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(54) Full automatic document selection and sealing device.

(57) The invention relates to a full automatic document selection and sealing device comprising a collating unit (A) which includes plural shelves (3) to carry document paper sheets of different types thereon, rollers (4) separately and individually controlled by a computer to select and feed the paper sheets one by one from the shelves, and optical sensors (15) located between adjacent shelves to detect paper sheets thus fed, the optical sensors being connected to feeding rollers (11,12) that are separately and individually driven; a folding unit (B) serially connected to the collating unit (A) which includes plural sets of folding rollers (21), and a control means to define folding positions on the paper sheet, and which folds the paper sheet either into two or three folds; an enclosing unit (C) which includes a supplying unit provided near the discharging terminal of the folding unit (B), a conveyer belt (29) laterally to be driven by a pulse motor, the conveyer belt carrying thereon rollers that are driven by a motor and which pay out envelopes one by one at one end of the belt, a folding roller to apply a folding line on the tongue of the envelope at the other end, and an opening means for opening the mouth of an envelope at an intermediate position on the belt; and a sealing unit which includes a pasting means, a folding vane and a press means whereby the device can continuously collate, fold, enclose and seal the document paper sheets.

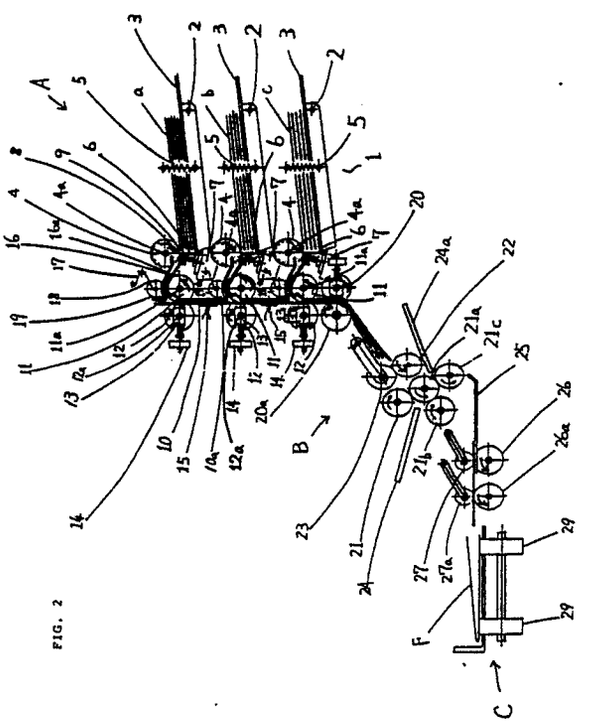


FIG. 2

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Full Automatic Document Selection and Sealing Device

This invention relates to a full automatic document selection and sealing device which collates automatically selected paper documents by the edges of paper sheets, folds and places the same in envelopes, and seals the envelopes sequentially.

There has been known a conventional enclosing/sealing device which sequentially but in different and separate steps collates, folds, piles and places in envelopes the paper documents, and seals the envelopes. However, there has never been known a device which can simultaneously collate, feed, fold and place the paper sheets in envelopes and seal the envelopes in a single and continuous process.

The prior art device is detrimental in that its operation ratio is low, the noise from operation is large, and the size of the device bulky. The conventional device is not suitable for installation in offices, presenting a particularly grave problem in respect of confidential communications.

The present invention was conceived to obviate aforementioned problems encountered in the prior art and to satisfy the demands of users for a device which is small and light, and which can in one sequential process collate paper documents by the edges thereof, pile, fold and place the same in envelopes and seal the envelope all in one system. In order to achieve the above mentioned purpose, the full automatic document selection and sealing device according to this invention comprises a collating unit for aligning and collating paper documents by the edges which includes rollers driven and controlled individually by a computer to ruffle and sort paper documents of different types piled on plural shelves, and optical sensors provided between adjacent shelves and connected to feeding rollers that are driven separately to detect documents that have been fed; a folding unit serially connected to the collating unit for folding the paper documents in two or three folds which includes plural sets of folding rollers and a controlling means which determines the folding positions on paper sheets a supplying unit provided at the side of an outlet of the folding unit; an enclosing unit opposed to the supplying unit which includes conveying belts that are driven by a pulse motor and are suspended laterally, rollers which are provided at one end of the belt and are driven by motors to supply envelopes one by one, folding rollers which are provided at the other end to mark folding lines on tongues of the envelopes, and an enclosing means provided at the middle of the belt for opening mouths of the envelopes; and a sealing unit serially connected to the enclosing unit which comprises a pasting means provided at the position closest to the enclosing unit, a folding vane which folds the tongues of the supplied envelopes, and a sealing means which presses the folded tongues, to thereby automatically select, collate, fold, enclose and seal paper documents in one sequential operation.

The full automatic document selection and sealing device according to this invention will now be described referring to a preferred embodiment shown in attached drawings, wherein

FIG. 1 is a schematic view of the construction to show the processes according to this invention;

FIG. 2 is a vertical sectional view to show the collating, folding and enclosing units;

FIG. 3 is a side view to show the enclosing unit;

FIG. 4 is a side view to show a part of the enclosing unit and the sealing unit, and FIG. 5 is a plane view of FIG. 4.

The device according to the invention comprises a collating unit A, a folding unit B connected serially to the collating unit A, an enclosing unit C serially connected to the folding unit B and a sealing unit D serially connected to the enclosing unit C.

Respective units will now be described in more detail.

The collating unit A comprises shelves 3 arranged in plural stages, each of which is axially supported by a pin 2 on side plates 1,1 at one end thereof, and springs 5 which push up the shelves toward rollers 4 (ruffling rollers) respectively, so that the topmost sheets of paper document a, b, and c piled on the shelves 3 are abutted against the rollers 4. The rollers 4 are journalled with bearings on the side plates 1,1 so as to be positioned at one end of the shelves 3. Each roller shaft 4a is connected to a motor controlled by a computer via a one-directional clutch 4b. Underneath each roller 4 is opposed a plate 6 (ruffling plate) made of rubber plate or the like. The plate 6 is attached via a supporting rod 8 supported on an attachment plate 7, and is energized by a spring 9 so as to be pushed upward, whereby the plate 6 ruffles the documents on a shelf one by one as the rollers 4 rotate to feed the sheet to a predetermined position.

A pair of guide plates 10,10a are vertically arranged at an interval at the frontal side of the side plates 1,1. On both sides of the guide member are provided a pair each of rollers 11,12 (feeding rollers) at positions corresponding to respective shelves 3. While the roller shaft 11a is supported on the side plates 1, the roller shaft 12a is sup-

ported by a movable bearing 13 guided by the side plate 1, and the movable bearing 13 may be moved for adjustment by an adjustment handle 14.

The roller shafts 11a, 12a are attached with gears so that rotation may be transmitted by the gears. The roller shaft 11a is further connected via the one directional clutch to an individual motor connected to an optical sensor 15 which will be described later. The optical sensor 15 each is attached to a guide plate 10a between adjacent shelves 3,3 so that the sensor 15 upon detecting the paper, issues detection signals to actuate the motor for feeding out the paper sheet through the guide plates 10, 10a.

A pair of curved guide plates 16,16a are provided between the roller 4 and the roller 11 so as to guide the paper sheet from the roller 4 between the rollers 11, 12.

Rollers 19 (press rollers) axially supported on an arm 18 which is energized with a spring 17 in the pushing-up direction is provided to oppose the roller 11 in a manner to press the paper sheet thereon for guiding purpose.

A pair of guide rollers 20,20a are provided with bearings on the side plates 1,1 underneath the frontal guide plates 10,10a to supply the document paper which has been collated and sent by the rollers 11, 12 to the next stage at the folding unit B. The folding unit B comprises plural sets of folding rollers 21, 21a, 21b, 21c, a pulling roller 22 and a press roller 23, all of the rollers being driven by motors. The folding unit B is provided with guide plates 24,24a having control means which is adjustable for determining the folding positions. A guide plate 25 and a supplying means comprising push-in rollers 26,26a and press rollers 27,27a are provided at downstream of the group of said rollers so as to supply the paper sheets to the next stage at the enclosing unit C.

The enclosing unit C is installed laterally perpendicular to the folding unit B. The unit C is provided with conveying belts 29 suspended on conveying rollers 28,28a, and driven by a pulse motor. At one end of the conveying belt 29 is positioned a supplying unit 30 comprising a shelf 33 which is journalled at one end thereof at a pin 31 and energized upward with a spring 32, and a roller 34 (ruffling roller) driven by a motor and a plate 35 opposed thereto at the other end of the shelf 33. A pair of guide plates 36,36a are provided between the conveying belt 29 and the roller 34 to feed the envelop F which is supplied one by one onto the conveying belt 29 with the rollers 37 and 38. The roller 38 is energized with a spring 38a onto the roller 37. A pasting means 39 is provided at the down stream of the conveying belt 29, and an opening means is installed at an intermediate position on the belt 29 to oppose the supplying means of the unit B to open the mouth of an envelope F so that when the envelope F from the belt 29 is suspended, the mouth thereof may be opened with a suitable means such as claws. At one end of the enclosing unit C is connected a sealing unit D which is suspended between and journalled to the supports on both sides and which comprises a plural number of conveying rollers 41,41, conveying belts 42 suspended on the rollers, a plural number of free rollers 44 which are opposed to the conveying rollers 41 respectively and which are energized with springs 43 toward the conveying rollers 41, and a folding vane 45 on one side for folding the tongue Fa of the envelope F. On the side of the inlet before the folding vane 45 is provided a roller 46, while at the outlet side are provided press rollers 48,48 which are journalled at one end thereof and axially supported with springs on arms 47,47 so that pasted tongue member Fa is pressed against the envelope F and sealed.

As described in the foregoing, the device with aforementioned structure can be operated as follows. The paper document sheets a, b, and c piled on plural shelves 3 are selected when a user turns on a switch. The selected sheets are fed to a controlling position sheet by sheet by computer-controlled rollers 4 and plates 6. When the sheet a of the upper shelf comes to the controlling position, rollers 11, 12 are separately actuated with detection signals to feed the sheet a out. When the tip end of the sheet is detected by an optical sensor 15 provided between adjacent shelves, the sensor 15 issues a detection signal to actuate rollers 11, 12 separately for feeding out the paper sheet b on the subsequent shelf. The timing is so predetermined that the edge of the sheet a and that of the next sheet are aligned. As the two sheets, a and b thus aligned are detected by the next optical sensor 15, rollers 11 - 12 are caused to rotate and feed the sheets in the same manner as described above. While being fed, the sheets are further collated, and then moved to guide rollers 20,20a located underneath the rollers 11, 12. They are conveyed to plural sets of folding rollers 21,21a, 21b, 21c by means of a pulling roller 22 and a press roller 23 of the folding unit B, and to be further collated by a group of folding rollers and guide plates 24,24a having means to determine the folding positions. The sheets are then folded either in two or three folds according to an instruction determined beforehand. The folded sheets are fed onto a guide plate 25 and then to the supplying unit with press rollers 27, 27a and rollers 26,26a provided at the end of the guide plate 25. Envelopes F placed on a shelf 33 at the supplying unit of the sealing unit D, the sealing unit D being provided laterally perpendicular to the folding unit B, are ruffled one by one with a roller 34 and a

plate 35 which are driven with the signal from the unit C. An envelope F is paid out on the belt 29 by a roller 37 and a roller 38. As the envelope F reaches a predetermined position at the folding unit B, the conveyer roller 29 is suspended and an opening means provided at this position opens the mouth of the envelope. Coincidentally, the document sheets between the rollers 26,26a and the rollers 27,27a are inserted into the envelope F at a timing coordinated with signals.

The envelopes F containing the document sheets are intermittently moved on the conveyor belt 29 to the end of the belt 29. In the meantime, the tongue Fa thereof is applied with paste by a pasting means. The envelope is then conveyed onto the conveyor belt 42 between the roller 41 and free rollers 44 so as to be pressed therebetween. Meanwhile, the tongue Fa is applied with a folding line by a roller 46, and then is gradually folded with a folding vane 45. While being conveyed, the tongue Fa is folded over the envelope F, and when it is further conveyed, the envelope is pressed with rollers 48,48 provided at the terminal, and discharged. In other words, the envelope is sealed and taken out.

As described in detail in the foregoing, this invention device for full automatic document selection and sealing comprises a collating unit which includes plural shelves to carry document paper sheets of different types thereon, rollers separately and individually controlled by a computer to select and feed the paper sheets one by one from the shelves, and optical sensors located between adjacent shelves to detect paper sheets thus fed the optical sensors being connected to feeding rollers that are separately and individually driven; a folding unit serially connected to the collating unit which includes plural sets of folding rollers and control means to define folding positions on the paper sheet, and which folds the paper sheet either into two or three folds; an enclosing unit which includes a supplying unit provided near the discharging terminal of the folding unit, a conveyor belt laterally provided to be driven by a pulse motor, the conveyor belt carrying thereon rollers that are driven by a motor and which pay out envelopes one by one at one end of the belt, a folding roller to apply a folding line on the tongue of the envelope at the other end, and an opening means for opening the mouth of an envelope at an intermediate position on the belt; and a sealing unit which includes a pasting means, a folding vane and a press means, to thereby collate, fold, enclose and seal the paper document sheets. Simply by turning on the switch provided at the collating unit, and by placing document sheets on the shelves, the device can automatically align the sheets by the edge. thereof, collate fold and enclose the same into envelopes, and further seal the envelopes to thereby enhance rationalization and operability in document collation and sealing. This invention device is therefore quite effective in saving manpower. It can also protect the confidential communications as the documents can be enveloped and sealed in a single continuous process.

Claims

1. A full automatic document selection and sealing device comprising a collating unit which includes plural shelves to carry document paper sheets of different types thereon, rollers separately and individually controlled by a computer to select and feed the paper sheets one by one from the shelves, and optical sensors located between adjacent shelves to detect paper sheets thus fed, the optical sensors being connected to feeding rollers that are separately and individually driven; a folding unit serially connected to the collating unit which includes plural sets of folding rollers, and a control means to define folding positions on the paper sheet, and which folds the paper sheet either into two or three folds; an enclosing unit which includes a supplying unit provided near the discharging terminal of the folding unit, a conveyer belt laterally to be driven by a pulse motor, the conveyer belt carrying thereon rollers that are driven by a motor and which pay out envelopes one by one at one end of the belt, a folding roller to apply a folding line on the tongue of the envelope at the other end, and an opening means for opening the mouth of an envelope at an intermediate position on the belt; and a sealing unit which includes a pasting means, a folding vane and a press means, whereby the device can continuously collate, fold, enclose and seal the document paper sheets.

2. A method for contineously collecting, folding, enclosing and sealing paper sheets with a device according to claim 1.

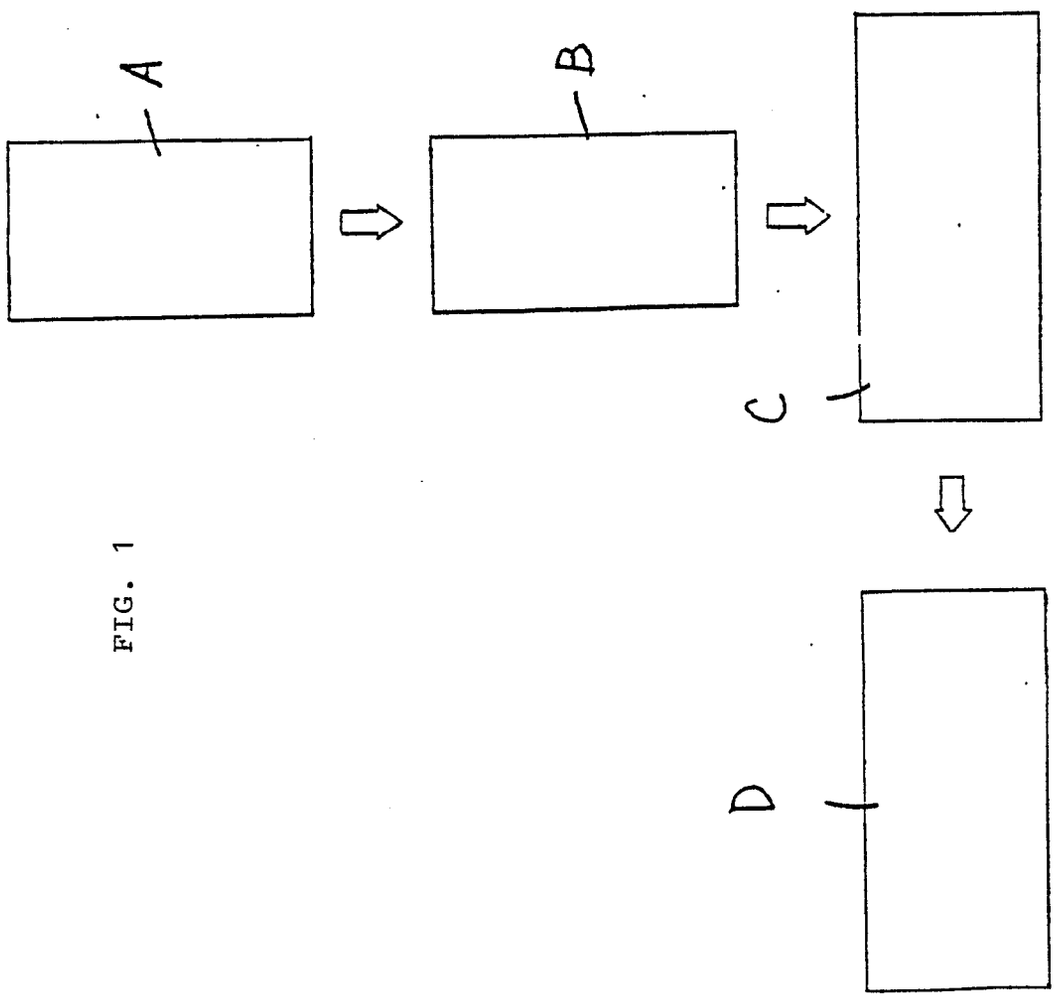


FIG. 1

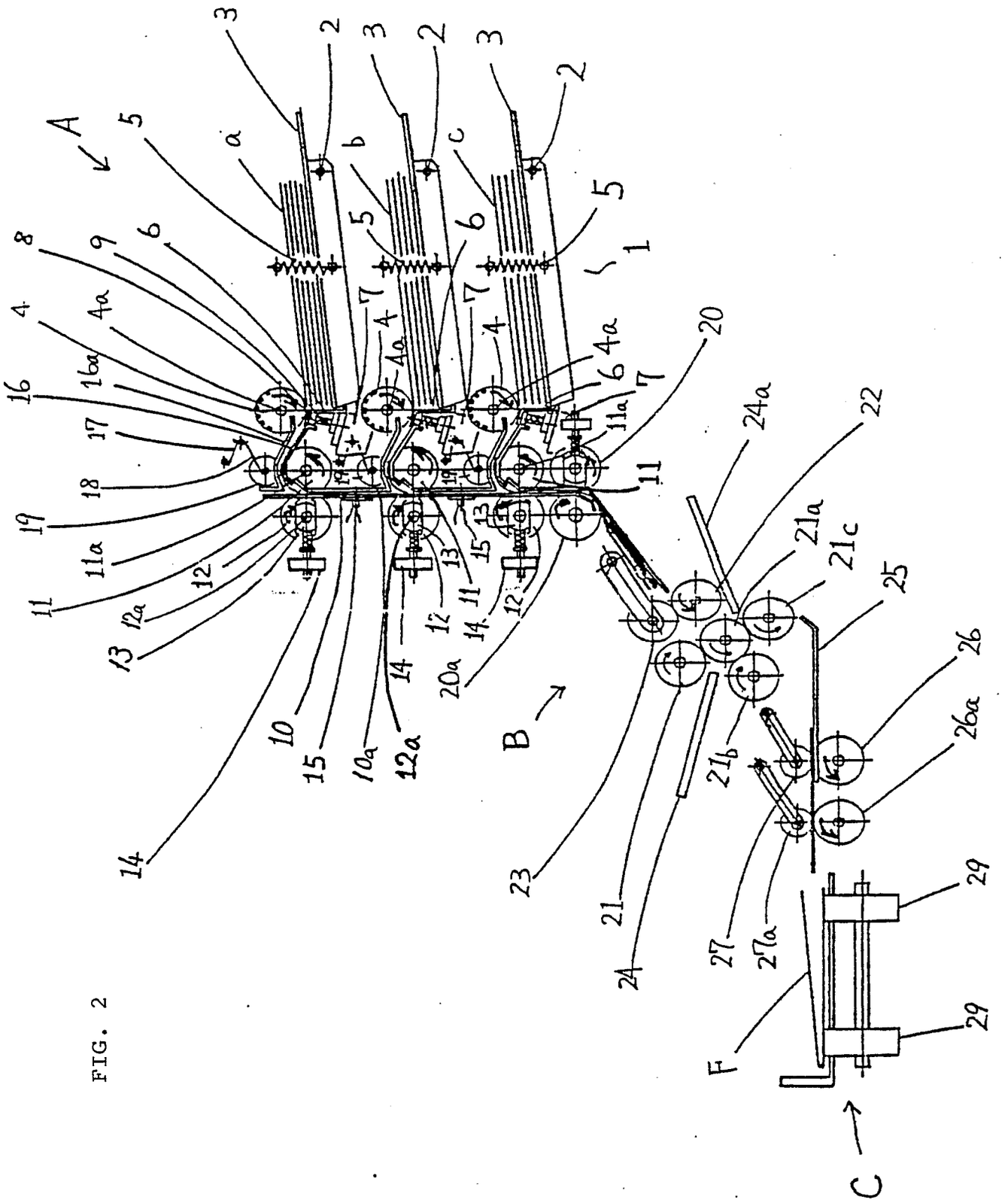

A
B
C
F
a
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4a
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FIG. 2

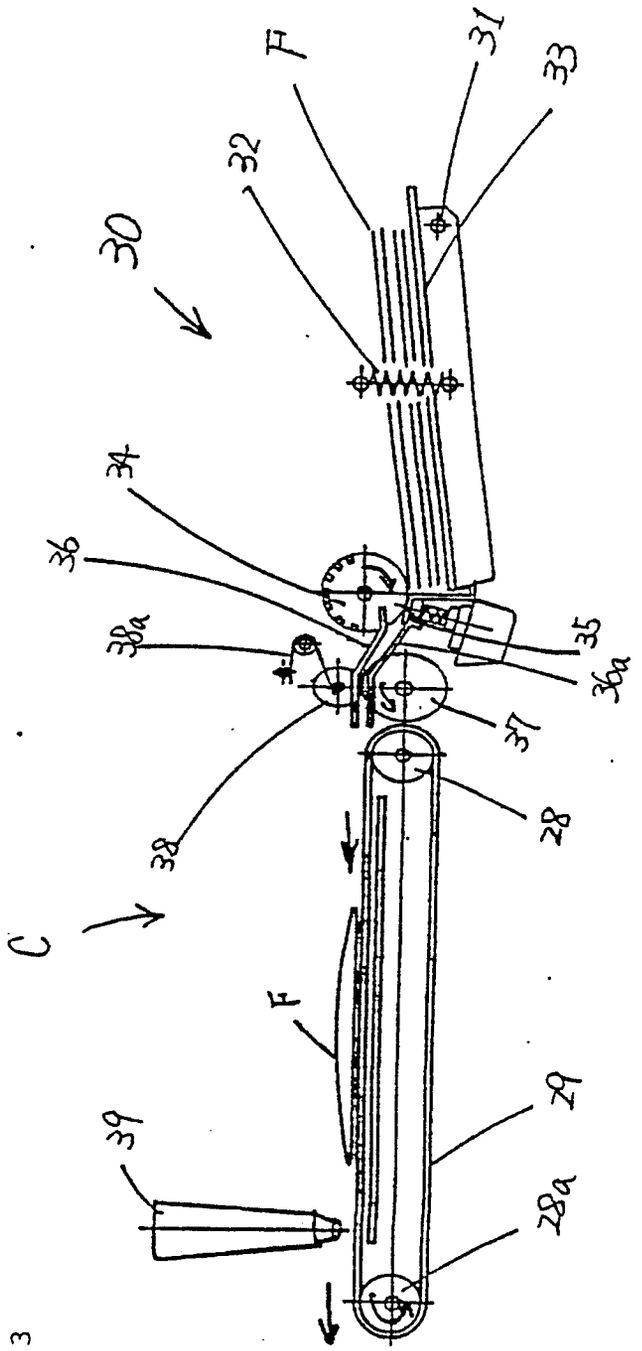


FIG. 3

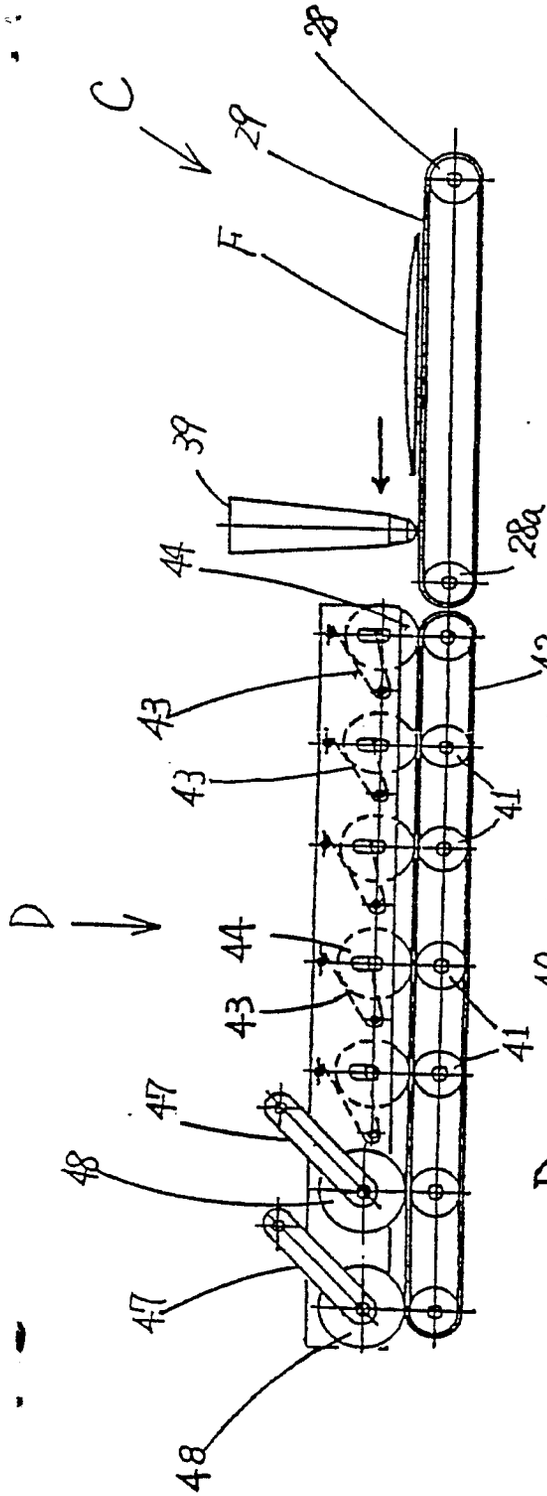


FIG. 4

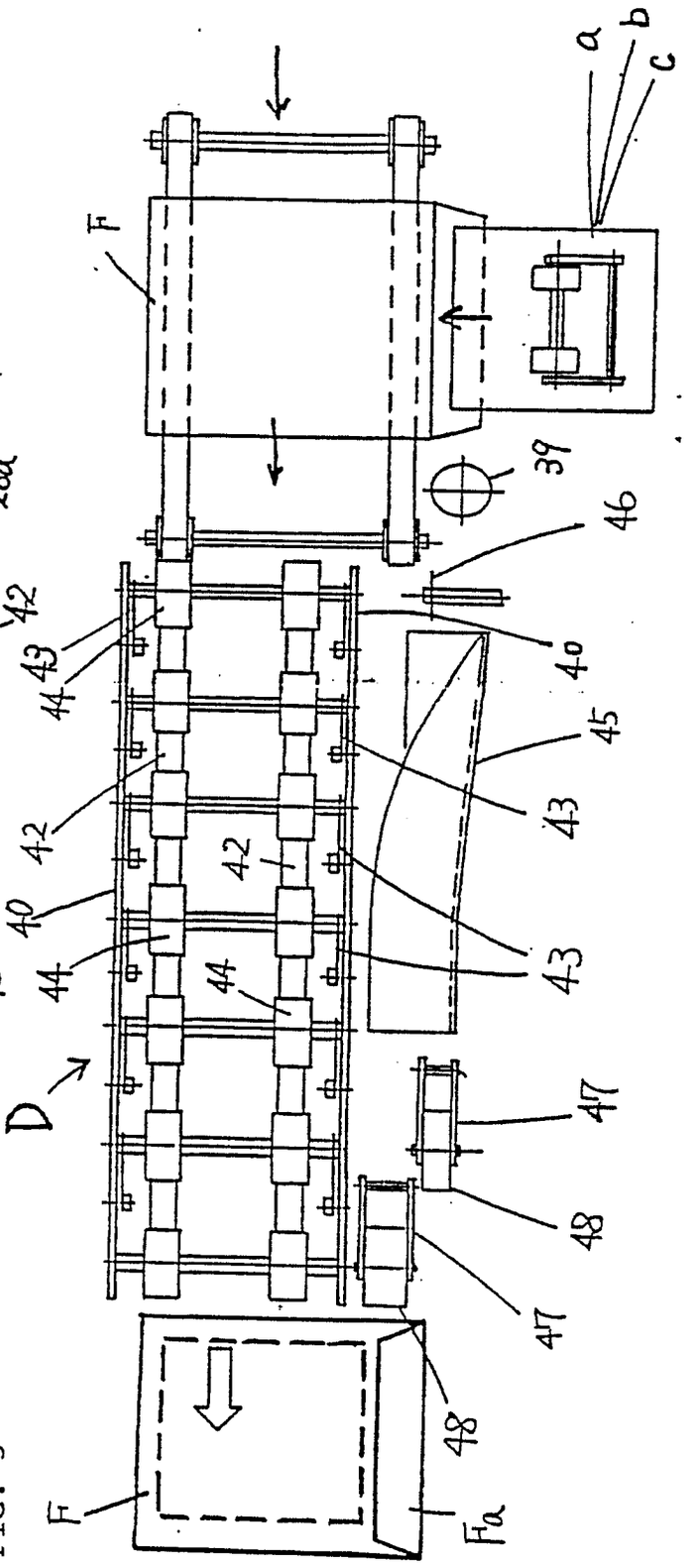


FIG. 5