

[54] DOCUMENT LOADER

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[22] Filed: Dec. 20, 1971

[21] Appl. No.: 209,808

[52] U.S. Cl. 271/150, 271/154

[51] Int. Cl. B65h 1/02, B65h 1/14

[58] Field of Search 271/62 B, 62 R, 39, 271/43 A, 30 A, 8 A, 40, 57

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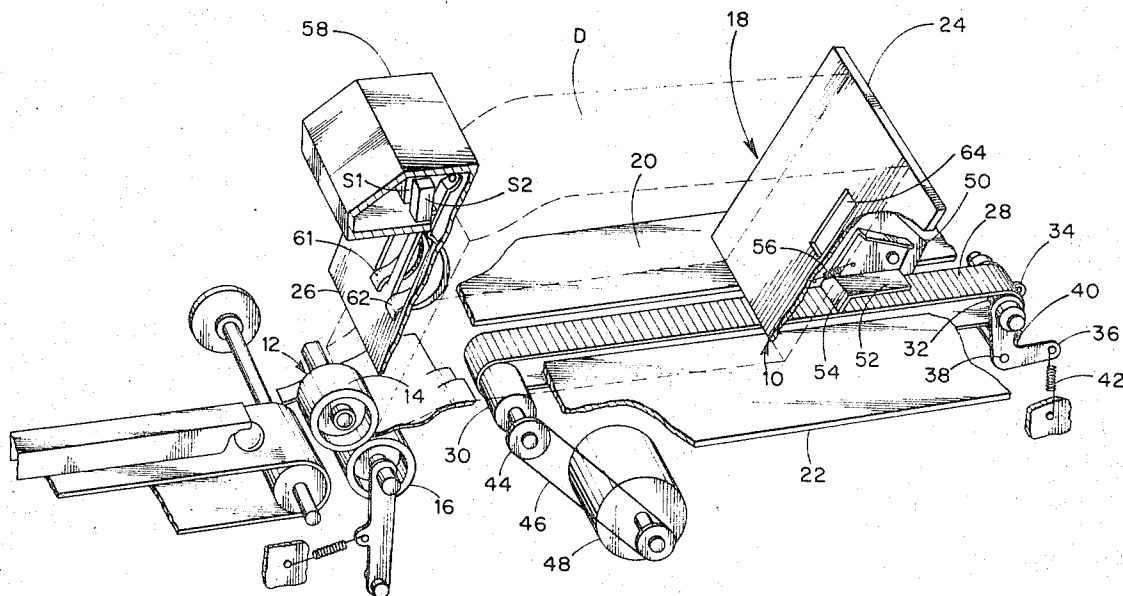
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[57] ABSTRACT

A document hopper, loader and follower assembly is provided wherein documents are automatically loaded into a feed device from a hopper by a movable follower assembly. The follower assembly is so mounted as to allow documents to be added to the hopper while the loading operation is in progress.

8 Claims, 4 Drawing Figures



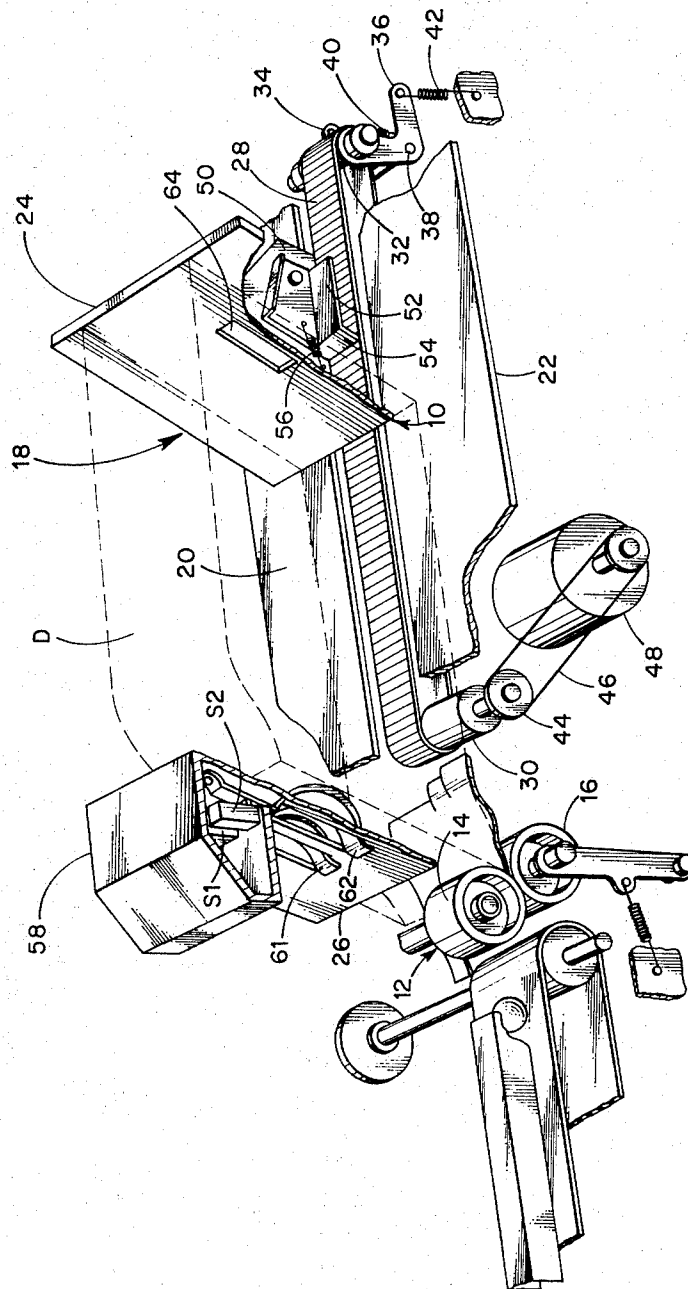
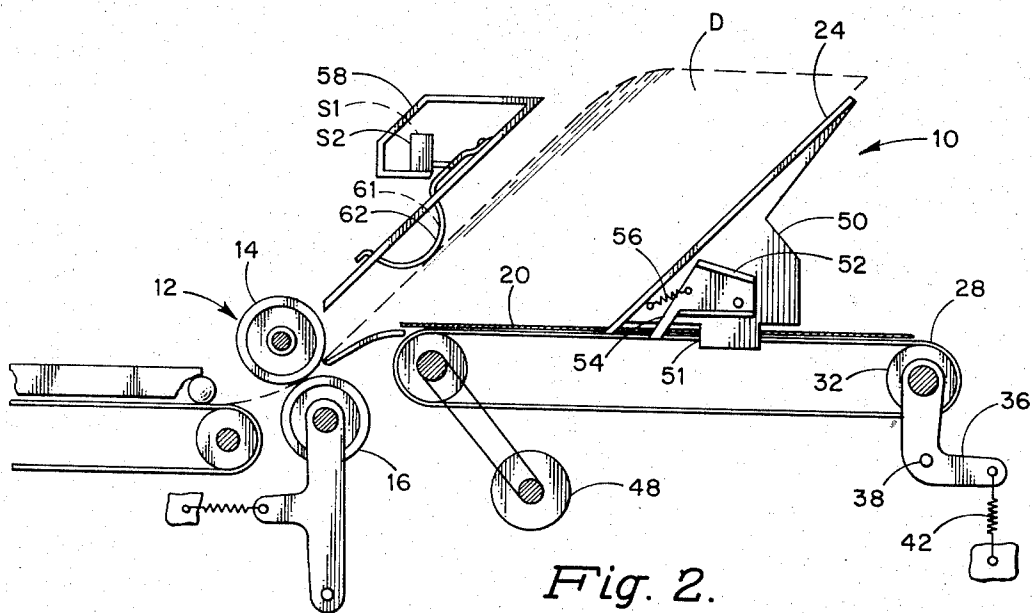
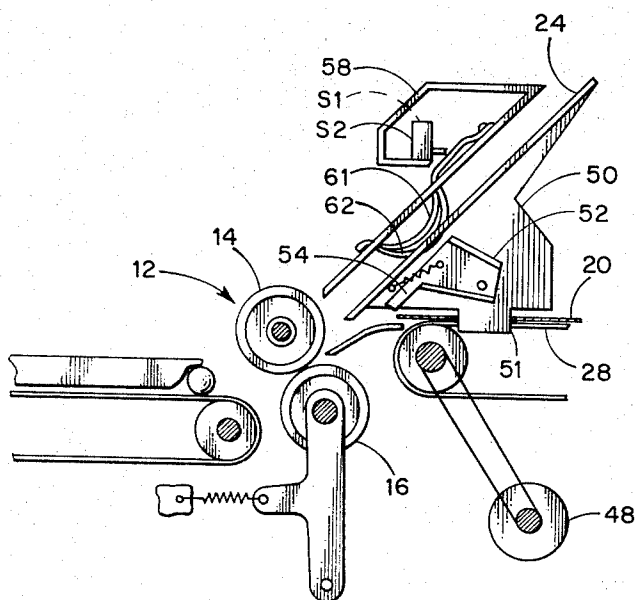
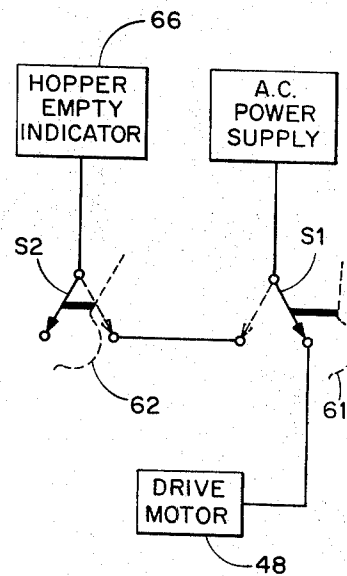


Fig. 1.



DOCUMENT LOADER

BACKGROUND OF THE INVENTION

This invention relates to document loading devices, and more particularly to a combination hopper, loader and follower assembly for use with a document feeding device.

The problem of feeding documents sequentially to work stations is one which is encountered in many applications of technology, and which is generally present in high speed computer equipment. Such devices as card punches, card readers, sorters, etc. are found in general usage in almost all systems wherein documents are arranged to present information to a computer processor. A typical document feeding device is shown in applicant's co-pending U.S. Patent application Ser. No. 204634, filed Dec. 3, 1971 and assigned to the Assignee of the present invention.

While a document feeding device as referred to above adequately solves the problem of feeding documents sequentially to a work station, a further problem which must be approached in the use of such devices is that of loading the documents into the feed device in a manner to present the documents to the feeder arranged in the sequence desired to be fed to a work station. Ideally, the loading of documents into a feed device should be accomplished with as little operator effort as possible. That is, an arrangement should be provided wherein the operator may load a large quantity of documents to be fed into the loader, and then be able to leave the loading device and go about performing other tasks.

Further in order to minimize the time that the device is shut down due to a lack of documents in the loader it is highly desirable that the document loader be capable of being supplied with documents during continuous operation rather than only when shut down. An added advantage of this requirement is that the operator is free to go about other tasks while the loader is in operation, and he may provide a new set of documents to the loader as they become available, or when he has free time to take care of this task.

With these requirements in mind, it is therefore an object of the present invention to provide a document hopper, loader and follower combination which provides means for introducing documents to the hopper during operation of the device.

A further object of the invention is to provide a loader device of the type described which automatically loads documents into a feeder or other assembly.

Yet another object of the invention is to provide a document loader of the type described which is simple in construction and operation, and therefore more reliable than prior art devices of this type.

SUMMARY OF THE INVENTION

The various objects of the invention are achieved by providing a document loader which may be used with a document feeding device and which comprises a hopper having an opening into which documents are introduced and an opening from which the documents are expelled, the hopper containing the documents to be operated on by a feeder, or other device. A follower member is disposed opposite the exit opening from which the documents are expelled and a movable belt to which the follower member is attached, is driven in a direction to move the follower toward the exit open-

ing of the hopper. Control means are also disposed adjacent the exit opening for energizing the drive means in response to an absence of documents adjacent the opening. Thus, a stack of documents located in the hopper is automatically moved toward the exit opening and expelled from the hopper during operation of the device.

The means for connecting the movable belt with the follower member are of the quick disconnect type and the combination of the belt structure and the mechanism devised for connecting the follower member to the belt structure is such as to provide for loading of the documents into the hopper without terminating operation of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

For better understanding of the present invention reference should be made to the accompanying drawings, wherein:

FIG. 1 is a fragmentary perspective view showing a document hopper, loader and follower assembly constructed in accordance with the teachings of the present invention;

FIG. 2 is an elevational view partially in section showing details of the various elements of the structure of FIG. 1 with the hopper loaded, and the device in operation;

FIG. 3 is a fragmentary elevational view similar to FIG. 2 showing the device of FIG. 1 after all of the documents have been expelled from the hopper, and further showing operation of the quick disconnect feature; and

FIG. 4 is a diagrammatic view of the circuit employed in operating the device of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing there is shown a document loader 10 which is arranged to provide documents D to a feed device 12, and in particular to introduce documents sequentially between the rollers 14 and 16 of the feed device. While it should be evident that any feed device which is arranged to receive documents D from the loader 10 as they emerge therefrom could be employed in combination with the loader, the feed device 12 herein shown is that device described and claimed in applicant's copending United States Patent Application Ser. No. 204,634, filed Dec. 3, 1971 and assigned to the Assignee of the present invention. The particular feed device 12 as shown, or any other applicable feed device, will not be described in greater detail therefor, as it is not deemed necessary for the purpose of describing the present invention.

Referring to FIGS. 1 and 2, the document loader 10 comprises a plurality of walls which form a hopper 18 into which the documents D are retained and from which the documents are ejected. The bottom wall of the hopper 18 is formed by plates 20 and 22 which are spaced to provide an elongated opening for access under the hopper. A follower plate 24 is disposed to provide the rear wall of the hopper 18 and is slidably supported by the plates 20 and 22. The forward portion of the hopper 18 is substantially open at the bottom and a front plate 26 is rigidly mounted at the upper portion of the hopper, which serves to support elements which are basic to the operation of the device, and which will be described in greater detail below.

The hopper 18 is generally open at the top and may have side walls (not shown) which complete the hopper enclosure. As an alternate, it may in some cases be desirable to provide a side opening hopper in which case the top and one side of the hopper might be enclosed with one side left open to insert documents into the loader 10. In the present structure, however, it will be assumed that the documents are loaded from the top and that side walls (not shown) are provided for maintaining the documents within the hopper enclosure.

Adjacent the slotted opening between the plates 20 and 22 a belt 28 is provided which further serves to support the follower plate 24. The belt 28 is provided with a plurality of closely spaced grooves on its outer surface which grooves run transverse to the direction of movement of the belt. The belt 28 passes over a drive roller 30 and an idler roller 32, the drive roller being fixed in suitable bearings in the structural frame of the device and the idler roller being supported between a pair of angle members 34 and 36 which are pivotally supported by a pin 38 also fixed to the machine frame. The rearwardly extending arm of each of the angle members 34 and 36 is connected to a pair of springs 40 and 42 each of a suitable spring constant to retain the belt 28 in driving engagement with the driver roller 30 by retaining tension in the belt.

While the belt 28 may be of a special design, for the present device it has been found that a standard purchased timing belt may be employed for this purpose if one of suitable dimension is available.

The shaft on which the drive roller 30 is mounted extends outwardly from the roller and has at one end a pulley 44 which is connected by means of a drive belt 46 to a drive means in the form of an electric motor 48. The electric motor 48 may be of any type well known in the art and a suitable arrangement of pulleys or gears between the motor 48 and the drive roller 30 may be provided such that the motor speed is compatible with the desirable speed for driving the roller 30.

Referring now to FIGS. 2 and 3, the follower plate 24 is shown to be provided with a rearwardly extending flange portion 50 which is disposed above and adjacent one side of the belt 28. The flange portion 50 has a lower lip 51 which extends horizontally under the belt 28, and a lock member 52 is pivotally connected to the flange 50 above the lip. The lock member 52 has a finger 54 projecting downwardly to contact the belt 28, and arranged to be received in the grooves of the belt. A tension spring 56 connects the lock member 52 to the follower plate 24 and is arranged such that the finger 54 is spring biased into contact with the belt 28. The action of the finger 54 against the upper surface of the belt 28 combined with the lip 51 which contacts the lower surface of the belt 28, provides a locking engagement between the follower plate 24 and the belt 28.

As depicted in FIG. 3, with the belt 28 stationary or moving the outstanding flanges of the lock member 52 may be grasped so as to lift the finger 54 from engagement with the belt, and the follower plate 24 may be moved rearwardly to present documents to the rear of the stack. This quick disconnect feature of the loader permits the operator to insert documents into the hopper 18 during operation of the device.

Turning now to the forward wall of the hopper 18, the front plate 26 has disposed at the upper side thereof a support member 58 which houses a pair of switches designated as S1 and S2. A pair of spring arms 61 and

62 are attached to the front plate 26 at a point above the switches S1 and S2, and each has an arc formed therein which extends through a pair of slots in the plate 26 so as to strike the documents D in the hopper 18. The arms 61 and 62 are spring biased into the hopper 18 and are retained in the openings in the plate 26 by virtue of their opposite free ends being bent downwardly to retain them in the respective opening in the plate, as best shown in FIG. 1. Each of the switches S1 and S2 has a button for activating the respective switch mechanism. The spring arms 61 and 62 are arranged in relation to the actuator buttons on the switches S1 and S2 such that the arm 61 is effective to move the button on the switch S1 and the arm 62 is effective to move the button on the switch S2 when the respective arm is moved outwardly from the hopper 18. However, the arrangement of the switch buttons relative to the arms 61 and 62 is such that the arm 61 is effective to release the switch S1 when documents are removed from the stack and energize motor 48 as will be described below. As viewed in FIG. 2, when the documents are removed from the hopper 18 both arms 61 and 62 move rearwardly into the hopper, and are effective to actuate switch S1 and switch S2.

Referring to FIG. 3 taken in conjunction with FIG. 1, it will be noted that a slotted opening 64 is provided in the plate 24. With the plate 24 adjacent the arms 61 and 62 the slot provides an opening into which the arm 62 is received. Thus, when the last document is removed from the face of the plate 24, the arm 62 is free to extend into the slot 64 and to thereby actuate the switch S2 to the closed position.

Referring now to FIG. 4, the switches S1 and S2 are shown schematically in combination with an AC power supply, drive motor 48, and a hopper empty indicator 66. The AC power supply is, of course, any supply which will energize the motor 48 while the hopper empty indicator 66 may serve a plurality of functions. The hopper empty indicator 66 may be a light or buzzer which is actuated to inform the operator that the hopper 18 is empty, or in addition, the signal sent to the hopper indicator by connecting it to the AC power supply may be effective to shut down the document feeder mechanism, card reader or other device connected with the loader 10.

As shown, the AC power supply is connected to the drive motor 48 when the button on switch S1 is in a position caused by the arm 61 being moved rearwardly into the hopper 18. When the button on switch S1 is in the position shown in dotted lines in FIG. 4 caused by the arm 61 being moved forwardly, the motor 48 is disconnected from the AC power supply. Noting the position of the switch S2, it will be seen that the switch is normally open when the switch button is in the forwardmost position, and is closed, as shown in the dotted line position, when the button is moved rearwardly into the hopper 18. However, as both the switch S1 and S2 are connected in series, the switch S1 must be in the dotted line position when the switch S2 is in the dotted line position in order for the hopper empty indicator 66 to be activated.

In operation, with documents loaded into the hopper 18 both the arms 61 and 62 will be in the forward position in the hopper and switch S2 will be in the position as shown in solid lines in FIG. 4 while switch S1 will be in the position shown in dotted lines of FIG. 4. When the document feeder 12 is activated, documents are re-

moved due to gravity flow from the front opening of the hopper and at some point in time the arms 61 and 62 and the button on switch S1 moves rearwardly to a point where the switch S1 closes the circuit to the AC power supply and the drive motor 48 is activated. As will be noted, it does not matter that the switch S2 is closed as the line is open from switch S2 to the power supply.

The drive motor 48 operates to rotate the roller 30 and the belt 28, moving the follower plate 24 forward in the hopper 18. When the documents force act on the arm 61 to move the button on the switch S1 forward, the drive motor 48 is shut off until documents are again fed to release the button and close the contact between the AC power supply and the drive motor 48.

As the documents are fed to the point where the last document remains in the hopper 18, the plate 24 contacts the switch S1 and moves it to the dotted line position of FIG. 4. When the last document is fed from the hopper 18, the arm 61 slips through the opening 64 in the plate 24 closing the switch S2 to the dotted position shown in FIG. 4. The hopper empty indicator 66 now energized by the AC power supply which is common to the drive motor 48 and the indicator.

During operation of the device, should it become desirable to add documents to the hopper 18, the lock member 52 is lifted such that the finger 54 is removed from a groove in the belt 28 and the entire follower plate 24 is moved rearwardly in the hopper. Documents are now added to the rear of the stack between the follower plate 24 and the documents already present, while the loader 10 is still effective to introduce documents into the feed device 12. The plurality of slots on the belt 28 may be closely spaced such that for any given number of documents to be added to the hopper 18, the plate may be moved up to a position where a groove is located under the finger 54 in a position where the plate 24 is slightly compressing the document stack.

From the foregoing it will be evident that the present invention provides a simple device for loading documents into a feeder or other mechanism and which provides a solution to many of those problems which are present in prior art devices. The present invention is therefore considered to provide a document loader which is more simple in operation and which comprises a minimum number of elements adding to its ease of construction and trouble free operation.

The various features and advantages of the invention are thought to be clear from the foregoing description. Various other features and advantages not specifically enumerated will undoubtedly occur to those skilled in the art, as likewise will many variations and modifications of the preferred embodiment illustrated, all of which may be achieved without departing from the spirit and scope of the invention as defined by the following claims.

What is claimed is:

1. A document loader for use with a document feeding device comprising; wall structure forming a hopper including a forward wall toward which documents are fed, said hopper having a first opening into which documents are introduced and a second opening adjacent said forward wall from which documents are expelled, said wall structure further comprising a follower member disposed opposite said forward wall,

movable belt means disposed adjacent said wall structure,

means connecting said follower member to said movable belt means,

means for driving said belt in a direction to move said follower member toward said second opening, and including a switch connecting said drive means to a source of electric power, a first slotted opening formed in said forward wall adjacent said second opening, a first switch actuator arm in the form of a spring extending through said wall and into said hopper for contacting documents located in said hopper and closing said switch in response to movement of documents toward said second opening,

a second switch, a second slotted opening formed in said forward wall adjacent said first slotted opening through which said drive means energizing arm extends, a second arm in the form of a spring extending through said second slotted opening and into said hopper for contacting documents in said hopper, said follower member having an opening formed therein in alignment with said second spring arm for releasing said spring to move inwardly into said hopper when documents are no longer present therein, and signal means for indicating the absence of documents in said hopper connected to a power source through said second switch whereby said spring movement into said hopper connects said signal means to its power source.

2. A document loader as set forth in claim 1 wherein said wall structure comprises a bottom wall on which the edges of documents are supported in said hopper and said follower member comprises a plate arranged at an angle of substantially 45 degrees with respect to said bottom wall.

3. The document loader of claim 1 wherein said means connecting said follower member to said movable belt means comprises a quick disconnect device including a movable finger element extending into an opening in a surface of said belt means, a portion of the device located to contact the opposite surface of said belt to clamp said belt means between said finger and said portion and a lever movable to disengage said finger element from said belt means, said finger element being spring biased into engagement with said belt means opening.

4. The document loader of claim 3 wherein said belt means comprises a belt having said finger contacting surface in which a plurality of equally spaced grooves are formed, the spacing between adjacent grooves forming said opening into which said finger member is received.

5. The document loader of claim 4 in which said wall structure comprises a bottom wall on which the edges of documents are supported in said hopper and said follower member comprises a plate arranged at an angle of substantially 45 degrees with respect to said bottom wall, said bottom wall further having a slotted opening provided therein and said belt being disposed adjacent and aligned with said slotted opening such that said follower member is attached to said belt through said slotted opening.

6. The document loader of claim 1 wherein said first switch and said second switch are connected in series to a common power source.

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7. A document loader for use with a document feeder device comprising: wall structure forming a hopper having a first opening into which documents are introduced and a second opening from which documents are expelled, said wall structure including a bottom wall having a slotted opening provided therein extending from one end of said hopper toward said second opening for substantially the length of said bottom wall, a movable belt disposed adjacent said bottom wall and aligned with said slotted opening for access to said belt from inside said hopper, a follower member supported on said bottom wall structure in said hopper outside said second opening, a quick disconnect device including a finger member extending into an opening in a sur-

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face of said belt, a portion of said device located to contact the opposite surface of said belt to clamp said belt between said portion and said finger, lever means movable to disengage said finger element from said belt, said finger element being spring biased into engagement with said belt, and means for driving said belt in a direction to move said follower member toward said second opening.

8. The document loader of claim 7 wherein said belt has a finger contacting surface in which a plurality of equally spaced grooves are formed, the spacing between adjacent grooves forming said opening into which said finger member is received.

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