

[54] SHEET FEEDER OFF A STACK OF SHEETS

[72] Inventor: Anton R. Stobb, Pittstown, N.J.

[73] Assignee: Stobb, Inc., Mountainside, N.J.

[22] Filed: May 8, 1970

[21] Appl. No.: 35,697

[52] U.S. Cl. 271/6, 214/8.5 A, 214/8.5 B,
214/8.5 G, 271/34, 271/68
[51] Int. Cl. B65h 3/04, B65h 29/14
[58] Field of Search 271/68, 34, 7, 6, 4, 3, 86,
271/DIG. 7, 62; 214/8.5 A, 8.5 B, 8.5 G

[56] References Cited

UNITED STATES PATENTS

3,522,943	8/1970	Swanson	271/6
2,933,313	4/1960	Stobb	271/68
3,416,679	12/1968	Stobb	214/8.5 A
3,161,292	12/1964	Van Dalen	271/68 X
3,027,161	3/1962	Solyst	271/34 UX

3,188,082	6/1965	Stobb	271/68
3,191,927	6/1925	Hartbauer et al.	271/68 X

Primary Examiner—Joseph Wegbreit

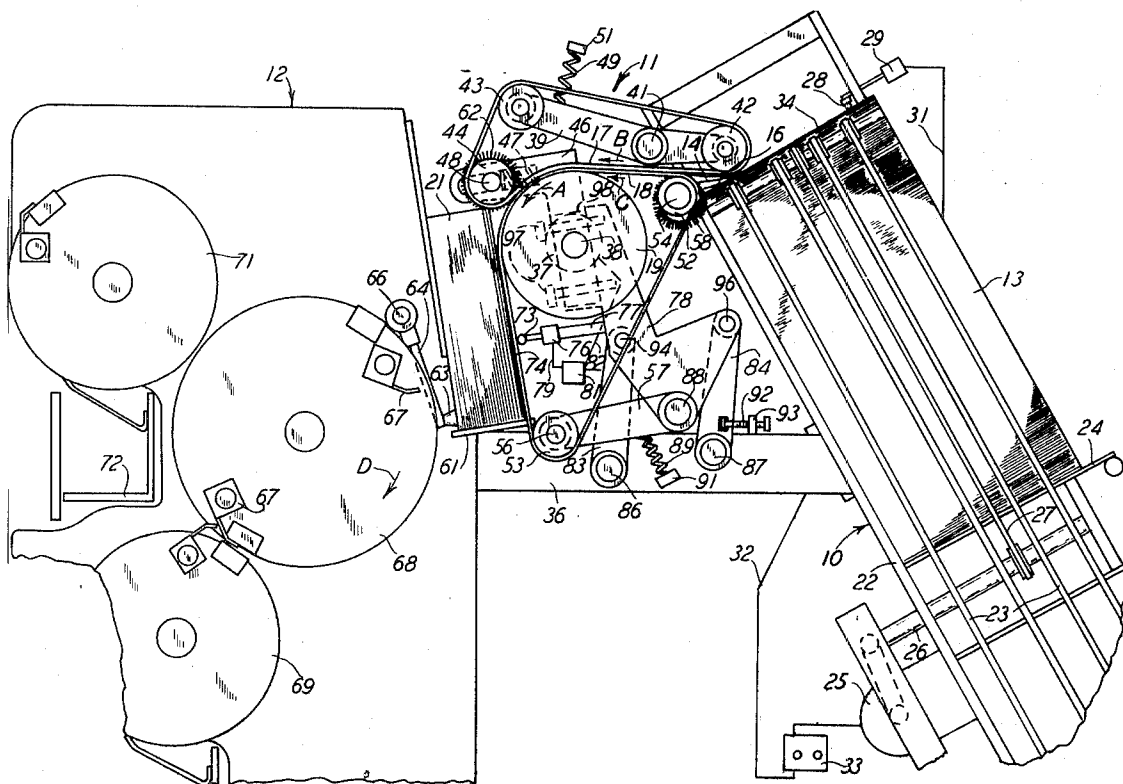
Assistant Examiner—Bruce H. Stoner, Jr.

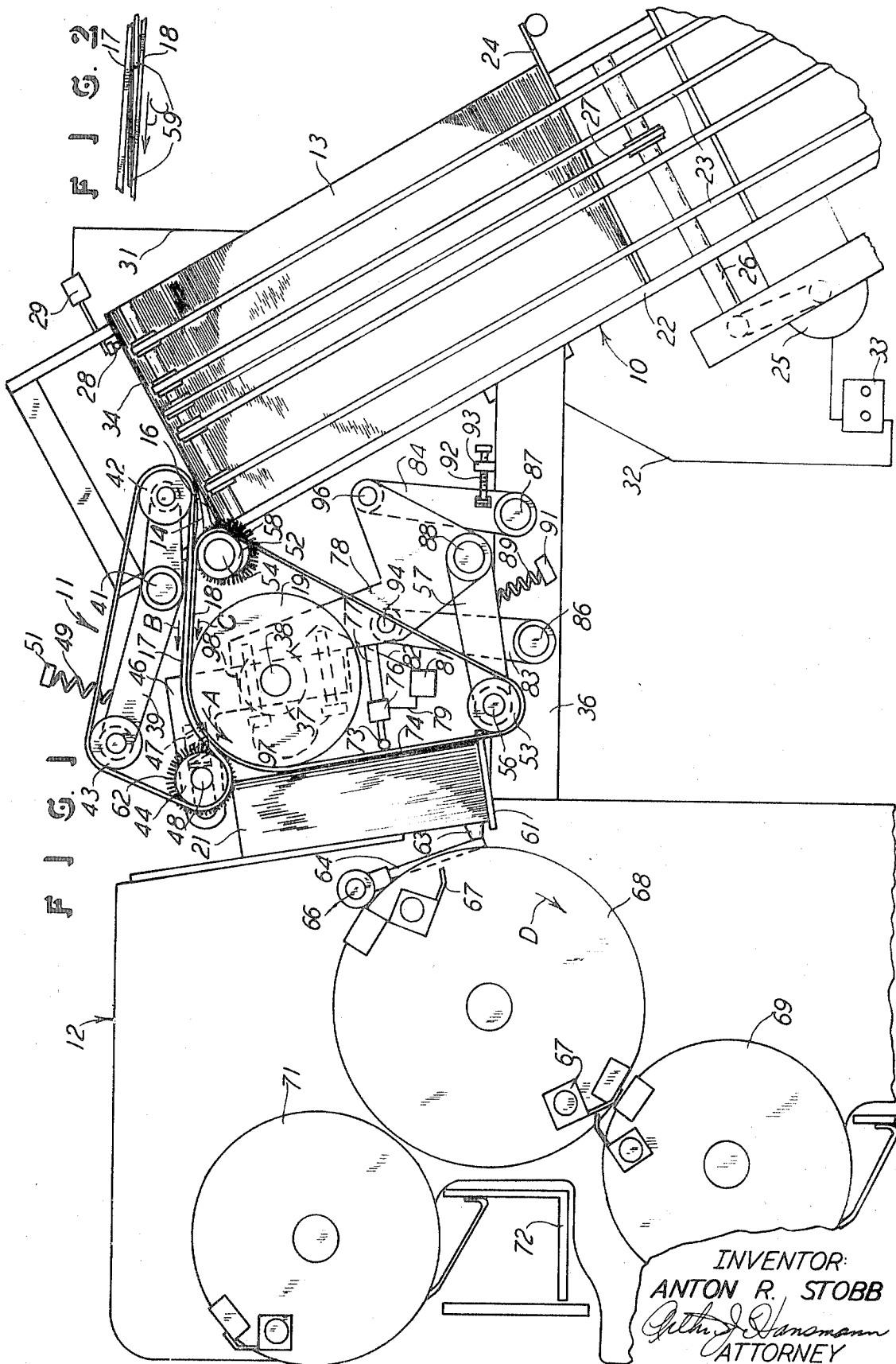
Attorney—Arthur J. Hansmann

[57] ABSTRACT

A sheet feeder for transferring sheets from a stack of sheets and forming them in a second stack of sheets, and including two sheet pickup belts disposed to singly remove sheets from the first stack and place them in an imbricated relation and move them to a bed which strips the sheets from the belts and places them into a second stack. A motor is used for driving the belts, and a sensor is used for detecting the height of the second stack and to thereby turn the motor off and on for driving the belts to control the height of the second stack. The belts are adjustable for positioning to select the height of the second stack and also for positioning to accommodate sheets of different lengths. A rotating brush for singly feeding the sheets from the first stack and onto the belts in the imbricated or stream relation.

10 Claims, 2 Drawing Figures





SHEET FEEDER OFF A STACK OF SHEETS

This invention relates to a sheet feeder for transferring sheets from a first stack of sheets and into a second stack of sheets of a controlled size. More particularly, it relates to a sheet feeder for handling signatures or sheets which are used in books, magazines, and the like, and which are already disposed in a stack but which are to be fed to a sheet gathering mechanism, or which are to be fed to other apparatus, and wherein this feeding is to be done from a stack of the sheets wherein the stack is of a controlled or optimum size for the feeding.

BACKGROUND OF THE INVENTION

In the industry of printing and assembling magazines, books, and the like, it is common practice to stack sheets, which are either printed or folded into signatures, or both, and to take these sheets from the stack and place them into bundles which are set next to gathering apparatus. The gathering apparatus takes the sheets singly and places them into positions which permit the collection or assembly of the individual sheets, all to form the final book or magazine. In this process and using the necessary apparatus, the prior art commonly requires that an operator separate a bundle of sheets from a first stack, and, by hand or manual operation, the operator takes the bundle of sheets and places them into a hopper on the gathering mechanism where the sheets are then individually handled for the final collection or assembly in book form, as mentioned. That is, the prior art requires the manual handling of the bundles, and it is a tedious job and normally requires careful attention in order to maintain a correct supply or height of the bundle of sheets being led into the gathering mechanism.

The present invention improves upon the prior art apparatus and it avoids the tedious manual functions of requiring that the various bundles of sheets be lifted from one stack and placed into the hopper of the gathering mechanism.

More specifically, the present invention provides apparatus which automatically separates the sheets from a first stack, and the apparatus then places the sheet into the gathering apparatus hopper, and it does so in a manner and through apparatus which provides the correct or optimum height of the bundle or stack of sheets in the hopper.

Still a more specific object of this invention is to provide apparatus which automatically removes sheets from a first stack and places the sheets in an imbricated stream and which conducts the sheets to a hopper in a stream form from whence the sheets are stripped and placed into a bundle or stack of an optimum size for feeding into a gathering mechanism. In accomplishing the aforementioned objects, the present invention provides apparatus which is mechanically and automatically controlled so that the feed of the sheets into the gathering apparatus can be controlled in a desired quantity and manner. Still further, the aforementioned objects are accomplished with apparatus which is reliable and accurate and dependable, and the apparatus need only be observed by the operator while the apparatus does the physical work of moving the sheets from the first stack and into the bundle or second stack in the hopper described.

Still further, the present invention provides sheet transferring apparatus which is adjustable for the desired size of bundle or stack in the hopper, and which is also adjustable for handling sheets of different lengths or heights when the sheets are placed in the stacks mentioned.

Other objects and advantages will become apparent upon reading the description herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a preferred embodiment of this invention as related to a stack-handling apparatus and a gathering apparatus.

FIG. 2 is a side elevational view of a fragment of FIG. 1, and showing two sheets therein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 basically shows stack-advancing apparatus, generally designated 10, the transferring apparatus, generally designated 11, and the gathering apparatus, generally designated 12. It will be understood that the sheet feeder or advancing apparatus 10 holds a stack of sheets 13 which are moved upwardly into contact with the sheet transfer apparatus 11. The transfer apparatus 11 takes the individual sheets or signatures, such as the sheets 14 and 16, off the top of the stack 13, and the sheets are placed in a stream or imbricated relationship between the upper belt 17 and the lower belt 18 of the apparatus 11. The belt 18 is supported on a large pulley or drum 19 which rotates in the direction of the arrow A, and thus the belt 18 moves in the direction of the arrow A and causes the stream of sheets to be moved into a bundle or stack 21, in a manner described later. Finally, the individual sheets are removed from the stack 21 by the gathering mechanism 12, and the individual sheets are then placed in a position to be assembled into a book, magazine, or the like, in the manner well known in the art.

The feeder apparatus 10 may be as shown in U.S. Pat. No. 3,416,679, with some modification shown in the present disclosure. Thus, a bed 22, along with belts 23 holding a baseplate 24, support the stack 13 and advance it upwardly. A motor 25 is suitably connected to a shaft 26 which carries a belt 27 for driving the belts 23 and thus the baseplate 24 upwardly. A sensor 28 may be disposed at the top of the stack 13, and the sensor may be operative on an electric switch 29 which is connected to the motor 25 through electric wires 31 and 32 which are connected together and which connect to the motor 25. Also, a manually operative electric switch box 33 is shown in the electric connection to the motor 25, and the operator may control the running of the motor 25 and therefore control the upward drive of the supporting plate 24, to properly position the upper surface 34 of the stack 13.

It will therefore be understood that the stack 13 is advanced upwardly under the motor power described, and the sensor 28 rides on the stack upper surface 34 to control the automatic switch 29 and thereby turn the motor 25 off and on so that the upper surface 34 will be positioned at the desired level for feed of the sheets from the stack 13 and into the transfer mechanism 11. Also, the operator can override the automatic switch 29, and he does so by means of the manual control or switch 33, in any conventional manner of providing these components and making the connections therebetween. As further disclosed in said U.S. Pat. No. 3,416,679, the operator would provide a supply of sheets onto the bed 22 and below the supporting plate 24, and the new supply of sheets would be moved upwardly on the bed 22 as the plate 24 is withdrawn so that a continuous stack of sheets is provided on the bed 22, and the stack 13 can be considered as a continuous stack.

The transfer mechanism 11 includes the belts 17 and 18, and it includes a frame 36 which is connected between the bed 22 and which is shown connected to the gathering apparatus 12. The drum or pulley 19 is powered by an electric motor 37, and the drum 19 is supported on the shaft 38. Thus the belts 17 and 18 move in the directions of the arrows D and C, and the upper belt 17 is in contact with the top surface 34 of the stack 13. A rocker arm 39 is mounted on a pin 41, and pulleys 42 and 43 are rotatably disposed on opposite ends of the arm 39, and the belt 17 is trained over the pulleys 42 and 43. Also, the pulley 44 is mounted on an arm 46, and the belt 17 is trained over the pulley 44, as shown. A compression spring 47 is disposed between the arm 46 and the supporting shaft 48 of the pulley 44, so the pulley 44 is urged outwardly on the arm 46, and the belt 17 is therefore retained taut on the pulleys 42, 43, and 44, regardless of the pivoted position of the rocker arm 39 or the adjustable arm 46, as described later. A tension spring 49 is connected between the arm 39 and a fixed support 51, so the rocker arm 39 is urged into a clockwise direction

around the supporting pin 41 so that the pulley 42 and the adjacent extent of the belt 17 are urged downwardly on the stack surface 34.

The belt 18 is trained on the drum or pulley 19, and it is also trained on the pulleys 52 and 53, with the pulley 52 being supported on a shaft 54 in a fixed position, and the pulley 53 being supported on a shaft 56 which is on a pivot arm 57. Thus, the belts 17 and 18 have the common overlying extent along the upper length of the belt 18 between the drum 19 and the pulley 52.

A brush 58 is rotatably mounted adjacent the edge of the stack 13, and rotation of the brush 58 in the counterclockwise direction causes the sheets 14 and 16 to fan or separate, as indicated in FIG. 1. This brushing action, along with the movement of the upper belt 17 in the direction of the arrow B, feeds the sheets or signatures 14 and 16 into a stream or imbricated relationship between the belts 17 and 18. Thus the brush 58 is a sheet pickup member which, along with the portions of the belts 17 and 18 in contact with the sheet leading section, provides a sheet pickup means. FIG. 2 shows the stream or imbricated relationship of the sheets 14 and 16 when they are between the belts, and it will here be seen that the sheet leading edges designated 59 are in contact with the belt 18, and this orientation is significant for a purpose described later.

The stream of sheets is led to the pulley 44, and at this point the belt 17 discontinues contact with the sheets, and only the belt 18 continues to move the sheets and at this point it guides the sheets downwardly to a floor or bed 61 which extends into sheet-flow communication with the belt 18. Thus the sheets are striped from the belt 18, and the sheets therefore form the bundle or second stack 21. It will also be noticed that a brush 62 is rotatably mounted on the shaft 48 along with the pulley 44, and the brush 62 brushes the trailing or tail ends of the sheets so that they move into the stack 21, and the brush 62 therefore rotates in the clockwise direction.

Finally, the gathering apparatus 12 has a suction cup or pickup member 63 which contacts the first or lower one of the signatures or sheets in the stack 21, and the cup 63 is shown on a pivot arm 64 pivotal about the shaft 66. The pickup mechanism mentioned then takes the single signature or sheet from the stack 21 and exposes it to the gripper 67 on the rotatably mounted drum 68. The drum 68 is rotatably driven in the direction of the arrow designated D, and the signature is then passed to a gripper on a half-size drum 69 which is rotatably mounted in sheet-flow communication with the drum 68. Also, the drum 68 can pass the signatures to the second drum 71, and will be seen that the drum 68 has two grippers 67 which alternately take a single signature or sheet from the stack 21 and the grippers 67 then alternately deposit the sheets onto the drums 69 and 71. Ultimately, the sheets are dropped onto a collector or conveyor chain 72, and the sheets or signatures can then be moved into a position for assembly and into book form with other signatures. The gathering mechanism 12 is a conventional construction, except that the transfer mechanism 11 relates thereto in a novel manner, as shown.

The transfer mechanism 11 automatically governs the height of the pile 21, so that optimum size of the pile 21 is provided for passing of the sheets to the gathering mechanism 12. In accomplishing this, a sensor 73 is in contact with the pulley 18 or with the back of the stack 21, as designated 74. The sensor is connected to a switch 76 supported on an arm 77 connected to an adjustable support 78. The switch 76 may be electric, and a wire 79 connects the switch 76 to a switch or control box 81. Also, a wire 82 connects the motor 37 to the box 81. With this arrangement, when the stack 21 is either of a larger or smaller height than that set by the mechanism, the sensor 73 will move up or down relative to the belt 18 or the surface 74, and thus the switches 76 and 81 will be activated to either turn the motor 37 on or off, depending upon the condition. In this manner, the precise size of the stack 21 can be obtained for optimum size and therefore optimum and constant feeding of the sheets to the gathering mechanism 12.

The support 78 is movably supported on arms 83 and 84 which are pivotally mounted on shafts 86 and 87 on the frame 36. Also, it will now be seen that the belt support arm 57 is pivotally mounted on the shaft 88 on the support 78, and a tension spring 89 is connected to the arm 57 and is also connected to a bracket 91 on the frame piece 36. Thus the arm 57 is urged downwardly by the spring 89, and thus proper tension is retained in the conveyor belt 18. Also, the arm 84 can be pivotally set by a control 92 which is shown supported on a bracket 93 and which connects to the arm 84. The control 92 is shown threaded, so the pivoted position of the arm 84 can be set by the adjusting mechanism 92. The setting therefore positions the support 78, and thus the drum or pulley 19 is positioned, and therefore the height of the stack 21 can be selected and set. Thus, in the arrangement described, the upper ends of the arms 83 and 84 pivotally support the member 78 through the pivot pins 94 and 96, as shown.

The arm 46 is adjustable up and down on the support 78, and two adjusting screws 97 connect between the arm 46 and the support 78 for the up-and-down adjustment desired. This adjustment therefore accommodates different lengths of signatures or sheets, that is the different height of the stack 21 would be accommodated so that the pulleys 19 and 44 would be set in the desired position so that the stack 21 can be formed from the stream of incoming sheets described. The support 46 is therefore shown slotted at 98, for the up-and-down adjustment on the arm or support 78, as mentioned. Up-and-down adjustment of the arm 46 carries the shaft 38 for the up-and-down adjustment of the pulley 19 and its belt 18, as mentioned.

What is claimed is:

1. A sheet feeder for transferring sheets from a first and upright stack of sheets and forming a second stack of sheets of a controlled size, comprising two sheet pickup belts disposed in overlying relation to each other and extending adjacent the upper end of said first stack, a sheet pickup member in contact with said sheets at said upper end of said first stack to singly remove sheets from said upper end of said first stack and feed said sheets in an imbricated relation to a position between said two belts with the leading ends of said sheets being against one of said two belts and with the trailing ends of said sheets being against the other of said two belts, a bed disposed adjacent said one of said belts for stripping said sheets from said one belt and forming said second stack of said sheets, a motor for driving said one of said belts, and a sensor connected to said motor for turning said motor off and on and with said sensor being operable in response to the size of said second stack in the off and on control of said motor for controlling the size of said second stack.

2. The sheet feeder as claimed in claim 1, including movable support means supporting said one belt for selective positioning of said one belt relative to said bed and thereby adjustably establish the size of said second stack, said sensor being movably mounted for positioning relative to the positioning of said movable support means and in the direction of the growth of said second stack.

3. The sheet feeder as claimed in claim 2, wherein said sensor is mounted on said movable support means for movement with the latter in controlling the size of said second stack.

4. The sheet feeder as claimed in claim 1, wherein said pickup member is a brush rotatably mounted for engagement with said leading ends of said sheets in said first stack, for separating and feeding said sheets onto said belts.

5. The sheet feeder as claimed in claim 1, including a second motor operative on said first stack for advancing said first stack upwardly toward said belts, a portion of said other belt extending over said upper end, and a sensor operatively connected to said second motor and being responsive according to the position of said upper end of said first stack for turning said second motor on and off to control the advance of said first stack up to said portion of said other belt.

6. The sheet feeder as claimed in claim 5, including movably mounted support means supporting said portion of said other

5

belt for movement of said portion in the directions of the longitudinal axis of said first stack to position said portion in contact with said upper end of said first stack.

7. The sheet feeder as claimed in claim 1, including rotatably and movably mounted pulleys for guiding said one belt in movement past said second stack and past said bed, and support means for said pulleys for positioning said pulleys in the directions along the longitudinal axis of said second stack according to the desired size of said second stack.

8. The sheet feeder as claimed in claim 7, including sheet gathering mechanism disposed adjacent said bed for removing said sheets from said second stack.

6

9. The sheet feeder as claimed in claim 7, wherein said pulleys are movably mounted for movement toward and away from said bed to accommodate sheets of more than one length.

10. The sheet feeder as claimed in claim 9, including rotatably and movably mounted pulleys for guiding said other belt, and common support means for movably mounting at least some of said pulleys of both said belts such that positioning of said support means simultaneously selectively positions both said belts.

* * * * *

15

20

25

30

35

40

45

50

55

60

65

70

75