

[54] DOCUMENT FEED MECHANISM

[75] Inventor: Yasuhiko Kohda, Tokyo, Japan

[73] Assignee: Fujitsu Limited, Kawasaki-shi, Japan

[22] Filed: July 7, 1972

[21] Appl. No.: 269,608

[30] Foreign Application Priority Data

July 7, 1971 Japan..... 46-49586

[52] U.S. Cl. 271/3.1, 214/8.5 SS, 271/DIG. 9, 271/35

[51] Int. Cl. B65h 3/02, B65h 7/14

[58] Field of Search..... 271/DIG. 7, DIG. 9, 34, 271/35, 4, 154, 155, 3.1; 214/8.5 G, 8.5 SS

[56] References Cited

UNITED STATES PATENTS

2,697,528 12/1954 Bishop et al. 214/8.5 G
 2,776,831 1/1957 Shields..... 271/DIG. 7

2,853,296 9/1958 Skow 271/DIG. 7
 3,522,943 8/1970 Swanson 271/DIG. 7
 3,705,719 12/1972 Polit et al. 271/198 X

FOREIGN PATENTS OR APPLICATIONS

909,982 11/1962 Great Britain 271/35

Primary Examiner—Richard A. Schacher

Assistant Examiner—James W. Miller

Attorney, Agent, or Firm—Maleson, Kimmelman & Ratner

[57] ABSTRACT

A document feeding mechanism is arranged such that a conveyer means including a file hopper conveys a part or all of documents piled in the file hopper in a direction substantially the reverse of a direction in which the documents are to be fed, and a feeding means including a feed hopper temporarily stores the documents conveyed by the conveyer means, then the feeding means feeds out the documents sheet after sheet in the feeding direction.

5 Claims, 6 Drawing Figures

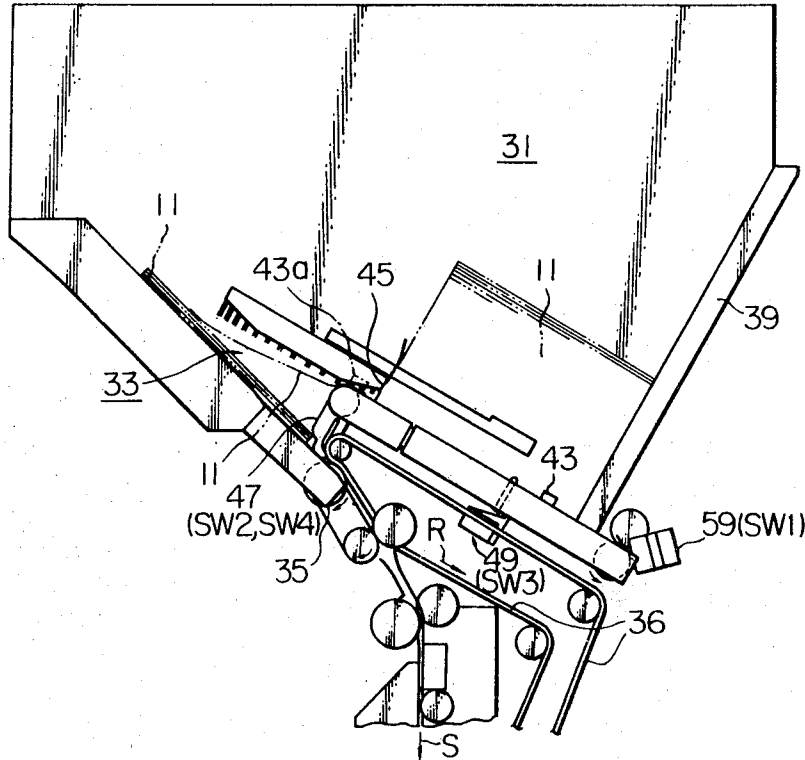


Fig. 1

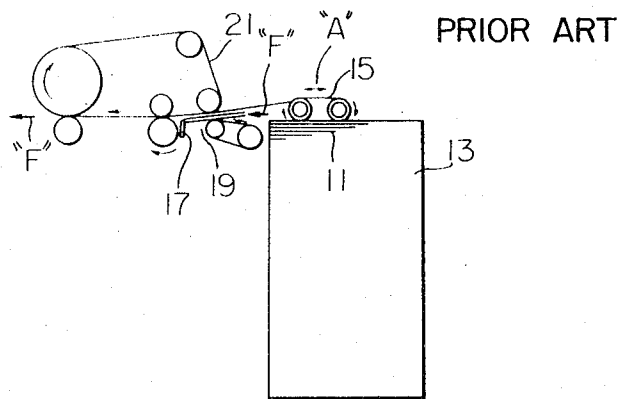
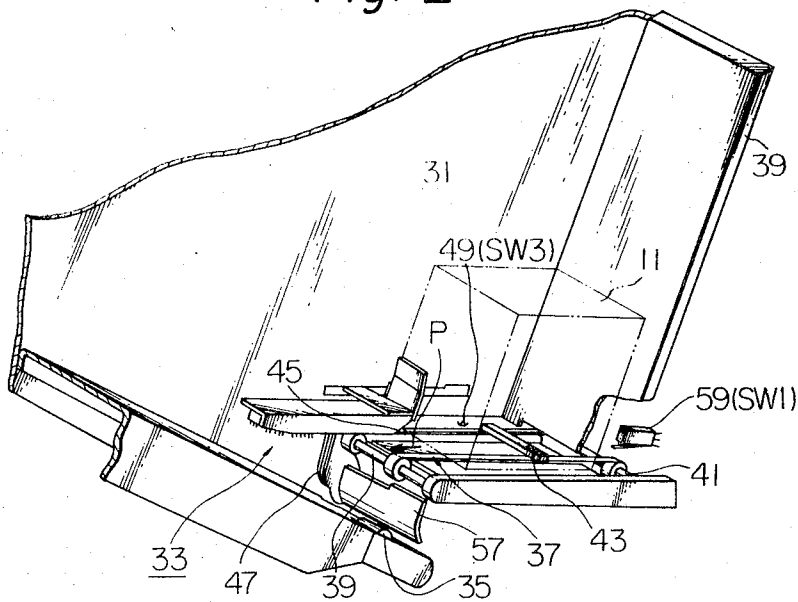


Fig. 2



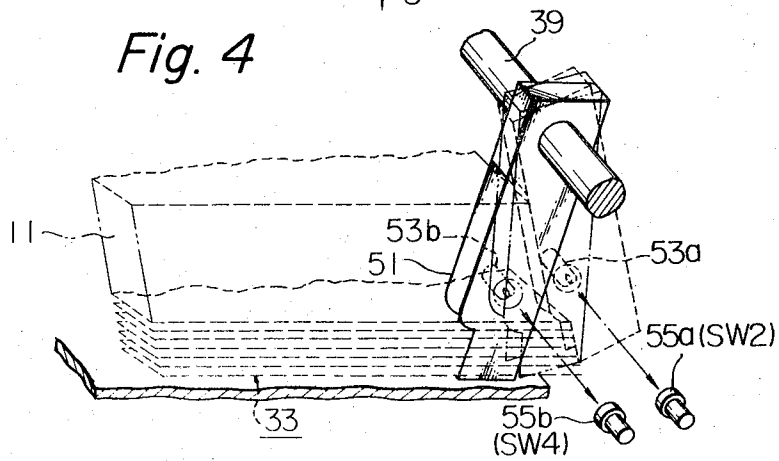
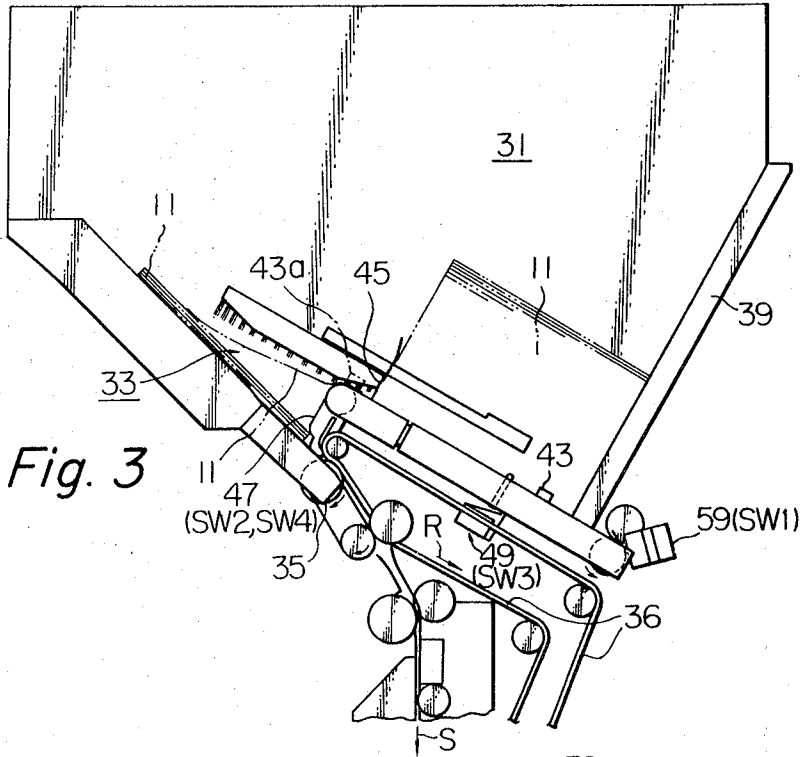
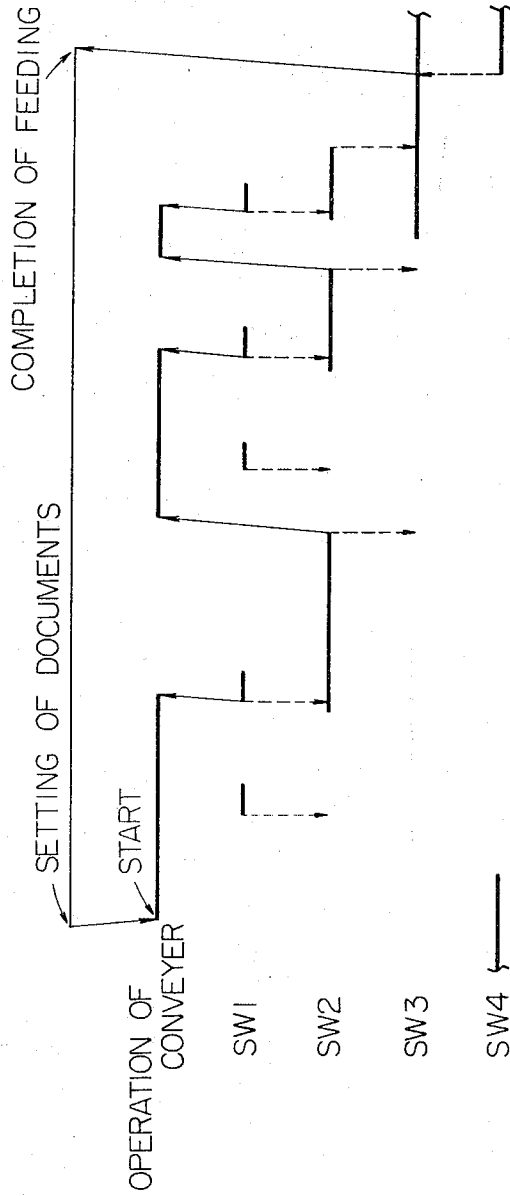


Fig. 5



DOCUMENT FEED MECHANISM

DISCLOSURE OF THE INVENTION

The present invention relates to a document feeding mechanism applicable to a document hopper of a card reader, an optical character reader, or a mark reader which is an input unit of the computer system. More particularly it relates to an apparatus capable of simultaneously feeding documents of various lengths in a stable condition.

In the many document feeding mechanisms of the prior art, a system for carrying out feeding of documents in very small numbers is used. In these mechanisms the documents are moved once to the feeding stage from a file-hopper, with the moving direction always selected so as to coincide with the feeding direction of the documents. That is to say, the documents piled on the file-hopper are taken out in very small quantities in the direction of feeding. Then, they are momentarily stored at the feeding stage located at the forward portion of the file hopper. Such document feeding mechanism is very advantageous only in the case that the lengths of the documents are not different. However, when documents of different lengths must be fed by the mechanism, several defects are encountered.

Therefore, the object of the present invention is to provide a mechanism eliminating such defects.

The mechanism of the present invention is characterized in that there are provided a conveying means, capable of conveying a part or all of piled documents in a direction substantially the reverse of a direction in which the documents are to be fed and; a feeding means temporarily storing the documents conveyed by the conveying means and then feeding said documents a sheet at a time in the feeding direction.

The other features and the advantages of the present invention will be more apparent from the ensuing description. The description refers to the accompanying drawings wherein:

FIG. 1 is a schematic view of the document feeding mechanism of the prior art;

FIG. 2 is a partially cut perspective view of the feed of documents according to the present invention;

FIG. 3 is a side view of the feed of documents of FIG. 2;

FIG. 4 is a partial perspective view of a device detecting the amount of piled documents and used in the feed of FIG. 2;

FIG. 5 is a time chart illustrating the operational sequence of the feed of documents of FIG. 2; and

FIG. 6 is a block diagram of a control circuit.

FIG. 1 shows an arrangement of the document feeding apparatus according to the prior art. In FIG. 1, documents 11 piled in a file-hopper 13 are taken by a belt means 15 out of the file-hopper 13 in a small amount of sheets. They are then moved to the direction of feeding as shown by an arrow "F" until they are momentarily stored in a feeding hopper 19 by an action of a gate-stop 17. Then, the documents 11 in the feeding hopper 19 are separately fed into the delivery passageway. As is apparent in FIG. 1, the feeding hopper 19 is located at the forward portion of the file-hopper 13 with respect to the feeding direction of documents. Assuming that the documents 11 piled in file-hopper 13 have different lengths, the location of belt means 15 must be

adjusted along narrow "A." This adjustment depends upon the respective lengths of the document and is made in order to maintain the correct feeding operation of the mechanism. This is because feed hopper 19 can not work so as to align the foremost feeding edges of respective documents. That is, if the foremost feeding edges of respective documents are not aligned, there might occur a case where a document in the feed hopper below the first has its feeding edge situated at a position further forward than the uppermost or first document. In such a case the lower document is fed by belt means 21 and the feeding of the first document can not be carried out. Also, as an adjustment of belt means 15 must depend upon the respective lengths of the documents 11, a complicated control is necessitated. Further, if such control, can be done, belt means 15 must be moved toward feed hopper 19 when a relatively short document is to be fed by belt means 15. As a result of this, it often happens that a longer document stored in feed hopper 19 has its end damaged by belt means 15. Hence, in the document feeding mechanism of the prior art, a stable feeding operation of the documents is not attainable.

FIG. 2 and FIG. 3 show the arrangement of the document feeding mechanism according to the present invention. In FIGS. 2 and 3, documents 11 are conveyed from file-hopper 31 to feed hopper 33 in a small quantities and are momentarily stored in the feed-hopper 33. Then, each document 11 stored in feed hopper 33 are separately fed in the direction of an arrow "S" into the delivery passageway by means of picker roller 35. The picker roller 35 and a restraint belt 36, which moves at an extremely low speed, serve to feed the documents 11 separating them into separate sheets.

In the file hopper 31, documents of which the rear edges are aligned to a plate 39 of file hopper 31 are piled on a conveyer 37. The conveyer 37 is driven by drive wheels on the front and rear drive shafts 39 and 41 as shown in FIG. 2. On a portion of the conveyer 37, a sweep bar 43 projecting from the upper surface of conveyer 37 is rigidly connected so as to form a kind of means for conveying documents 11. When the conveyer 37 with the sweep bar 43 moves to the direction of "P," a part of the documents at the bottom of that of the file hopper 31 are caught and conveyed by the moving sweep bar 43 in the direction "P." At this time, several documents which cannot be completely been caught by the projecting portion of the sweep bar 43, might also be carried by friction of the documents 11 and the sweep member 43. However, they are caught by a gate 45 so as to be retained in the file hopper 31. At the next conveying time, they are delivered out of the file hopper 31 to the following feeding stage. When sweep bar 43, moving with conveyer 37 comes to a position 43a as shown by a phantom line in FIG. 3, the documents 11 which have been conveyed by sweep bar 43, drop into feed hopper 33 due to their own weight. When the amount of documents 11 within feed hopper 33, exceeds a predetermined height, for example a 10 millimeter height, a detecting device 47 generates a signal. Thus, the movement of conveyer 37 is stopped so as not to convey further documents 11 from file hopper 31 to feed hopper 33.

The conveyer 37 again automatically starts when the amount of documents 11 within feed hopper 33 is reduced to the predetermined value. When all of documents 11 piled in file-hopper 31 are completely swept

off by conveyer 37, a detector 49 constituted by a micro-switch, issues an output. In response to the output, a lamp or a bell is energized for the purpose of indicating the fact to an operator. When no document 11 remains in file hopper 31, conveyer 37 is not operated, even if the detecting device 47 detects a lack of documents 11 within feed hopper 33. However, according to the present invention, an operator can easily and freely supply documents 11 into file hopper 31 without stopping the operation of the mechanism.

FIG. 4 picks out the above-mentioned detecting device 47 for sensing or detecting the amount of documents stored within feed hopper 33 after conveyed by conveyer 37. The figure illustrates the arrangement and the operation of detecting device 47. The detecting device 47 includes a shutter plate 51 swingably mounted on the shaft 39 which drives conveyer 37, and photoelectric sensing elements 53a, 53b, 55a, 55b of the kind well-known. The shutter plate 51 swings about shaft 39 in response to the height of the documents 11 stored within feed hopper 33. The shutter plate 51 intercepts light running from light emitting elements 53a, 53b toward light sensing elements 55a, 55b. As a result, the switching operations are introduced between elements 53a, 53b and 55a, 55b, respectively.

It should be noted that the photo-electric sensing elements 53b, 55b are operable for sensing whether documents 11 remain within feed hopper 33 or not. While the photo-electric sensing elements 53a, 55a are operable for detecting whether the amount of documents 11 stored in feed hopper 33 have reached a predetermined value or not. Of course, a pneumatic sensing system may be replaced by the above photo-electric sensing system.

Referring again to FIG. 2 and FIG. 3, the gate 45 is set to its position corresponding to the longest document 11 within the documents 11 piled in file hopper 31. However, as explained previously, the gate 45 is arranged to serve merely to retain the documents 11 which have not been caught by sweep bar 43 until the following conveying operation of conveyer 37. Hence a high accuracy of setting position of gate 45 is not required. Further, documents of different lengths can be contained in file hopper 31, if the rear edges of the documents 11 are aligned to plate 39 inclining downward from the horizontal position as seen from FIG. 3. Thus, the documents 11 tend to be easily and with certainty caught by sweep bar 43. Similarly, the documents 11 dropping into feed hopper 33 from file hopper 31 are aligned by a stop 57 of feed hopper 33. As a result, the documents 11 are fed into the feeding passageway in order, without any stagnation.

It should be noted that through the documents 11 retained by gate 45, due to the incomplete catch by sweep bar 43, are not aligned with the other documents, they are dropped into feed hopper 33 at the next conveying operation of conveyer 37 preceding the other documents. This is true because the documents 11 conveyed by conveyer 37 disengage from conveyer 37, in order, from the bottom document.

Preferably, the sweep bar 43 is formed in the shape which is capable of separating the documents 11 piled in file hopper 31 by thrusting its projecting portion into the documents. As a result of this, even if a document itself is very thin, so that the piled documents are in a undulated condition, the sweep bar 43 catches the documents 11 with certainty.

Thus, according to the present invention, the documents 11 can be perfectly fed by the mechanism without any particular care as to the different lengths of the documents to be fed.

FIG. 5 shows a time chart illustrating the operating conditions of conveyer 37 and respective switches SW1 thru SW4 from the start of operation of the mechanism to the completion of feeding of a certain volume of documents piled in file hopper 31.

FIG. 6 shows a block diagram illustrating the control circuit of a drive motor driving the conveyer 37.

The feeding operation of the documents by the mechanism will be briefly explained below, referring to FIG. 5 and FIG. 6.

1. A certain volume of documents 11 is set in the file hopper 31.

2. The apparatus is started by a command signal given by an operator.

3. The conveyer 37 begins to move so that the sweep bar 43 connected to conveyer 37 may turn and convey a part of the documents.

4. A predetermined amount of documents out of the part of the conveyed documents are delivered out from the file hopper 31 under the action of the gate 45.

5. As soon as the documents drop into the feed hopper 33, they are fed into the feeding passageway a sheet at a time under the separating action of the picker roller 35.

6. The conveyer 37 is continuously driven by the drive motor M and delivers a predetermined amount of documents until the switch SW2 of feed hopper 33 becomes "ON." That is, every time a switch 59 (SW1) becomes "ON," by actuation of the sweep bar 43, the switch 59 (SW1) monitors switch SW2 as to whether it is "ON" or "OFF." According to the result of the monitoring, the conveyer 37 either continues to be driven or is immediately stopped by the control circuit.

7. When the switch SW2 becomes "OFF" corresponding to the reduction of the documents within feed hopper 33 while the conveyer 37 is stopped, the conveyer 37 is immediately driven again so as to supplement the documents from file hopper 31 into feed hopper 33.

8. When all of the documents remaining in file hopper 31 are delivered into feed hopper 33 and the file hopper 31 becomes empty, the switch SW3 becomes "ON."

9. Thus, the conveyer 37 is no longer driven, even if the switch SW2 of feed hopper 33 returns to "OFF."

10. When the documents within feed hopper 33 are completely fed out, and the feed hopper 33 becomes empty, the switch SW4 becomes "ON" and the operation of the mechanism is completely stopped.

What we claim is:

1. A mechanism adapted for feeding documents of various lengths comprising:

a file-hopper having an upwardly open mouth from which a stack of said documents of various lengths can be piled at any time and a stop plate inclining to one side thereof from a vertical direction so that said stack of documents piled from the mouth into said file-hopper have their rear edges aligned with each other;

means for conveying a substack of documents of various lengths from said stack of documents in a di-

5

rection substantially the reverse of the direction in which said documents are to be fed while keeping the rear edges of the conveyed substack of documents aligned, and;

feeding means for momentarily storing said substack of documents of various lengths fed by said feeding means in such a form that the rear edges thereof are aligned and for feeding out one document a time from said momentarily stored documents with said aligned rear edges becoming the front edges of said fed out documents.

2. A mechanism as set forth in claim 1, wherein said conveying means is provided with a sweep bar member secured thereto for pushing the aligned rear edges of documents conveyed by said conveying means.

5
10
15

20

25

30

35

40

45

50

55

60

65

6

3. A mechanism as set forth in claim 1, wherein said conveying means is further provided with gate means for defining a space through which said documents are conveyed by said conveying means to said feeding means.

4. A mechanism as set forth in claim 1, wherein said feeding means is provided with a stop to thereby realign the previously aligned edges of said documents with each other in said feeding means.

5. A mechanism as set forth in claim 1, wherein said feeding means is further provided with a detecting device consisting of a shutter plate and photoelectric sensing elements for detecting the height of said documents stored in said feeding means.

* * * * *