Jan. 20, 1959 C. H. HEIGL ET AL 2,869,870

PILE ELEVATOR

Filed July 31, 1952 2 Sheets-Sheet 1

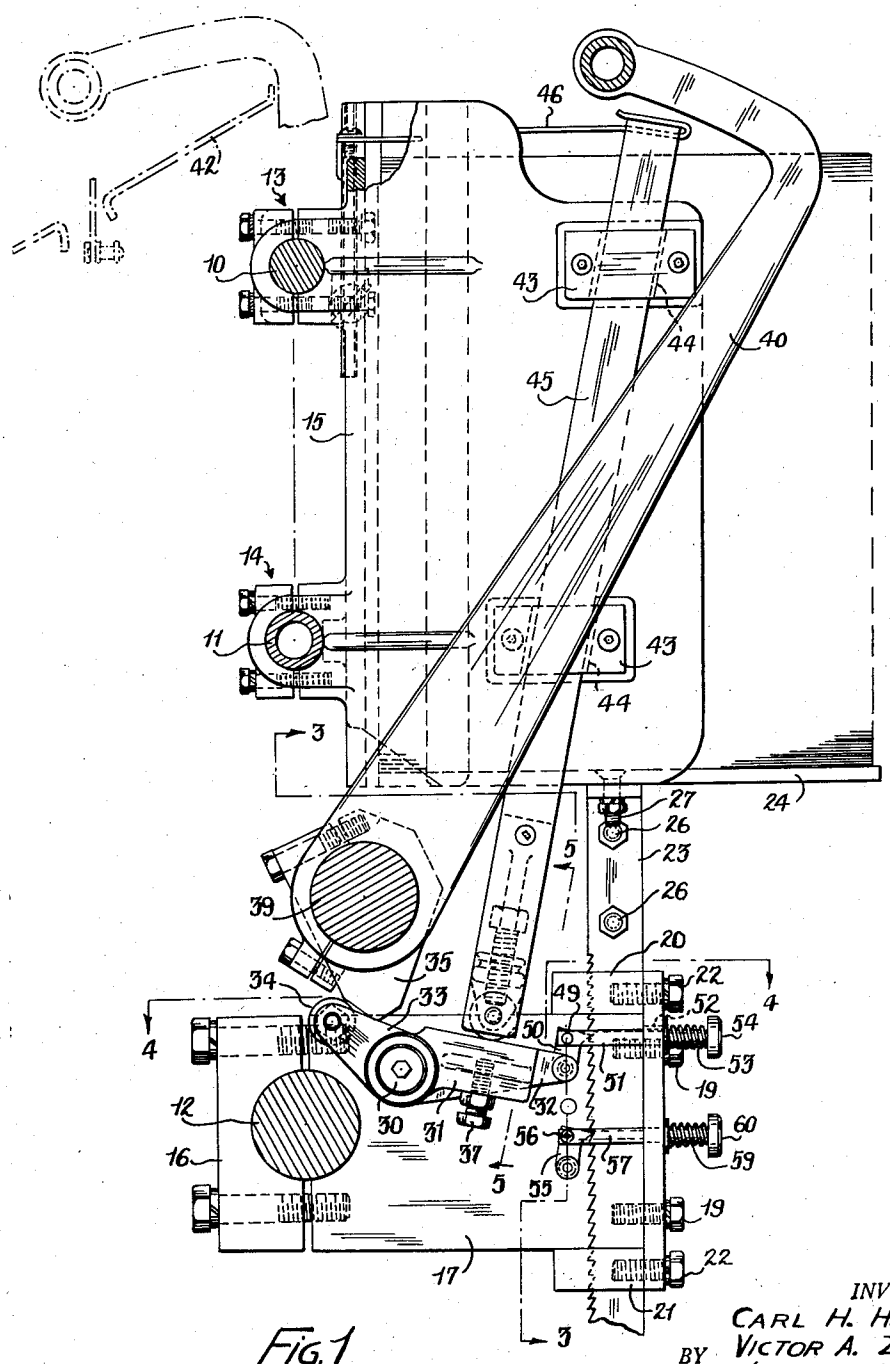


FIG. 1

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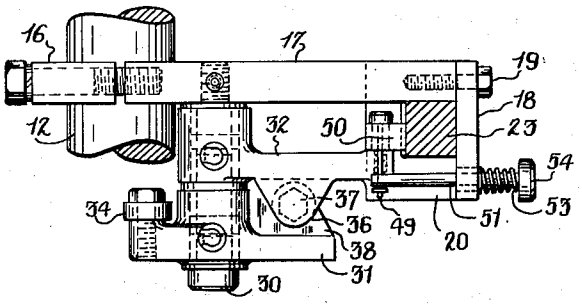


FIG. 4

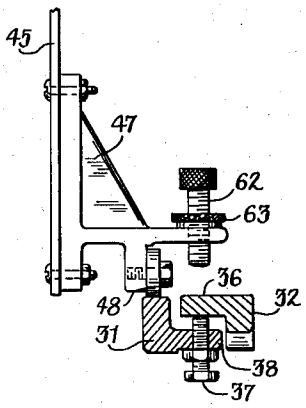


FIG. 5

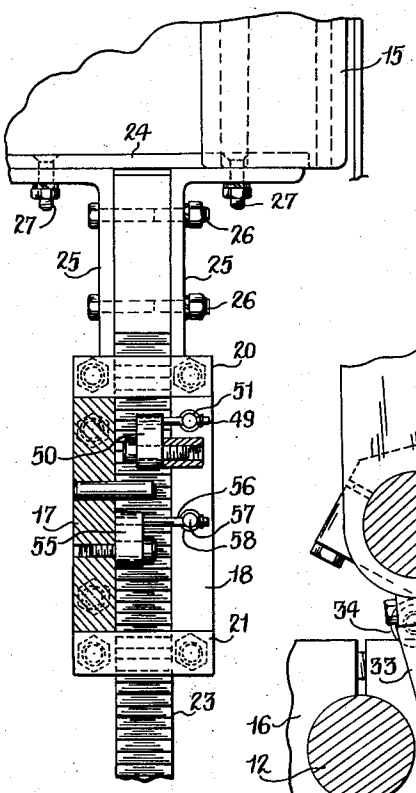


FIG. 3

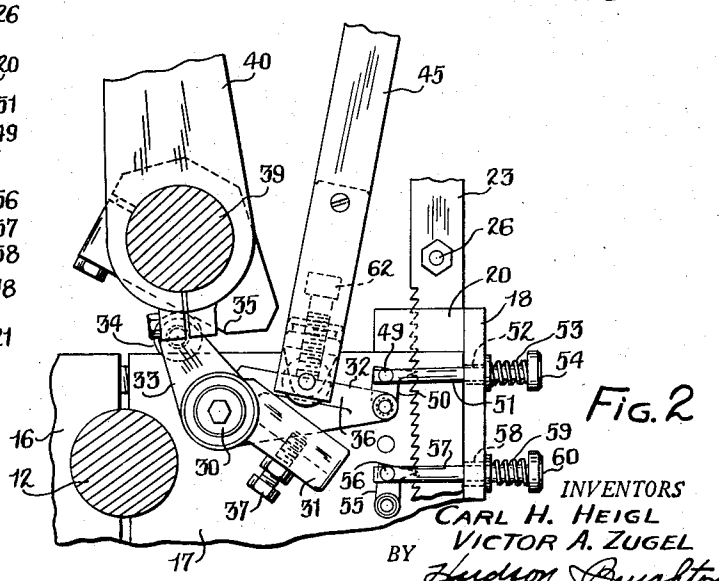


FIG. 2

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2,869,870

PILE ELEVATOR

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Application July 31, 1952, Serial No. 302,022

3 Claims. (Cl. 271—62)

This invention relates to improvements in pile elevators, that is to say means for progressively raising a pile of sheets automatically during the operation of a sheet handling machine, for example a collator, in order to maintain the top of a pile at approximately constant height so that the means for feeding the sheets from the top of the pile may function correctly.

One of the objects of the invention is the provision of a means of this character which shall be of simple construction, involving a minimum number of parts.

Another object is the provision of means of this character in which a feeler contacting the top of a diminishing pile functions by its own weight to depress a rack engaging pawl far enough to engage beneath the next lower tooth of the elevator rack, with periodically operating means to raise the pawl for actuating the elevator.

Still another object is the provision in mechanism of the character stated of two arms pivoted on a common axis, one of which arms is adapted to be depressed by the feeler for lowering the said pawl, and the other of which is swung upwardly after the pawl is depressed for engaging the first arm and lifting it to raise the pawl and elevate the rack and the pile carried thereby.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application, we have illustrated in the accompanying drawings, in which

Fig. 1 is a side elevational view of pile elevating mechanism embodying the invention, the parts being shown in the positions which they occupy as a raising movement of the pile is being completed.

Fig. 2 is a fragmental view of the same with the parts in the positions which they assume as the feeler bar descends to cause the lifting pawl to engage a next lower tooth of the rack.

Fig. 3 is a detail elevational view, partly in section, illustrating the rack upon which the pile is supported, the guiding means therefor, the lifting pawl and the pawl for preventing downward motion between pawl lifting movements.

Fig. 4 is a plan view taken partially in section on line 4—4 of Fig. 1, and

Fig. 5 is a vertical sectional view taken substantially on the line 5—5 of Fig. 1.

The drawings illustrate the application of the invention to a collator having a series of hoppers in which piles of paper sheets are carried and from the tops of which piles a series of oscillating feeder arms take sheets and transfer them to a conveyor pan indicated at 42 in Fig. 1, upon which the sheets from the various piles are collated.

The frame of the machine illustrated includes three fixed bars or shafts 10, 11 and 12 running lengthwise or parallel to the direction of travel of the sheets on the conveyor. On the two upper bars 10 and 11 there are supported by divided clamps 13 and 14 a series of pairs of right angle guides 15 open at the top and bottom and along one side which may be considered to be the front side. These guides, one or both of which may be adjustable laterally of the bars 10 and 11, assist in the formation of even piles and hold them against lateral movement as they travel upwardly during the operation of the machine.

Beneath each pile there is supported on the bar 12 by means of a clamp 16 a heavy plate 17, to the forward edge of which a plate 18 is secured by means of screws 19. At the top and bottom of plate 18 above and below plate 17 right angle guides 20 and 21 are mounted by means of screws 22. Between these guides and the plates 17 and 18 there is slidably mounted a rack 23 with ratchet teeth on its rear surface.

The upper end of rack 23 is fastened to and supports a hopper plate 24 upon which the pile of sheets are to be stacked. In the illustrated arrangement angle irons 25 are secured to the rack by bolts 26 and the horizontal flanges of the angle irons are bolted to the bottom surface of the hopper plate by bolts 27. It is to be understood of course that the hopper plate is free to move up and down within the area inclosed by a pair of angle guides 15.

A fixed shaft or trunnion 30 is threaded into a hole in plate 17 and projects horizontally therefrom. On it are mounted two independently operated arms 31 and 32, hereinafter called the driving and the driven arm respectively. Driving arm 31 is part of an integral lever, the other arm 33 of which carries a follower 34 which engages an actuating cam 35. Driven arm 32 carries a laterally projecting abutment 36, the under surface of which is adapted to be engaged by the screw 37 adjustably mounted in a flange 38 of arm 31.

Cam 35 is adjustably mounted on an oscillating shaft 39 which is journaled in the frame of the machine. On this same shaft there are secured upwardly extending arms 40. For every cycle of the machine these arms swing from the full line position of Fig. 1 to the dotted line position and back again. Each one carries sucker means that is operated to grasp the top sheet of the pile, lift it, carry it off the pile and drop it onto a conveyor trough partially indicated at 42 in Fig. 1, along which the sheets or assembled groups of sheets are moved intermittently until they emerge from the forward end of the machine as collated packs. The position of the arm 40 and the cam 35 illustrated in Fig. 2 corresponds to the dotted line position of arm 40 in Fig. 1, the oscillation taking place through an angle of 36° approximately.

Upon the side wall of one of the angle guides 15 of each pile we mount a pair of retaining guide plates 43 which are provided with inclined slots 44 on their rear faces to slidably receive a feeler bar 45. At its upper end each feeler bar carries a feeler arm 46 which extends over the pile and is adapted to rest upon it for a short period when the feeding arm is in a sheet feeding position.

The bar 45 has substantial inherent mass, and in addition there is mounted at its lower end a weighted bracket 47. Hence gravity tends strongly to pull the feeler bar down until the arm 46 encounters the top of the pile and prevents further descent. The feeler bar is raised to clear the top of the pile during that portion of the cycle in which the feeding suckers at the top of the arm 40 are performing their function of engaging and grasping a sheet and drawing it off the pile. This is effected by the action of cam 35, swinging driving arm 31 upwardly against a follower 48 rotatably mounted on the bracket 47. At such time the driven arm 32 is also swung upwardly because of the engagement of screw 37 with the laterally projecting part 36 of arm 32.

On the extremity of arm 32 there is pivotally mounted a pawl 50 which projects upwardly from the arm and comprises a tooth that is adapted to engage beneath a tooth on the rack 23 and lift the rack, but to ride downwardly over the rack into engagement with the next lower tooth when arm 32 descends far enough to bring about this effect. The upper end of the pawl is connected by a pivot 49 with a pin 51 which extends through a hole 52 in plate 18 with considerable clearance, so as to permit tilting of the pin 51 through a small vertical angle. A spring 53 engaging behind the head 54 of the pin serves to yieldably draw the pawl into engagement with the rack.

A second pawl 55 is pivotally mounted on plate 17 in position to engage rack 23 and hold it against unintentional downward movement. This pawl is similarly connected by a pivot 56 with a pin 57 that extends through a relativly large hole 58 in plate 18. A spring 59 working against the head 60 of pin 57 biases pawl 55 toward operative rack engaging position. When the rack is raised one tooth by pawl 50, pawl 55 rides downwardly over a tooth and engages beneath that tooth to hold the rack against downward movement.

A stud 62 is threadably mounted in a horizontally extending portion of bracket 47 so as to be adjustable up and down in the bracket. A knurled nut 63 on the stud may be threaded down against the bracket to hold the stud in adjusted position. The lower end of this stud is disposed above the upper surface of arm 32 or the abutment 36 thereon. When the arms 31 and 32 are in the positions illustrated in Figure 2, and the support for the feeler bar 45 furnished by arm 31 is removed by that arm swinging down below the level of follower 43, stud 62 engages arm 32, and if the height of the pile is sufficiently decreased the weight of the feeler bar pressing down upon arm 32 pulls pawl 50 down while swinging pin 51 down against the action of spring 53, with the result that the pawl engages beneath the next lower tooth of the rack.

Now, as the arm 40 swings from its dotted line position of Fig. 1 to it full line position, arm 31 swings up from the position of Fig. 2 to the position of Fig. 1, which causes the driving arm 31 to engage and raise the driven arm 32, thereby forcing the pawl 50 upward to raise rack 23. Pawl 55 then function to engage a lower tooth of the rack and prevent retrograde movement thereof. At the same time feeler bar 45 is slid upwardly in its guides 43, so that the horizontal arm 46 is lifted off the pile and is incapable of interfering with the removal of the uppermost sheet by the sheet separating and feeding mechanism, not shown.

Having thus described our invention, we claim:

1. In combination, a frame, a hopper plate for supporting a pile of sheets, an upstanding rack operatively connected with said hopper plate and adapted upon endwise travel in said frame to move the hopper plate up or down, ratchet teeth on one side of said rack, means for preventing downward travel of said rack, a driving arm and a driven arm pivoted about a single horizontal axis and extending laterally therefrom, a pawl on said driven arm adapted to engage the toothed side of said rack, means for rocking said driving arm down and up through a predetermined arc during each cycle of the machine, means for limiting the downward movement of said driven arm, an abutment on one of said arms adapted to cause said driving arm to raise said driven arm when the driving arm swings to the upper end of its arc of travel, an upstanding feeler bar slidable endwise in said frame having a laterally extending portion adapted to engage the top of the pile, said bar having a foot riding on said driving arm during the upper portion of its arc of travel and having a second foot adapted to bear upon said driven arm when the driving arm is in the lower part of its arc and to depress said driven arm and cause said pawl to engage beneath the next lower tooth of the rack when descent of the feeler bar to a sufficient extent is permitted by a decreasing pile height.

2. A machine as defined in claim 1, wherein said feeler bar functions through gravity alone to depress said driven arm with its pawl for causing the latter to engage the next lower tooth of said rack.

3. In combiniation, a frame, a hopper plate for supporting a pile of sheets, an upstanding rack operatively connected with said hopper plate and adapted upon endwise travel in said frame to move the hopper plate up or down, ratchet teeth on one side of said rack, means for preventing downward travel of said rack, a rock shaft, a feeder arm secured thereto adapted to remove a sheet from the top of the pile on each oscillation of said shaft, a driving and a driven arm pivoted about a single horizontal axis and extending laterally therefrom, a pawl on said driven arm adapted to engage the toothed side of said rack, a cam on said rock shaft moving said driving arm down and up through a predetermined arc for each oscillation of said shaft, means for limiting the downward movement of said driven arm, an abutment on one of said arms adapted to cause said driving arm to raise said driven arm when the driving arm swings to the upper end of its arc of travel, an upstanding feeler bar slidable endwise in said frame having a laterally extending portion adapted to engage the top of the pile, said bar having a foot riding on said driving arm during the upper portion of its arc of travel and having a second foot adapted to bear upon said driven arm when the driving arm is in the lower part of its arc and to depress said driven arm and cause said pawl to engage beneath the next lower tooth of the rack when descent of the feeler bar to a sufficient extent is permitted by a decreasing pile height.

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