Nov. 24, 1953 T. A. RIBICH 2,660,430

PACK FEED CONTROL MECHANISM

Filed Sept. 12, 1950

4 Sheets-Sheet 1

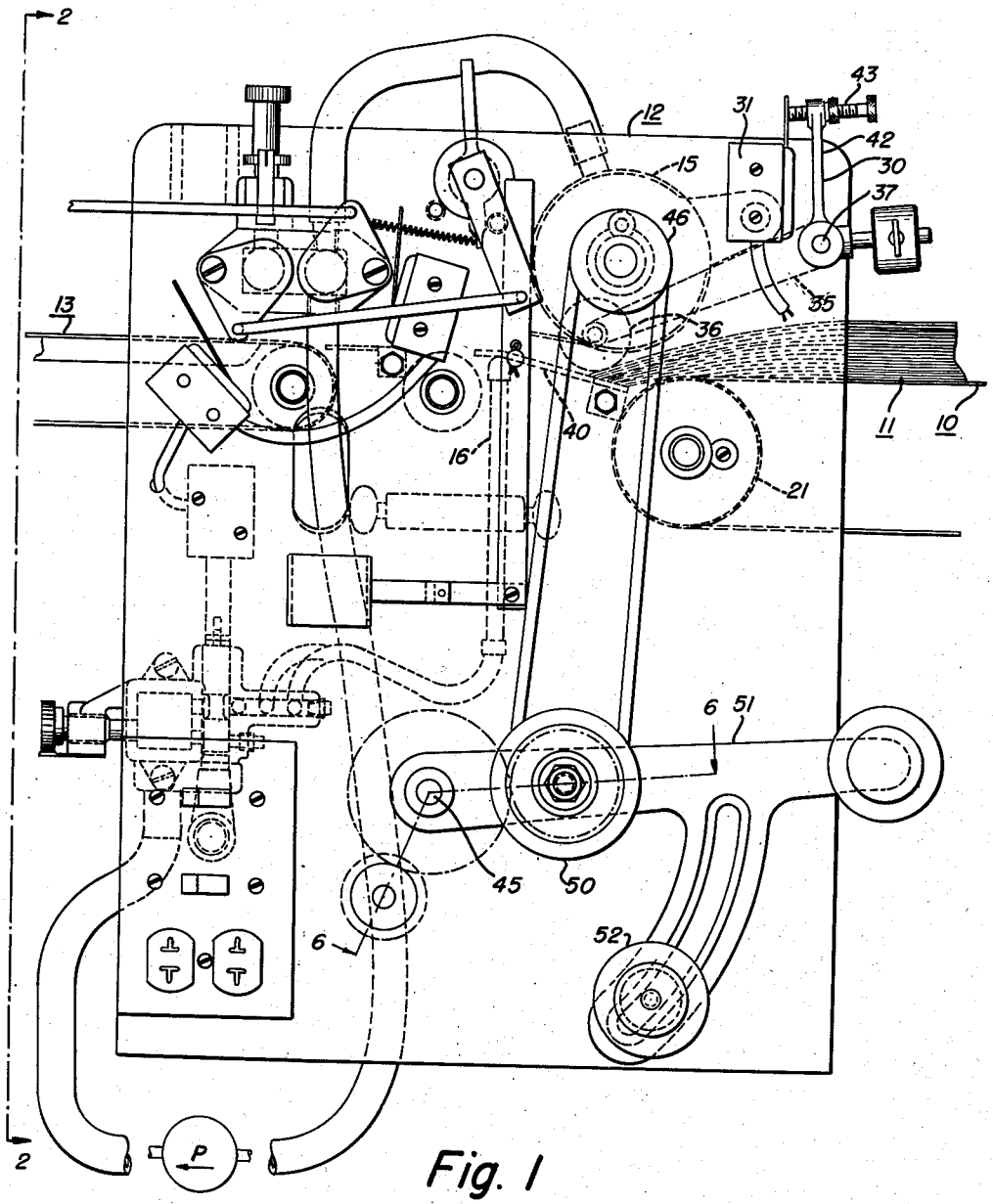


Fig. 1

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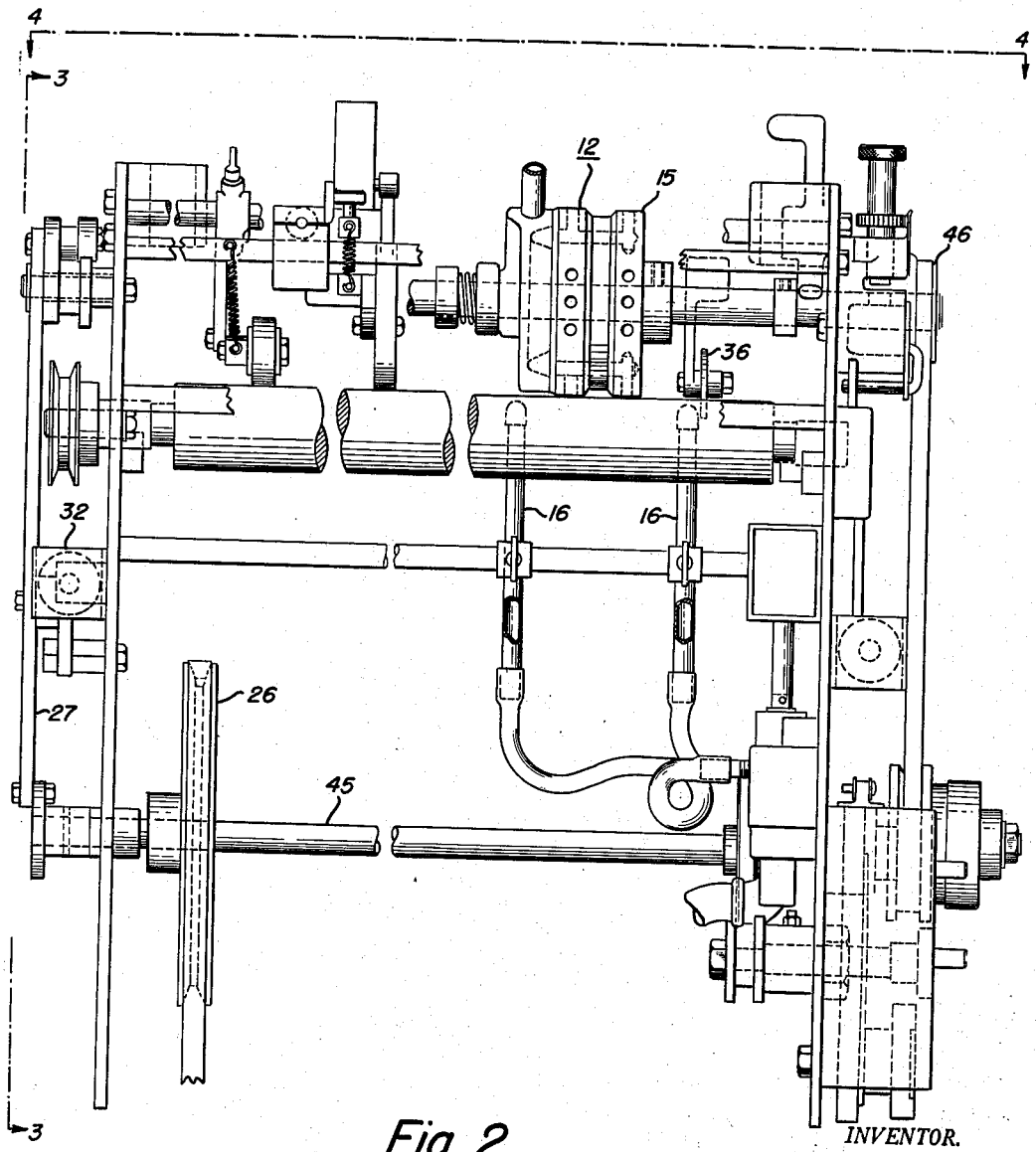


Fig. 2

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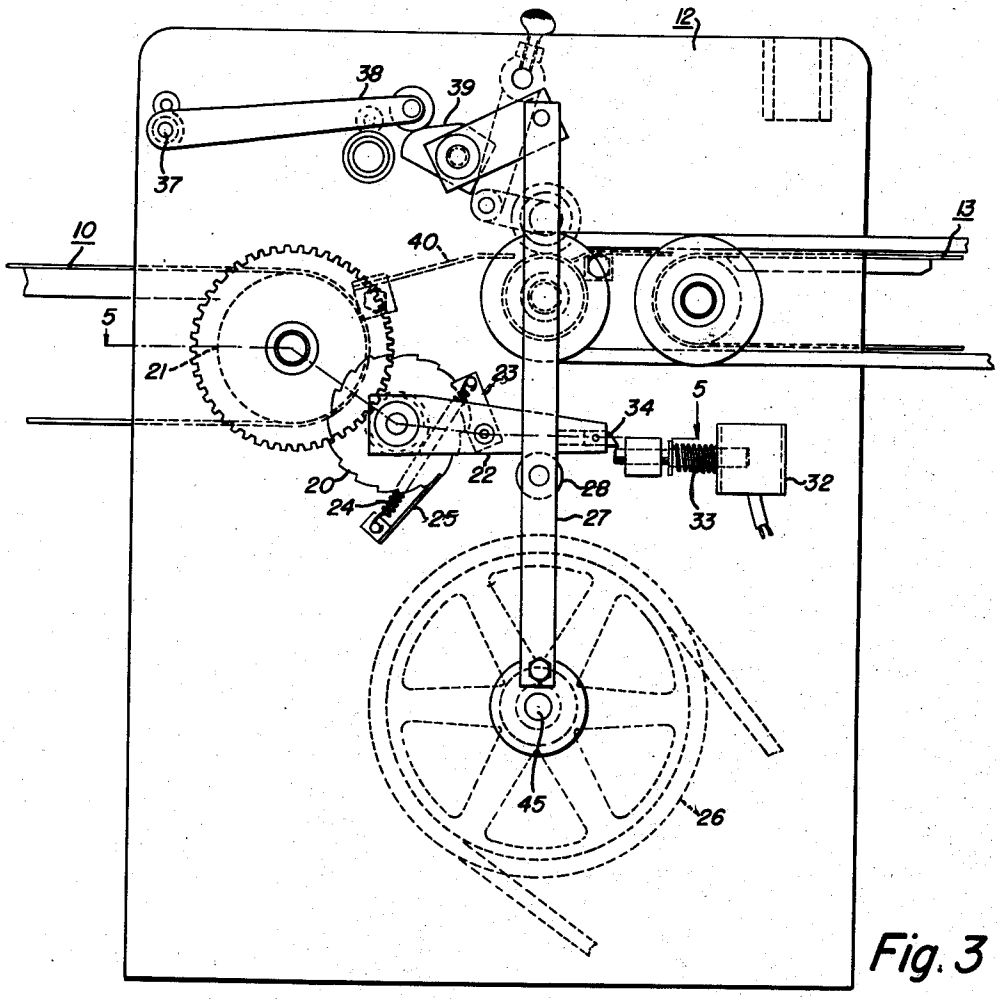


Fig. 3

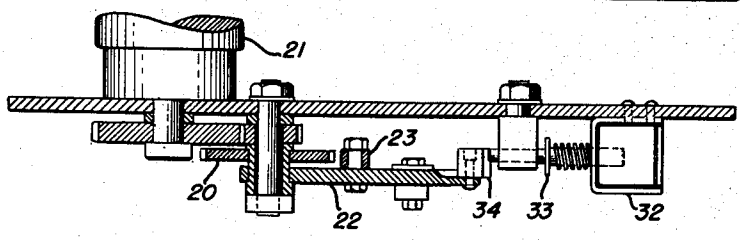


Fig. 5

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Filed Sept. 12, 1950 4 Sheets-Sheet 4

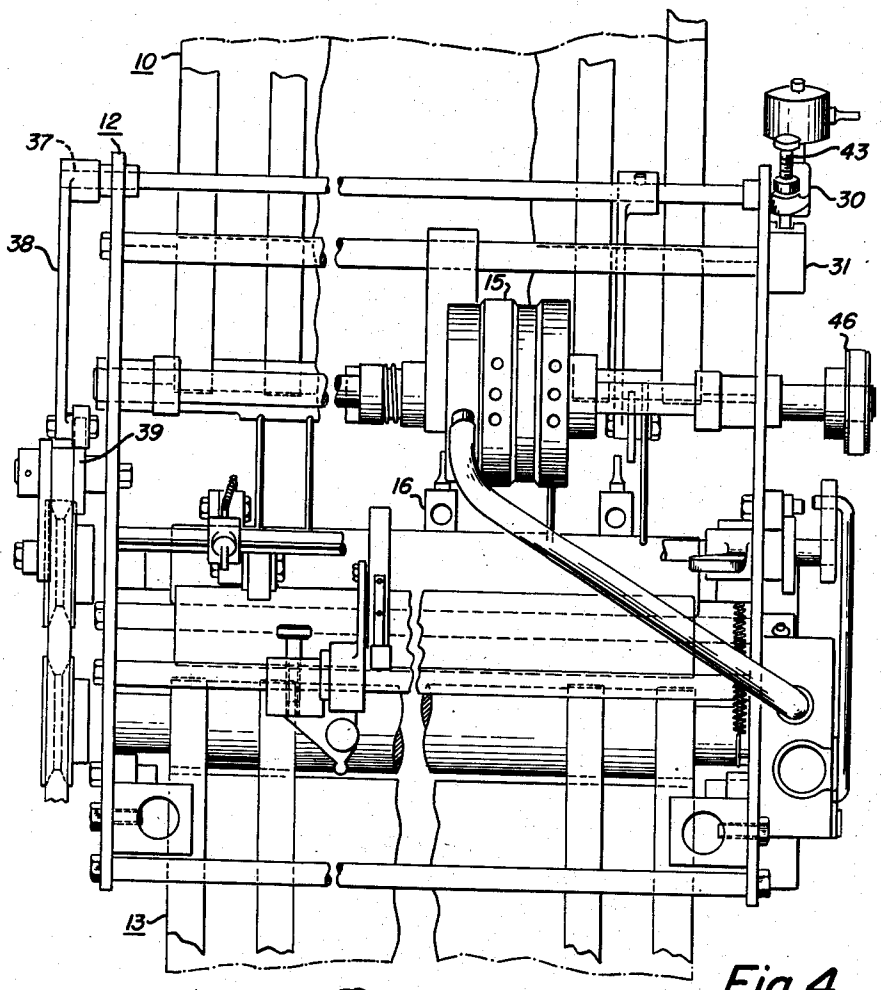


Fig. 4

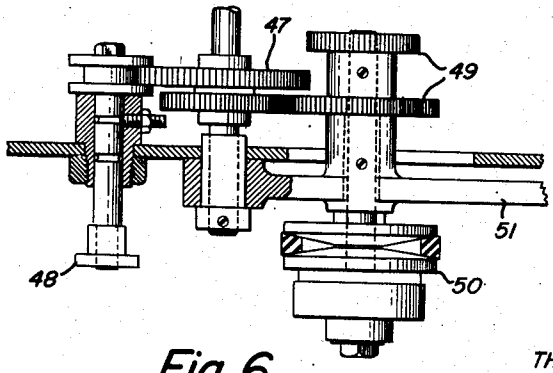


Fig. 6

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UNITED STATES PATENT OFFICE

2,660,430

PACK FEED CONTROL MECHANISM

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Application September 12, 1950, Serial No. 184,450

2 Claims. (Cl. 271—12)

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The present invention relates to a device for controlling a conveyor which moves a stack of papers into a machine whereby a supply of papers is always maintained at the machine.

In paper manipulating machines, such as folding machines, the papers to be folded are placed in a continuous stack on a conveyor belt which carries the papers into a machine. The sheets of paper are then removed one at a time from the top of the stack so that each individual sheet may be folded separately. In these machines, a paper separating device is used to remove the sheets of paper one at a time from the top of the stack. This paper separating device generally has air blast tubes which direct an air blast between the sheets of paper in the stack to separate them and a suction wheel to move the top sheet of paper from the top of the stack. To maintain a high rate of production in the machine, a substantially constant supply of paper should be maintained at the paper separating device so that the top sheets may be continually taken from the stack at a uniform rate. It is well known that when a long stack of papers is placed by hand in a longitudinally skewed fashion on conveyors there may be more papers in one portion of the continuous stack than in the next succeeding portion of the stack. Since the thickness of the stack at the end of the conveyor or at the suction roll of the separating device should be not greater than a predetermined thickness, it is necessary to provide means for moving the conveyor and the papers carried thereby towards the roll as the papers are removed from the top of the stack. The thickness is directly dependent on the number of sheets of paper at that position and the thickness of each sheet of paper. When too few sheets of paper are present, the thickness of the stack at the end of the conveyor is less than the predetermined thickness and when too many sheets of paper are present, the thickness is greater than the desired predetermined thickness.

Therefore, one of the objects of the invention is to provide a positive control which automatically feeds the stack of papers to the separator device when the preceding papers have been removed from the conveyor by the separator device.

Another object of the invention is to provide an electrically controlled ratchet and pawl drive for a conveyor in a paper folding machine.

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Another object of the invention is to provide a thickness gauge on a paper separating device which operates an electrical switch to control a conveyor and thereby move more papers into the device when the supply has reached a predetermined minimum.

Another object of the invention is to provide a conveyor drive for a conveyor wherein the drive is controlled by the thickness of paper or other material leaving the conveyor.

Another object of the invention is to provide a ratchet and pawl drive for a conveyor wherein the pawl is controlled by electrical controls directly responsive to the thickness of paper or other material leaving the conveyor.

Another object of the invention is to provide a ratchet and pawl drive for a conveyor for conveying a longitudinally skewed stack of papers wherein the pawl is controlled by electrical controls directly responsive to the number of papers at the discharge end of the conveyor.

Another object of the invention is to provide a simple positive drive for driving a conveyor in stepped movements.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a front side elevational view of the paper separation portion of a folding machine positioned between conveyors;

Figure 2 is a view taken along the line 2—2 of Figure 1, with certain parts omitted for purposes of clarity;

Figure 3 is a back side elevational view of the machine taken along the line 3—3 of Figure 2;

Figure 4 is a top view of the machine as taken along the line 4—4 of Figure 2;

Figure 5 is a fragmentary cross-sectional view taken along the line 5—5 of Figure 3; and

Figure 6 is a fragmentary cross-sectional view along the line 6—6 of Figure 1.

The paper separating device illustrated in the drawings is positioned between first and second conveyors which are disposed in end to end relationship. In this instance, the conveyor 10 conveys a continuous stack of paper 11 into the paper separating device 12 and the conveyor 13 carries the individual sheets of paper away from the the paper separating device 12 towards a paper

folding part of the machine. The paper folding part of the machine is not illustrated in the drawings or described herein since it may be of conventional design. The conveyor 10 operates in a stepped movement to keep a continuous supply of paper at the paper separator device 12. Thus, when the separator 12 has removed the top sheet of paper from the continuous and longitudinally skewed stack of papers 11, the conveyor 10 again steps the stack of papers 11 towards the separator 12. The conveyor 13 moves continuously and at an even and steady speed to carry the individual sheets of paper away from the paper separator 12 as the individual sheets of paper have been removed from the top of the strung-out stack of papers 11.

The paper separator or separating device 12 illustrated and described herein comprises in general a suction wheel 15 designed to move the top sheet forward and from the stack, along with an air blast device 16 aligned to blow air into the forward edge of the stack of papers 11, and between the sheets of paper to separate the top sheet from the other sheets in the stack. As is illustrated in Figures 1 and 2 of the drawings, the air blast 16 is in the form of tubes, also identified by the number 16, having nozzles at the upper end thereof directing the air generally toward the suction wheel and into the forward edge of the stack of papers. The air suction wheel 15 is of standard rotating vacuum operated design widely used on paper separating devices. When it engages the top sheet of paper it picks up that sheet of paper and thrusts it in a forward direction. In Figure 1 of the drawings, the suction wheel 15 moves the top sheet of paper from the continuous stack of paper 11 on conveyor 10 and from right to the left over top of the air blast nozzles 16 and onto the conveyor 13.

The conveyor 10 is driven by a drive roll 21 rotated by a ratchet and pawl drive mechanism to drive the conveyor 10 in stepped movement whereby the long continuous skewed stack of paper 11, carried by the conveyor 10, is moved into the separating device 12 in stepped movements to maintain a continuous supply of papers at the suction wheel 15 and air blast 16 of the separating device 12. Referring to Figure 3 of the drawings, this driving mechanism for the drive roll 21 includes a ratchet wheel 20 and a rocker arm 22. The ratchet wheel 20 is geared to the drive roll 21. In this instance, the rocker arm 22 is pivotally mounted on the axis of the ratchet wheel 20 and has a pawl 23 engageable with the teeth on the periphery of the ratchet wheel 20 (see Figure 3). The rocker arm 22 is swingable in a vertical direction. A spring 24 urges the pawl 23 into the periphery of the ratchet wheel 20.

A pulley wheel 26, carried by a shaft 45 which is journaled in the housing of the paper separating device 12, drives a reciprocating bar 27 to pivot the rocker arm 22 in one direction to step the ratchet wheel 20 angularly from one tooth to the next tooth. This bar 27 carries an abutment 28 which abuts the underside of the rocker arm 22 to angularly move the same upwardly thereby stepping the ratchet wheel 20 to move the conveyor 10 forward one step thereby advancing the continuous stack of papers 11 into the paper separating device 12. The rocker arm 22 is not attached to the abutment 28 and returns by gravity as the abutment 28 is lowered.

In the present machine the suction wheel 15 is driven through a variable drive transmission from the same shaft 45 that supports pulley wheel 26. The suction wheel 15 is carried by a shaft rotated by a pulley 46. A clutch means with variable speed interconnects pulley 46 and shaft 45. As is best illustrated in Figures 1 and 6, a pair of gears 47 of different diameters are slidably mounted on shaft 45 and slidable by a gear shift button 48 mounted in the housing. A pulley shaft carrying a complementary pair of gears 49 and a speed change pulley 50 is mounted for cooperative driving by gears 47. This pulley shaft is carried by an angularly adjustable arm 51 pivoted on shaft 45 and angularly positionable in a locked position by suitable locking means 52. The speed of the suction wheel 12 relative to pulley 26 depends on the ratio of intermeshing of gears 47 and 49 by gear shift button 48 and the pulley ratio between pulleys 46 and 50 caused by angularly positioning arm 51. This various speed drive provides an unlimited number of speeds for fine adjusting of the machine to accommodate papers of many various sizes and thicknesses.

Since the stack of papers 11 on the conveyor belt 10 are not of uniform thickness throughout the length of the conveyor and come in bunches, it is necessary that the conveyor 10 be moved only when the supply of papers at the suction wheel 15 and air blast 16 is low. To insure papers being at the suction wheel 15 so that the top sheet thereof may be removed one at a time, the machine has been provided with a thickness gauge or feed control 30 operating through electrical micro-switches 31 and the solenoid 32 to control the dropping of the pawl 22 and thus movement of the ratchet wheel 20. The micro-switch 31 and solenoid 32 are electrically connected to a source of energy by suitable electrical wiring.

The solenoid 32 has a spring loaded armature 33 positioned to normally extend under the end 34 of the rocker arm 22 and hold the weight of the rocker arm 22 when the bar 27 goes down (see Figure 3). The pulley wheel 26 rotates continually by means of belt drive from a suitable drive motor and thus continually moves the bar 27 up and down. When the armature 33 is under the end 34 of the pawl 22 as illustrated in Figure 3, the pawl cannot drop down when the bar 27 reaches the bottom of the stroke, thus the ratchet wheel 20 cannot then be moved forward to advance the stack of papers 11. However, when the solenoid 32 is energized and the armature 33 drawn endwise and away from the end 34 of the rocker arm 22, the rocker arm 22 can drop with the bar 27 as the bar 27 goes to the bottom of its stroke. As the bar 27 is again moved to the top of the stroke, the pawl 23 engages the rim portion or the teeth on the ratchet wheel 20 to drive the same a step forward and thereby step the conveyor to move the stack of paper thereon towards the separating device 12. In this particular instance, the abutment 28 raises the pawl 22 at the top of every stroke a sufficient distance to release frictional drag between the end 34 of rocker arm 22 and the armature 33 of the solenoid 32 whereby the armature may move easily when the solenoid is energized.

The thickness gauge 30, sometimes referred to as a "sensor," of the feed control is in the form of an arm 35 carrying a small wheel 36 on the end thereof. The arm 35 is secured to a shaft 37 which carries a cam follower 38. See Figure 3. Pivotally mounted on the supporting structure is a cam 39, pivotally oscillated by the bar 27. The cam follower 38 rides on this cam 39 and is

moved in synchronous movement with the bar 27 and the pulley wheel 26 so that the thickness gauge wheel 36 continually and pivotally bobs up and down against the top of the stack of papers as they are being fed under the suction wheel 15. The wheel 36 of the thickness gauge 30 is positioned along side of the suction wheel 15 in the separating device 12 to be responsive to the thickness of paper between the conveyor bed 40 and the suction wheel 15.

The micro-switch 31 is secured to the supporting structure of the machine and the shaft 37 of the thickness gauge 30 carries an operating arm 42 having an adjustable set screw 43 which abuts the switch arm of the micro-switch 31.

The set screw 43 may be threadably adjusted to set the thickness control within a few thousandths of an inch. The control may be adjusted to accommodate thick or thin papers.

When the wheel 36 is bumping the conveyor bed 40, the screw 43 is closing the micro-switch 31, thereby causing energization of the solenoid 32. Since the solenoid 32 becomes energized, the pawl 22 will drop down to gain a new bite on the ratchet wheel 20 and move the stack of papers 11 on the conveyor 10 forward. Each time the pulley wheel 26 makes a complete revolution, the wheel 36 is raised up away from the bed 40 and again dropped down onto the stack of papers 11 or to the conveyor bed 40.

When the stack of papers 11 is between the wheel 36 and the conveyor bed 40, the wheel 36 cannot move as close to the conveyor bed 40, thus the set screw 43 cannot angularly move as far to operate the micro-switch 31 and energize solenoid 32. Therefore the conveyor 10 will not be stepped forward to move more papers into the paper separating device 12. The energizing of solenoid 32 is dependent on the thickness and thus the number of sheets of paper between control wheel 36 and conveyor bed plate 40. As long as there are a sufficient number of sheets of paper at the separating device 12, the arm 35 can not drop the wheel 36 close enough to the bed plate 40 to close switch 31 and operate solenoid 32. When the top sheets of papers have been removed the thickness of the stack is below the predetermined thickness and the micro-switch will be closed upon dropping of arm 35 and wheel 36 toward the conveyor plate 40.

While the paper manipulating machine is operating so that the separator device 12 is removing sheets of paper one at a time from the top of the stack of papers 11 and depositing these sheets one at a time on the continually moving conveyor 13, the stack of papers is fed into the device by the conveyor 10. The pulley wheel 26 rotates continually to move the bar 27 and the thickness gauge 30 all of the time that the machine is operating and sheets of paper are being removed from stack of papers 11. When the stack of paper gets low, the micro-switch 31 is closed to energize solenoid 32 thereby permitting the bar 27 to drive the ratchet and pawl drive mechanism to step the conveyor 10 and the stack of papers 11 carried thereby into the separating device 12. As soon as the stack of papers reaches the separating device 12, the thickness of the papers will prevent further closing of the switch 31 and thus further stepping of the conveyor until the immediate top sheets of paper of the stack of papers 11 has been separated therefrom and each individual sheet moved onto conveyor 13.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In a machine for removing sheets of paper one at a time from the top of a stack of papers, the provision of, a first paper carrying conveyor and a second paper carrying conveyor placed in end to end relationship, paper separating means between said conveyors, ratchet drive wheel means driving said first conveyor in stepped movement, a rocker arm and pawl drive means for said ratchet drive wheel, continuous drive means for said second conveyor, a control arm mounted for movement in a vertical reciprocating path toward and away from the paper carrying surface of said first conveyor, said control arm limited in the travel toward said first conveyor by contact with paper carried thereon, said rocker arm swingable in an oscillatory path between first and second limits of travel, said pawl means engageable in driving relationship with said ratchet drive wheel means in a first direction of movement of said rocker arm in said oscillatory path toward said first limit of travel, means urging said rocker arm in a second direction of movement in said oscillatory path toward said second limit of travel, prime mover drive means operating both said rocker arm and control arm in synchronized relationship wherein the control arm is moved toward the conveyor surface and the rocker arm is moved toward said first limit at the same time, and wherein both elements travel in the reverse direction at the same time, catch means engageable with said pawl means in a position to lock said pawl means near said first limit of travel against return by said urging means, said position being a distance from said first limit to allow said drive means to oscillate said rocker arm a slight amount and lift said rocker arm off said catch as the control arm approaches said conveyor surface, a solenoid attached to said catch to withdraw the catch and release said pawl means, an electrical switch for said solenoid, said control arm having a switch contact arm movable therewith, said contact arm actuating said switch upon approach of said control arm to a predetermined distance above said conveyor surface, and means to adjust said predetermined distance at which actuation of the switch takes place, whereby said catch is relieved of mechanical drag caused by the pawl means when the switch is activated to operate the solenoid and withdraw the catch.

2. A paper feeding machine to keep a constant supply of stock feed to a handling machine comprising, a conveyor to carry paper stock, ratchet drive wheel means driving said conveyor in stepped movement, a rocker arm and pawl drive means for said ratchet drive wheel, said rocker arm having a first length of swing for driving said conveyor, catch means to limit said rocker arm to a portion of said first length of swing, said portion of swing being less than sufficient to effect driving action of the conveyor, said second portion of swing producing a separation of the rocker arm and catch means, catch drive means to move said catch means to an inoperative position and release said rocker arm, a paper depth feeler mounted above said conveyor, drive means moving said paper depth feeler toward and away

from said conveyor in regular cyclic motion, movement of said paper depth feeler toward said conveyor taking place simultaneously with said separation of the rocker arm and catch, and control means for said catch drive means to activate said catch drive means to move to said inoperative position, said control means operated by said paper depth feeler by movement of said feeler to a predetermined height above said conveyor.

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