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[54] **CONVERTIBLE POWER STACKER**

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[52] **U.S. Cl.**..... **271/80**, 214/6 D, 214/7, 271/86

[51] **Int. Cl.**..... **B65h 29/22**, B65h 31/06

[58] **Field of Search**..... 271/80, 86 R, 86 ME, 271/87; 214/6 D, 7

[56] **References Cited**

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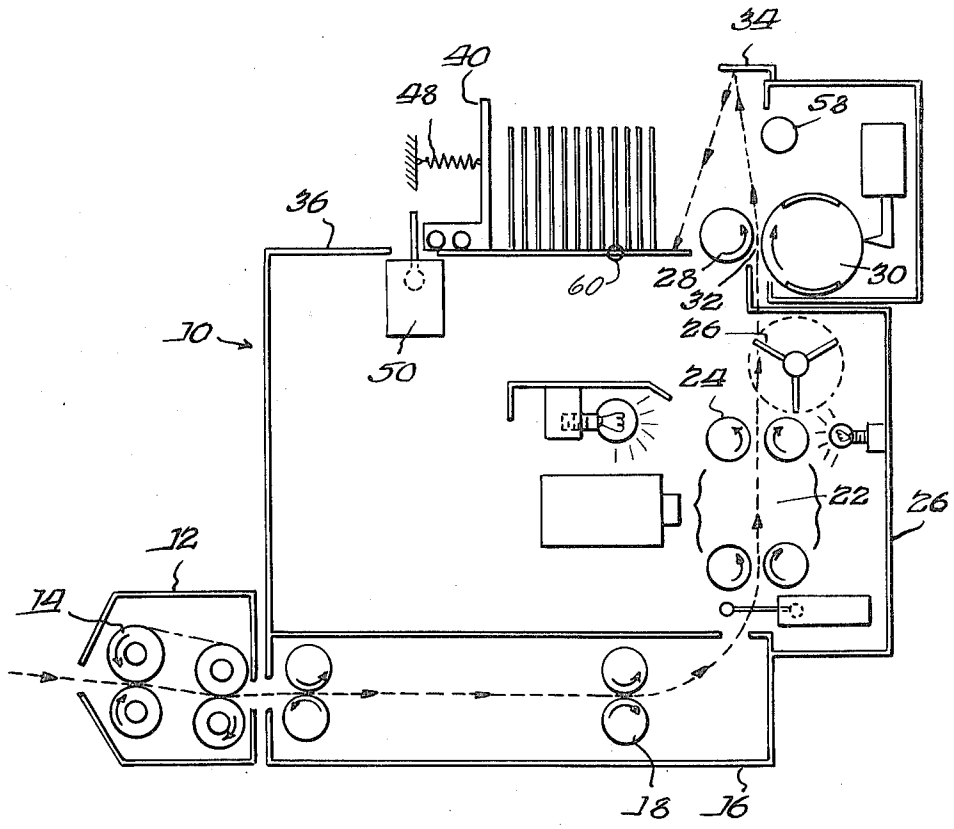
Assistant Examiner—James W. Miller
Attorney—James M. Wetzel et al.

[57] **ABSTRACT**

A document stacker at the exit of a processing device for business or other forms which accommodates automatic sequential vertical stacking of the forms, and is readily convertible to conventionally and horizontally stack larger size documents. Power stacking means are provided during the vertical stacker mode of operation of the invention to drive the lower edge of each form into the stack.

5 Claims, 2 Drawing Figures



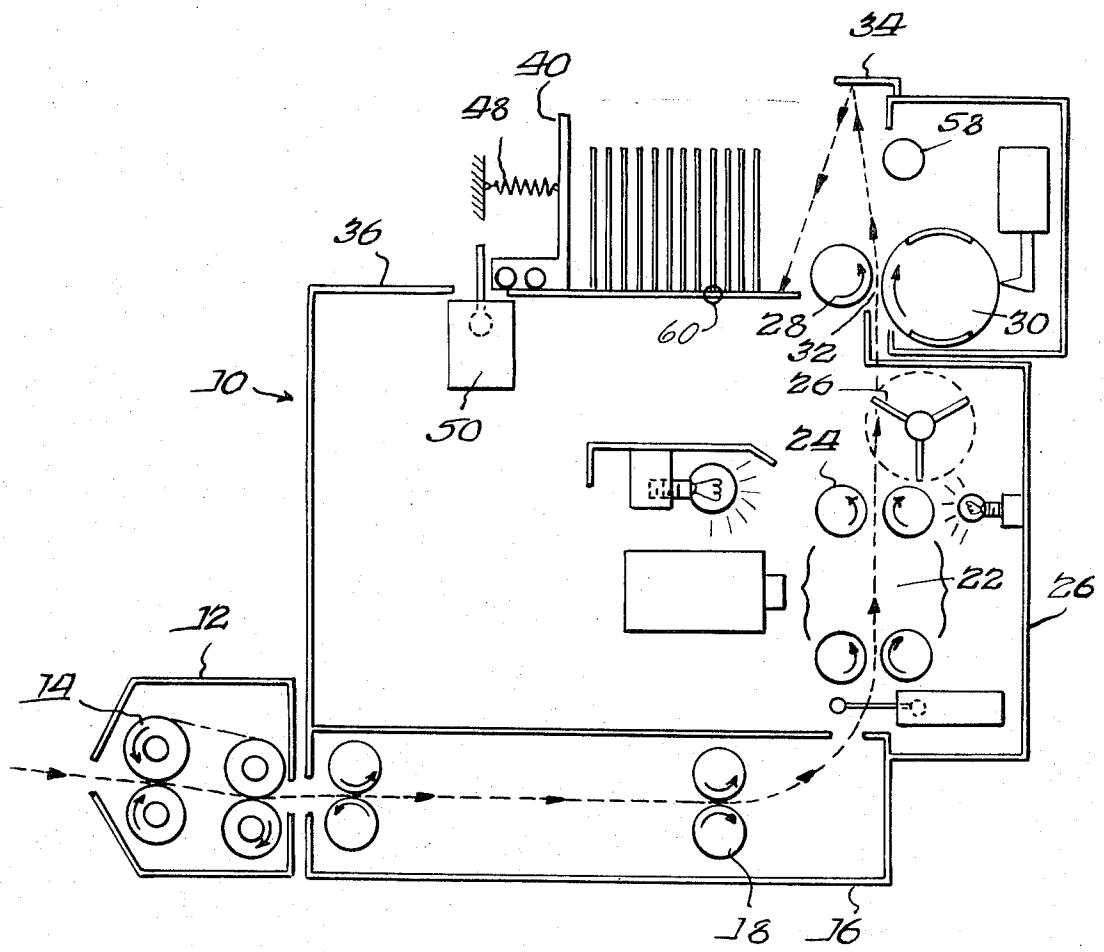


Fig. 1.

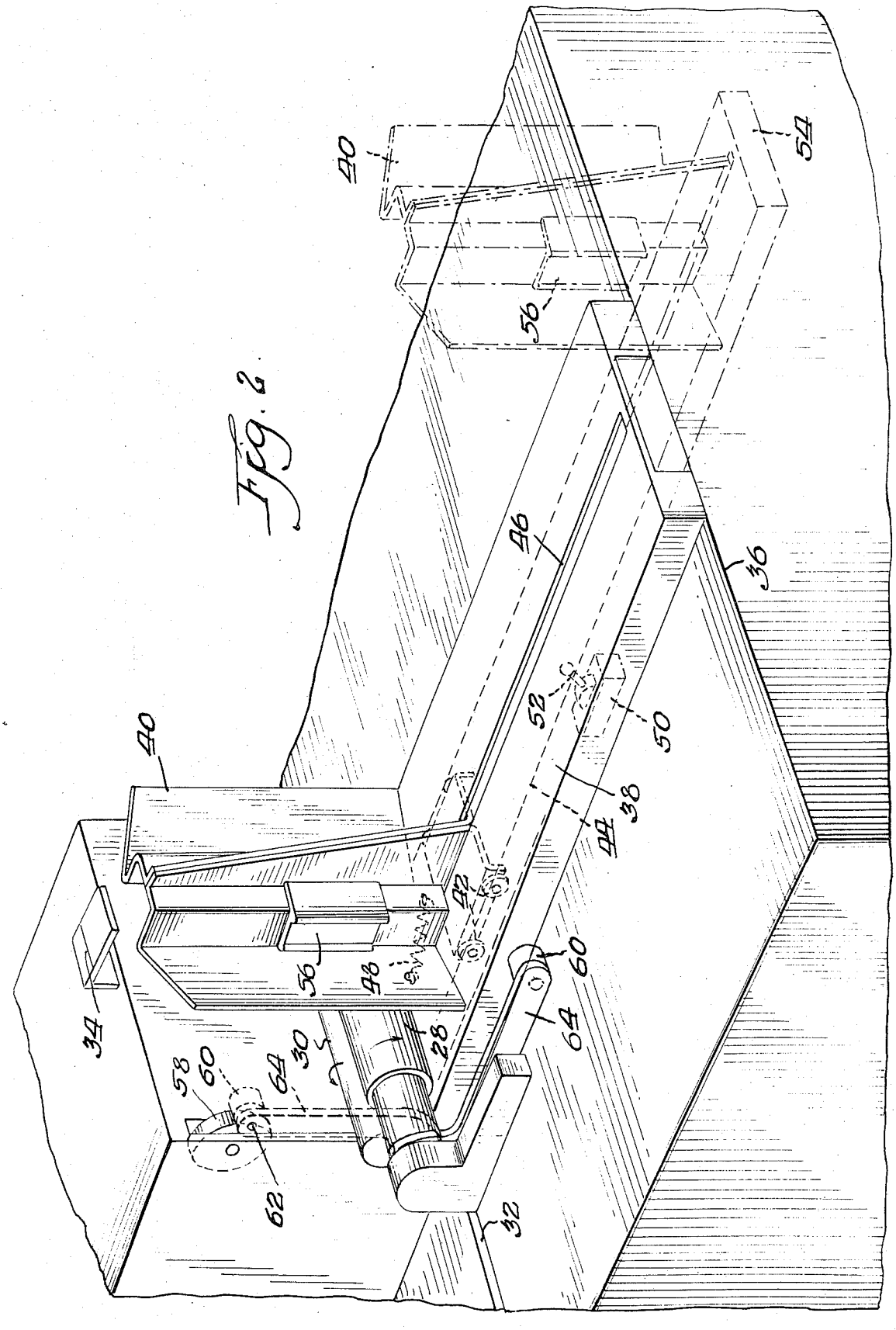


Fig. 2

CONVERTIBLE POWER STACKER

This invention relates to apparatus for high speed stacking of documents or forms and more particularly relates to a document stacker which accomodates sequential automatic vertical stacking of documents as well as conventional horizontal "float" type of stacking.

The proper stacking of documentary forms, such as checks or other business forms, is becoming increasingly more important as machinery is developed for more rapidly processing date carrying documents. For example, documents exiting from a microfilm recording device must be sequentially and automatically stacked with speed and accuracy. Present stacking machinery, however, is not capable of handling small documents, such as checks, which are preferably stacked vertically, as well as larger data forms, which must be stacked horizontally. Also, present stacking devices do not provide means for driving the lower edge of a document to be vertically stacked into position adjacent a preceeding document. Since data carrying documents come in all sizes, it is advantageous to have a single stacker which is capable of both vertical and horizontal stacking. Also, by positively driving the lower edge of a document into a vertical stack, the processing equipment with which the stacker is being used is able to handle more documents in a given period of time.

The principal object of the present invention, therefore, is to provide an improved, high speed stacking apparatus which allows automatic stacking of documents in either an upright position or the conventional horizontal position.

An additional object of the present invention is to provide a vertical stacking device wherein the lower edge of the document being stacked is driven into the stack.

According to the present invention, a pair of nip forming rollers are provided at the exit of a document processing apparatus to eject each document in an upright position. A stop means directly above the nip rollers limits the extent of the document's upward travel. As a document strikes the stop means, its lower edge is thrust outwardly and downwardly by the action of the outermost nip roller. The document becomes trapped in an upright position between the outermost roller and a backstop which is spring biased toward the outermost roller. The backstop travels horizontally along a track, and the power stacking operation continues until the backstop reaches a predetermined limit, at which point the operation of the document processing equipment and the stacker ceases.

To perform conventional, horizontal, floating stacking, a pair of retractable stacking rollers are provided which engage suitable drive rollers for driving the document horizontally away from the stop means after the document exits from the pair of nip rollers. The horizontally foating documents are caught in a "basket" formed by locking the backstop in a position at the end of the track.

The foregoing and other objects, features and advantages of the invention will be apparent from the following detailed description of a preferred embodiment of the invention, as illustrated in the accompanying drawing, wherein:

FIG. 1 is a schematic diagram of a document processing apparatus employing the convertible power stacking device of the present invention; and

FIG. 2 is a perspective view of the stacking device of the present invention.

Referring to FIG. 1, a document or form processing apparatus such as a microfilm recorder is indicated by the numeral 10. The recorder includes a document feeder 12 including conveyor rollers 14 for sequentially passing documents to input module 16. Conventional conveyor roller means 18 in module 16 transmit the documents into an optical module 20 and through a photo area 22 therein where a photographic record of each document is made by the recording device. Drive means including sets of rollers 24 advance the documents vertically to a count sensing device 26 and upward to a pair of opposed lower drive or nip rollers comprising outer roller 28 and inner roller 30 disposed adjacent exit slot 32 of the microfilm recorder. Suitable power means are provided to drive rollers 28 and 30 in opposite directions.

The stacking mechanism which forms the present invention includes a paper stop 34 attached to the housing of recorder 10 which extends horizontally for a short distance outwardly above drive rollers 28 and 30. Stop 34 is adjustable and is ideally positioned such that the vertical distance between outer roller 28 and stop 34 approximately equals the height of the document to be stacked. The stacking device disclosed herein would perform best with uniform size documents, however, the stacker will also perform well with mixed "check" sized documents.

The upper surface 36 of recorder 10 includes a platform 38 positioned next to outer roller 28 and extending outwardly to form a surface for receiving documents exiting from recorder 10 through slot 32. Movable upright backstop assembly 40 is slidably mounted on platform 38 by means of wheels 42 riding on an extendable track or rail assembly 44 disposed beneath platform 38. A slot 46 is provided in platform 38 through which upright assembly 40 extends. A spring 48 extends between the housing for recorder 10 and upright assembly 40 which biases upright assembly 40 towards outer roller 28.

A limit switch 50 is provided adjacent track 44 which is tripped when upright assembly 44 moves away from outer roller 28 under the pressure of an increasing stack of documents, as will be explained, and contacts lever 52. Limit switch 50 is preferably operably connected to the control system for recorder 10 whereby activation of limit switch 50 by upright assembly 40 will cause the recorder 10 to cease functioning.

As shown in FIG. 2, track assembly 44 includes a pull-out expandable rail assembly 54 which extends the track 44 upon which upright assembly 40 moves. Detent lock means 56 are provided on upright assembly 40 for locking the upright assembly in any position along track 44 or extendable track 54, thereby enabling the receiving area of the stacking device to accomodate any size of document. Lock 56 holds upright assembly 40 in place against the tension of spring 48.

In operation for vertically stacking documents, the documents exiting from recorder 10 through slot 32 are engaged between oppositely rotating drive rollers 28 and 30, and transported vertically to adjustable paper stop 34. As the upper edge of the document contacts stop 34, its lower edge contacts the surface of outer

drive roller **28,** since the distance between stop **34** and roller **28** is adjusted to approximate the height of the document. Outer roller **28,** which rotates in a counterclockwise direction as viewed in FIG. **1,** moves the bottom edge of the document up and over the roller center, whereby the roller pulls the document horizontally and downwardly. The document is positively driven into the space between upright assembly **40** and roller **28,** and pressure against the roller is maintained by spring biased upright assembly **40.**

Each sucessive document as it exits from slot **32** impacts against stop **34** and is thrust downward by roller **28** in the same manner as the preceeding document. Upright assembly **40** continues to maintain sufficient pressure by means of spring **48** as it moves away from roller **28** under the influence of continuously stacked documents. This pressure suffices to hold the documents in a vertical stack.

Upright assembly **40** moves in a direction away from roller **28** on track assembly **44** as additional documents are stacked. To provide a practical and safe stack height, should the operator overfeed microfilm recorder **10,** limit switch **50** is located adjacent track **44** whereby when upright assembly **40** reaches a safe stack limit, lever **52** trips and switch **50** functions to stop the document feeder mechanisms of recorder **10.** When the stacked documents are removed, upright assembly **40** returns to a position adjacent roller **28** under the force of spring **48,** allowing the document feeder to start operation again as lever **52** moves to its original position.

An important feature of the present invention is to provide a document stacking device which is capable of stacking documents in a conventional horizontal disposition, as well as accomplishing vertical stacking as described above. Horizontal stacking is desirable when the recorder **10** is processing documents which are too large to vertically power stack, or are of such extreme size variations that it is impractical to power stack. To this end, a pair of conventional or upper drive roller means **58** are rotatably supported in the housing of recorder **10,** and disposed above drive rollers **28** and **30** such that a portion of the curcumferential surface of rollers **58** is exposed beyond the housing. Suitable power means are provided to drive rollers **58** in a counterclockwise direction, as viewed in FIG. **2.**

A pair of retractable conventional stacking roller means **60** are rotatably supported by means of pins **62** on one end of shafts **64.** Shafts **64** are pivotally mounted at their opposite ends to the housing of recorder **10** adjacent the terminus ends of roller **28.** As shown in FIG. **2,** shafts **64** are pivotally movable from a first retracted position to a second operative position whereby rollers **60** engage the circumferential surface of upper drive rollers **58** at a point below the central axis of the rollers **58** such that the line of tangency between rollers **58** and **60** extends along an angular plane which bypasses stop **34,** for purposes to be explained. In this position, rollers **58** and **60** comprise means for guiding each successive document from a vertical to a horizontal position.

In operation for horizontal stacking, upright assembly **40** is manually moved back along track **44** to a position approximating the horizontal width of the documents to be stacked. Expandable pull-out rail assembly **54** allows upright **40** to be positioned beyond the edge of the housing of recorder **10** for accommodating large documents. Detent lock **56** is moved downward to lock upright assembly **40** in place, preventing the upright assembly from returning to lower roller **28** under the tension of spring **48.**

Shafts **64** are pivoted upward from their retracted position, and rollers **60** engage drive rollers **58** as previously described. As document exits from recorder **10** through slot **32,** it is driven upward by rollers **28** and **30,** and subsequently engaged between rollers **58** and **60,** whereupon the document is initially driven upwards and outwards substantially along the line of tangency between rollers **58** and **60,** and deflected away from stop **34.** The document then attains a horizontal position and floats downward onto the surface of platform **38,** or extendable rail assembly **54,** into the "basket" formed by upright assembly **40,** which acts as a backstop and prevents the document from floating horizontally beyond the edge of platform **38** or rail assembly **54.** Due to the position of rollers **58** and **60** above rollers **28** and **30,** a stacking height above the machine is provided whereby a substantial number of documents may be horizontally stacked before exceeding the capabilities of the device.

To return the stacking device to the vertical power stacker mode, shafts **64** are pivoted to their retracted position, lock **56** is released, upright assembly **40** is moved to a position adjacent roller **28** under the force of spring **48,** and expandable rail assembly **54** is retracted into position beneath platform **38.**

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention, which is defined by the following claims:

I claim:

1. In an apparaus for stacking forms:

stop means engageable by the leading edge of each form;

drive means for advancing the forms vertically and successively toward contact with said stop means;

means porviding a surface for stacking said forms in side-by-side relation; and

guide means selectively movable from a first inoperative position at which engagement with said forms is avoided to a second operative position in the path of travel of forms advancing from said drive means at which engagement with said forms is effected, whereby said forms contact said stop means and are fed to said stacking surface in a vertical position when said selectively movable guide means is in its first inoperative position and said forms are deflected away from said stop means and are fed to said stacking surface in a horizontal position when said guide means is in its second operative position.

2. The apparatus of claim **1** wherein said drive means includes opposed oppositely driven roller means for successively engaging each form wherein one of said rollers drives the lower edge of each form downwardly into said stack when said guide means is in said first position.

3. The apparatus of claim **1** wherein:

said drive means includes a first pair of opposed oppositely driven roller means for successively engaging and advancing each form and second roller means spacially disposed from said first roller means; and

said guide means includes third roller means tangentially engageable with said second roller means when said guide means are in said second position whereby said second and third roller means successively engage said forms as they advance from said first pair of roller means.

4. The apparatus of claim **2** including:

a variable positionable upright assembly means slidably attached to said surface for receiving and stacking said forms after said forms engage said stop means;

spring means yieldably forcing said upright assembly toward said roller means whereby said forms are maintained in a stack between said upright assembly and said roller means.

5. The apparatus of claim **4** wherein said upright assembly means is alternately adapted to be fixedly positioned on said stacking surface for receiving forms advanced by said apparatus when said guide means is in said second position.

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