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(54) **Document scanner.**

(57) A document scanner (111) includes a document tray (2) for supporting a plurality of documents (11) to be read, a reading section (61) for reading contents of the documents, and a document feeder (4) for feeding the documents one by one to the reading section from the document tray. A code decoder (63) is provided in the read section for reading a code (12) provided at a leading edge of each of the documents. A detecting unit (64) is connected to the code decoder for detecting multiple feeding when the code decoder is unable to read the code which is covered by the preceding document.

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DOCUMENT SCANNER

Background of the Invention

The present invention relates to document scanners for reading a number of documents sheet by sheet.

A conventional document scanner is shown in FIG. 11. The document scanner 1 includes a document tray 2 for supporting a plurality of documents 3, and a document feeder 4 for feeding a document 5 one by one to a reading section 6 from the document tray 2.

In operation, each of the documents 3 in the document tray 2 is fed to the reading section 6 by the document feeder 4 for reading the contents. One advantage of this document scanner 1 is that documents are read automatically one by one. However, two or more documents can be fed to the reading section 6 at the same time because of variations in paper thickness, friction, etc.

Such a condition is shown in FIG. 12, with the document scanner 1 omitted for simplicity, wherein two documents 11 and 21 are fed one upon another. The conventional document scanner 1 has no device for detecting such double or multiple feeding so that the operator must always monitor the operation.

Summary of the Invention

Accordingly, it is an object of the invention to provide a document scanner capable of automatically detecting multiple feeding, thereby assuring that documents are fed one by one.

According to the invention, the above object is accomplished by a document scanner which includes a document tray for housing a plurality of documents to be read, a reading section for reading contents of the documents, and a document feeder for feeding the documents one by one to the reading section from the document tray, a code decoder provided in the read section for reading a code provided at a leading edge of each of the documents; and a detecting unit connected to the code decoder for detecting multiple feeding when the code is covered by the preceding document.

The above and other objects, features, and advantages of the invention will become more apparent from the following description when taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

FIG. 1 is a perspective view of a document scanner according to an embodiment of the invention;

FIG. 2 is a top plan view of a document having a start and end codes;

FIG. 3 is a block diagram of the document scanner of FIG. 1;

FIGS. 4(a) and 4(b) are a perspective view and a side view of two documents, each being fed under normal conditions;

FIG. 5 is a timing chart showing the alternating detection of start and end codes;

FIGS. 6(a) and 6(b) are a perspective view and a side view of two documents being fed one upon another;

FIG. 7 is a timing chart showing the continuous detection of two end codes;

FIG. 8 is a top plan view of a document having a page code according to another embodiment of the invention;

FIG. 9 is a perspective view of three documents of FIG. 8, two of which are overlapped in part;

FIG. 10 is a timing chart showing detecting of the page codes where two documents are overlapped;

FIG. 11 is a perspective view of a conventional document scanner; and

FIG. 12 is a perspective view of two documents overlapping in part.

Description of the Preferred Embodiment

In FIG. 1, like numeral references denote like or corresponding elements in FIG. 11 and their description is omitted. A document reader 111 has a reading section 61.

In FIG. 2, a document 11 has a start code 12 at the leading edge and an end code 13 at the trailing edge. These start and end codes 12 and 13 are designed such that the document scanner 111 detect them.

In FIG. 3, the reading section 61 includes a read head 62, a code decoder 63 for reading the start and end codes 12 and 13, a detector unit 64 responsive to an output of the code decoder 63 to detect multiple feeding, and a document data processor 65.

In operation, a plurality of documents 3 in the document tray 2 are fed to the reading section 61 by the document feeder 4 one by one for reading the contents. When the documents are read se-

quentially by the reading section 62 as shown in FIGS. 4(a) and 4(b), the code decoder 63 is responsive to an output of the read head 62 to read the alternating start and end codes 12 and 13 as shown in FIG. 5. Also, the output of the read head 62 is fed to the document data processor 65. 5

When two documents 11 and 21 are fed to the reading section 61 one upon another, at least in part, as shown in FIGS. 6(a) and 6(b), the start code 12 of the subsequent document 21 is covered by the preceding document 11 so that the code decoder 63 reads the start code 12, end code 13, and end code 13 in this order as shown in FIG. 7. Consequently, the detecting unit 64 senses the irregular output to detect the multiple feeding. 10 15

Alternatively, only a page code 14 may be provided at the leading edge of a document 11 as shown in FIG. 8. Preferably, the page codes 14 are consecutive numbers such as "1", "2", "3",.... When two documents 11 and 21 are fed to the reading section one upon another as shown in FIG. 9, the page code "3" is detected following the page code "1" as shown in FIG. 10 so that the irregularity is sensed to detect the multiple feeding. Of course, the end codes may be used along with the page codes. 20 25

Claims

1. A document scanner comprising a document tray for housing a plurality of documents to be read, a reading section for reading contents of the documents, and a document feeder for feeding the documents one by one to the reading section from the document tray, characterized by a code decoder provided in the reading section for reading a code provided at a leading edge of each of the documents; and detecting means connected to the code decoder for detecting multiple feeding when the code is covered by a preceding document. 30 35 40

2. The document scanner of claim 1, wherein the documents each have a start code at a leading edge thereof and an end code at a trailing edge thereof. 45

3. The document scanner of claim 1, wherein the documents each have a page code at a leading edge thereof.

4. The document scanner of claim 1, wherein the documents are fed from top to bottom. 50

5. The document scanner of claim 1, wherein the documents are fed from bottom to top.

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FIG. 1

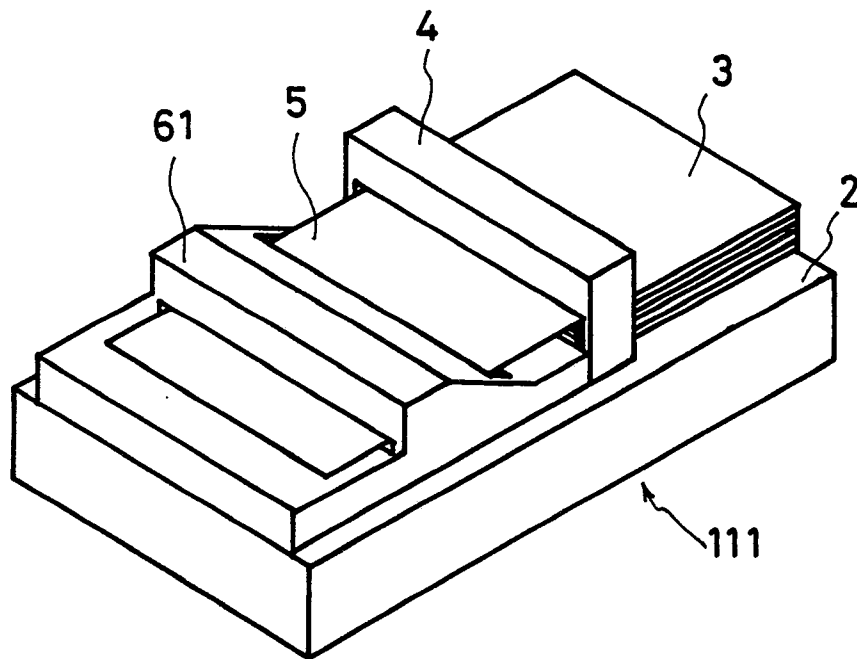


FIG. 2

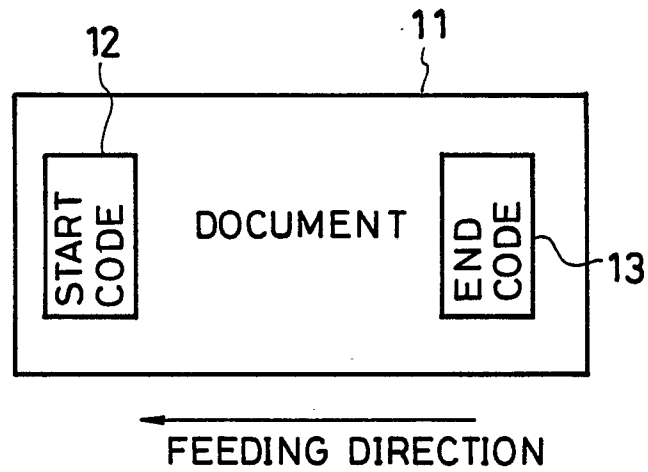


FIG. 3

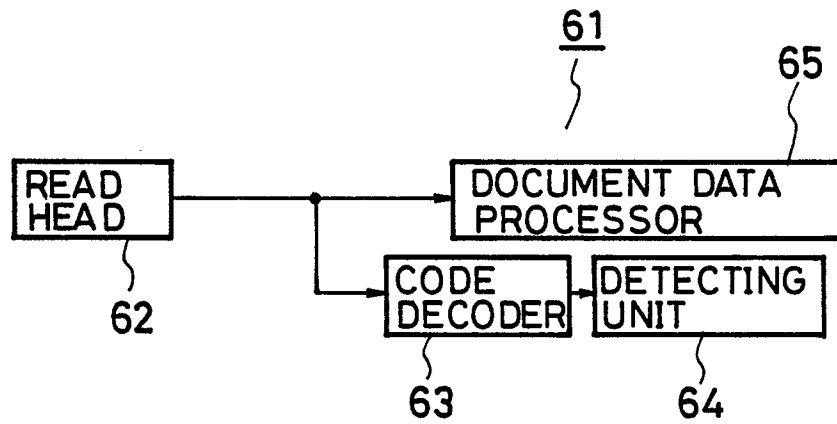


FIG.4(a)

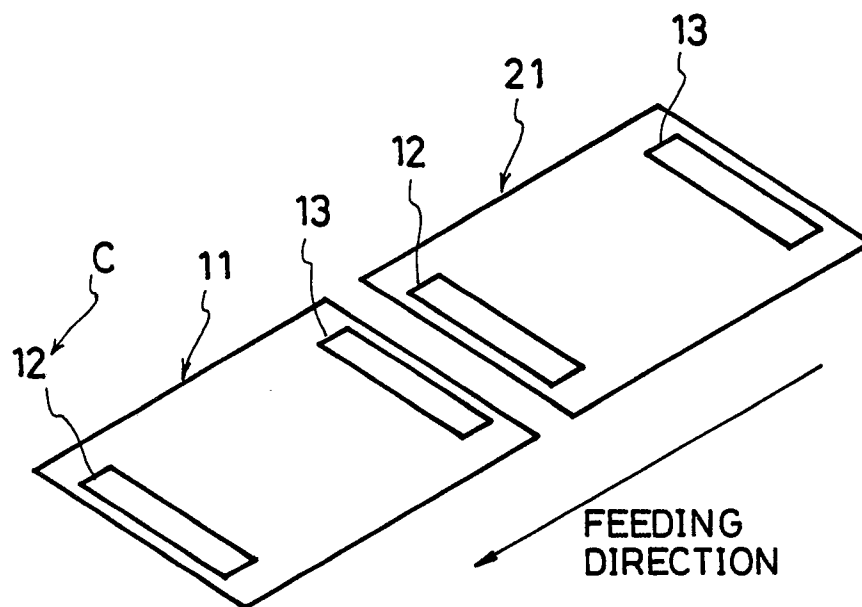


FIG.4(b)

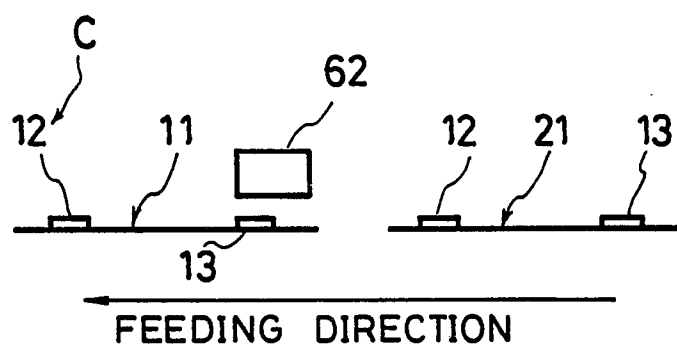


FIG. 5

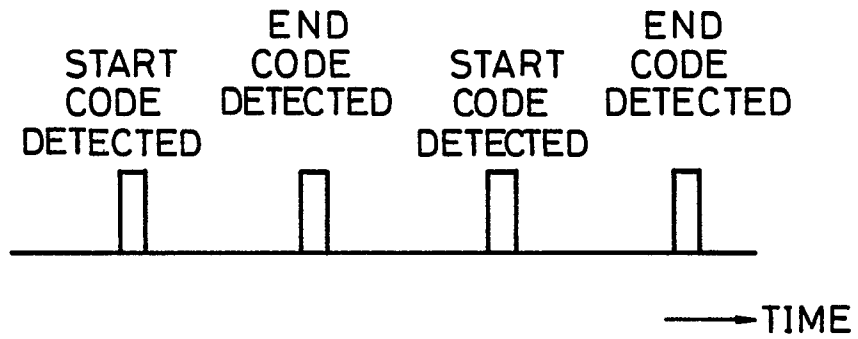


FIG. 6(a)

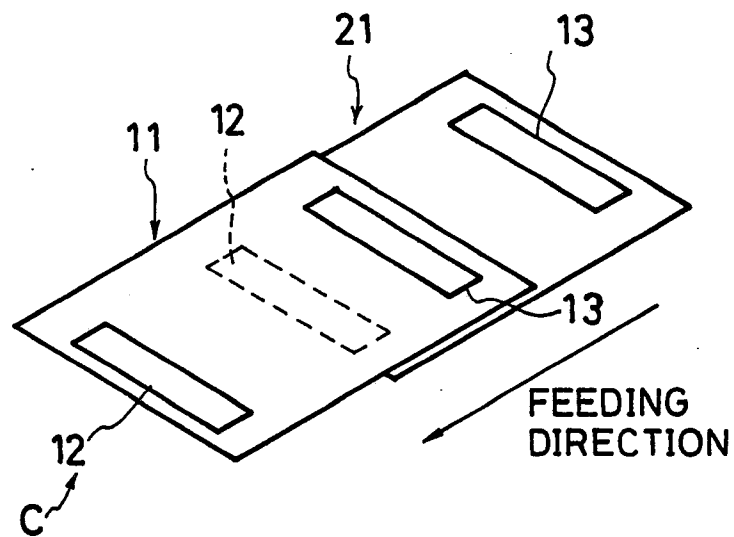


FIG. 6(b)

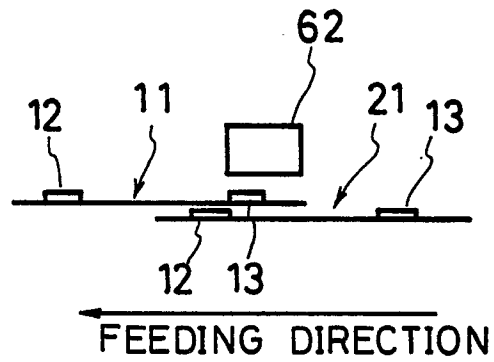


FIG. 7

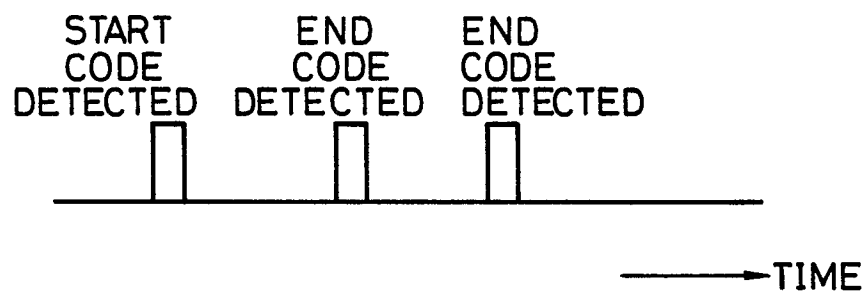


FIG. 8

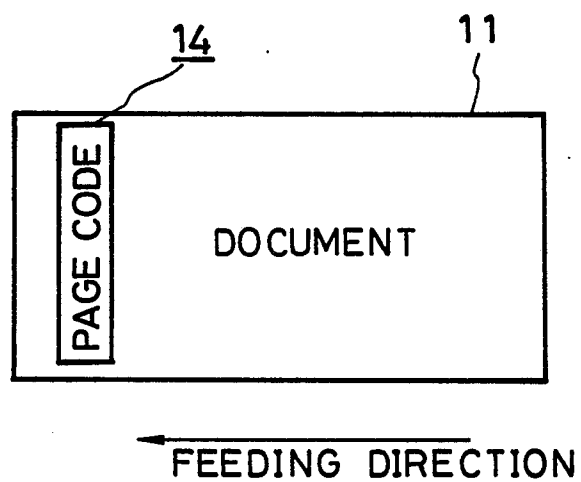


FIG. 9

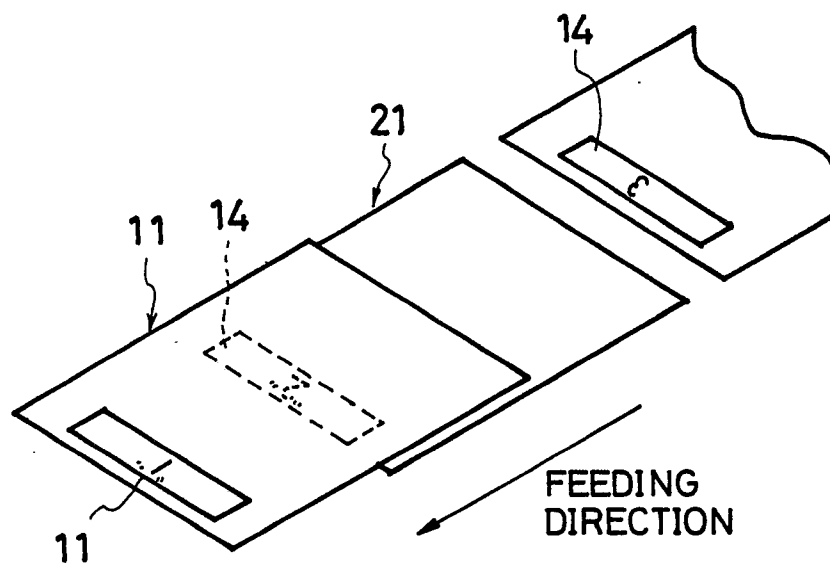


FIG. 10

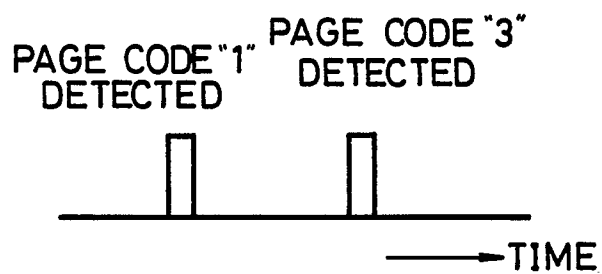


FIG.11 PRIOR ART

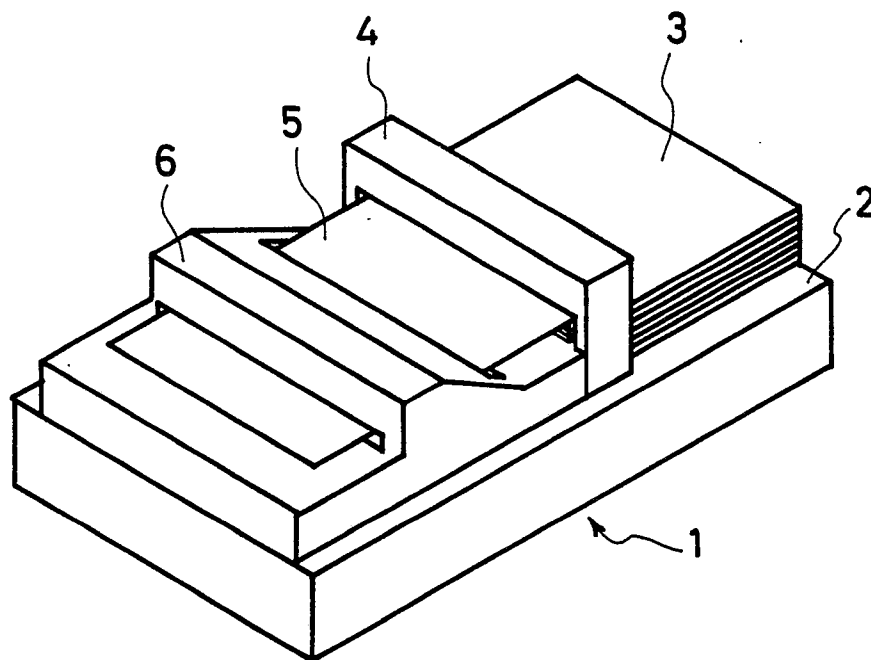


FIG.12 PRIOR ART

