the base 18 by a pivot pin 28 and slidably engages the platform 14 through roller 30 at its opposite end. The arms 20 and 26 are equal in length and are pivotally interconnected at their mid-points by pivot pin 31 such that the scissors linkage 16 maintains the orientation of the platform 14 parallel to the base 18 at all elevational levels of the platform along its predetermined path. The base 18 has a plurality of wheels 34 rotatably mounted at opposite sides (those sides oriented perpendicularly to the plane of the scissors linkage 16). The wheels 34 ride on tracks 35, the tracks 35 being located on a frame F such that the apparatus 10 may be accurately positioned relative to the feed mechanism to which the sheets of material from stack 12 are to be presented or, alternatively, moved laterally to the elevational plane of movement of the platform 14 to permit ready access to the apparatus for loading a stack 12 on the platform.

In order that each of the sheets in the stack 12 on platform 14 will remain accurately positioned relative to a feed mechanism, the platform 14 and base 18 are angled with respect to the horizontal. In this orientation the sheets in stack 12 on the platform 14, with a gravity assist, have their leading edge registered against a plate 32 extending perpendicularly from the base 18. The plate 32, in addition to its function as a registration device has an offset portion 32a which is parallel to the base 18. This offset portion 32a serves as an independent support for the platform 14 when the platform is in its lowermost position.

The elevational position of the platform 14 is controlled by a lift mechanism 36 operatively supported by the frame F. The lift mechanism 36 includes a chain 38 supported on spaced sprockets 40, 42, the sprockets defining a path of travel for the chain parallel to the desired elevational travel path for the platform 14. The shaft 44 carries a gear 46 which is driven by a worm gear 48 to rotate the shaft, the worm gear being driven in turn by a motor 50. The sprocket 40, about which chain 38 is entrained, is fixed to the shaft 44 for rotation therewith (there may, of course, be a plurality of sprockets on shaft 44 for driving a plurality of chain sets if such is necessary to properly lift the platform 14; for simplicity, only one set has been shown) so that operation of the motor 50 will induce movement of the chain. The operation of the motor 50 is controlled by a suitable control circuit, as is well known in the art, to enable the apparatus 10 to establish the height of the topmost sheet and to maintain the topmost sheet in the stack 12 at the desired height.

An elongated lever 54 is provided to couple the lift mechanism 36 to the platform 14 to transmit the elevational lift forces from the lift mechanism to the platform. The elongated lever 54 is connected at one end 56 to a link in the chain 38 for elevational movement therewith. The connection is such that it will permit free pivoting of the lever 54 with respect to the chain. A non-symmetrical C-shaped clip 58 connected to the underside of the platform 14 along an edge adjacent the lift mechanism 36 is selectively engaged by the lever 54. The clip 58 has a first leg 60 adapted to engage the lever 54 at a point between the ends thereof and a second shorter leg 62 adapted to engage the end 64 of the lever opposite end 56. As best seen in FIG. 2, the engagement of the first leg 60 with the elongated lever 54 is on the uppermost surface of the lever while the second leg 62 engages the end 64 on a lower surface of the lever. In this manner, the lever 54 will be captured in the clip 58 in such a way so as to restrict pivotal movement of the lever induced by movement of the chain 38. Thus, a lifting force at the end 56 tending to move the end in the direction of the arrow will be transmitted to the platform 14 with the leg 62 serving as a fulcrum and the leg 60 serving as a reaction member to the lifting force on the lever.

In order that the lift mechanism 36 may be completely disengaged from the platform 14 when it is desired to move the base 18 (and platform 14) laterally to gain access to the platform 14, a stop member 66 connected to the drawer slide adjacent the plate 32 is provided. The stop member is positioned to engage the lever 54 at a point between the ends 56 and 64 thereof when the platform 14 is lowered to rest on portion 32a of plate 32 (see FIG. 3). When the chain 38 moves the lever 54 in a downward direction beyond the point where the platform is supported by the plate 32a, the stop member 66 will cause the elongated lever 54 to pivot in a clockwise direction about the end 56. The pivoting of the elongated lever 54 will thus cause the lever to disengage from the legs of the C-shaped clip 58 to free the platform 14 from its positive coupling with the lift mechanism 36.

The operation of the elevator apparatus 10 is as follows. With the apparatus 10 in its solid line position shown in FIG. 1, the platform 14 rests on portion 32 of plate 32a. The stop 66 is engaged with the lever 54 and the lever is thus disengaged from the clip 58. As a result there is no positive communication between the platform 14 and the lift mechanism 36. The base 18 and platform 14 are thus free to be moved laterally in the tracks 35 to move the base to a position where ready access to the platform 14 may be established for loading a stack thereon. After a stack of material 12 has been loaded on the platform 14, the base 18 may be returned to its operative position relative to the lift mechanism 36. The motor 50 may then be actuated to operate the lift mechanism 36 until the topmost sheet in the stack 12 reaches the desired height.

As the motor 50 drives the worm gear 48, the worm gear will cause the sprocket 40 to move the chain 38 in the direction of the arrow of FIG. 1 carrying with it the end 56 of the lever 54. The lever 54 resting on stop 66 will rotate in a counterclockwise direction until the legs 60 and 62 of the clip 58 are engaged (see FIG. 2). At this point a rigid coupling will be defined and the lifting force supplied by the chain 38 will be transmitted to the platform 14. As the platform is elevated to

the desired height, particular orientation of the stack 12 thereon is ensured by the scissors linkage 16 which maintains the platform in parallel relationship with the base 18 at all times.

When the topmost sheet in the stack 12 is elevated to the desired height, the operation of the motor 50 will cease. As the sheets are drawn off of the top of the stack 12 by the sheet feeding apparatus (not shown), the lower level of the stack will periodically cause the motor 50 to be actuated to cause the lift mechanism 36 to raise the stack to account for depletion thereof. Each time a topmost sheet is elevated to the desired height, the motor 50 will stop. This cycle will be repeated until the stack is depleted and reloading is necessary. When the stack is depleted, the platform 14 will be at its ultimate height in the position shown in phantom lines of FIG. 1. A suitable device will sense this upper limit of movement of the platform 14 to cause the motor 50 to reverse its operation.

On reversal of operation of the motor 50, the chain 38 will be moved opposite to the direction of the arrow of FIG. 2, thus moving the lever 54 downwardly to lower the platform 14. The weight of the platform maintains the rotation-preventing-engagement of the legs of the clip 58 with the lever 54. The platform 14 will continue to be lowered until it engages portion 32a of the plate 32, which serves as an independent support for the platform in its lowermost position. The motor 50 will continue the indicated movement of the chain 38 for a distance sufficient to permit the lever to be disengaged from the clip 58. As noted above, this is accomplished by locating the stop 66 such that it will engage the lever 54 as it moves downwardly and will cause it to pivot in a clockwise direction about end 56. The clockwise rotation will release the contact between the lever 54 and the legs 60 and 62 of the clip 58, resulting in positive disengagement between the platform 14 and the lift mechanism 36.

From the foregoing it is apparent that there is herein provided an elevator lifting apparatus for accurately controlling raising and lowering of a platform, the platform being positionable to facilitate access thereto. While the invention has been described in detail with particular reference to the preferred embodiment thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. Apparatus for raising and lowering a platform guided for movement in a predetermined orientation along a predetermined path, said apparatus including:

lift means movable along a path spaced from and generally parallel to the predetermined path of said platform; and

coupling means for transmitting movement of said lift means to said platform, said coupling means comprising an elongated member pivotally connected to said lift means, said elongated member having a first portion readily detachably engageable with said platform for transmitting a lifting force thereto upon movement of said lift means, and a second portion, spaced from said first portion, readily detachably engageable with said platform for limiting the pivoting movement of said member relative to said lift means tending to result from the application of such lifting force.

2. The apparatus of claim 1 wherein said elongated member is a lever pivotally connected at one end to said lift means and arranged to bear against said platform such that said first portion is located along the upper side of said lever intermediate its ends and said second portion is located at the lower side of said lever adjacent its end opposite said pivoted end.

3. The apparatus of claim 2 further including means for independently supporting said platform, and means for pivoting said lever to effect disengagement of said lever from said platform upon movement of said lift means when said platform is independently supported by said supporting means.

4. The apparatus of claim 3 wherein said lever pivoting means includes a stop positioned so as to engage said lever between said end connected to said lift member and said second portion when said lift member moves downwardly after said platform has become independently supported.

5. Apparatus for raising and lowering material along a predetermined path said apparatus including: a platform guided for movement in a predetermined orientation along said predetermined path; an independent platform support in said predetermined path; lift means movable along path parallel to said predetermined path; coupling means for operatively connecting said platform to said lift means, said coupling means including a lever pivotally connected adjacent one end

thereof to said lift means and extending therefrom toward said platform, a reaction member on said platform to selectively engage the upper side of said lever between the ends thereof, a fulcrum on said platform to selectively engage the underside of said lever adjacent the end of said lever opposite said pivoted end, whereby said reaction member and fulcrum will limit pivoting movement of said lever such that movement of said lift means will be transmitted to said platform to regulate the raising and lowering of said platform; and means for effecting disengagement of said lever from said fulcrum and reaction member when said lift means continues to move after said platform has become independently supported by said platform support.

6. Apparatus of claim 5 wherein said means for effecting disengagement of said lever includes a stop associated with said independent platform support positioned to engage said lever when said lever moves with said lift means after said platform is supported by said independent platform support to pivot said lever out of engagement with said fulcrum and reaction member.

7. Apparatus of claim 5 wherein said reaction member and said fulcrum are integrally formed as a non-symmetrical C-shaped clip extending from said platform, the legs of said clip serving to contact said lever so as to form a rigid member therewith during raising and lowering of said platform.

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