

## Description

The present invention relates to a separating apparatus for separating a portion surrounded by intermittent cuts from a punched sheet, which was processed to have the intermittent cuts for example by a label punching machine such as a platen punching machine.

For example, labels are obtained as follows by punching a label original sheet with intermittent prints being given on the surface thereof. The label original sheet with intermittent prints being given on the surface thereof is placed between a cutter plate and a support plate in a puncher. Then the cutter plate is urged against the support plate to form intermittent cuts surrounding each label portion in the label original sheet with intermittent prints being given on the surface thereof. The label original sheet with intermittent cuts surrounding the each label portion is taken out of the puncher. A plurality of label original sheets are stacked on each other. Then the stacked label original sheets are pressed on the label portions by a manual operation using a hammer or the like or by a pushing machine provided with push plates corresponding to the label portions, whereby the label portions are separated from the label original sheets.

The separation of press-off label portions in the label original sheet therefrom requires means for taking out of the label puncher the label original sheets after cut by the label puncher and then stacking the label original sheets on each other, and means for manually or mechanically pressing the press-off label portions in the stacked label original sheets. In other words, there are two independent steps necessary for separating the press-off label portions from the label original sheets, that is, a step of taking out the label original sheets of the puncher and stacking them on each other and a step of separating the label portions from the stacked label original sheets.

There are the following cases in such an arrangement that the press-off label portions in the label original sheets are separated from the label original sheets by the two steps. If many label original sheets include label portions to be separated therefrom in the same size, shape and location, the two steps can be continuously carried out by locating the pushing machine with push plates corresponding to the label portions, next to the label original sheets stacked in a multiplicity of layers. If there are various kinds of label portions with different sizes, shapes and locations to be pressed off from a small number of label original sheets, the label original sheets must be stacked according to the size, shape and location of press-off label portions and push plates of different types corresponding to the sizes, shapes and locations of label portions in the stacked label original sheets must be exchanged therebetween depending upon the stacked label original sheets, which does not allow continuous execution of the two steps.

Applicant developed a separating apparatus for punched sheet in which a press roller is disposed above a feed roller for feeding a punched sheet, as being freely

contactable with or separable from the feed roller, the punched sheet fed between the press roller and the feed roller is pinched thereby, and the press roller is moved along a circumferential surface of the feed roller to separate portions surrounded by cuts from the punched sheet (see EP-A-0 509 443, which forms part of the state of the art according to Article 54(3) EPC).

The separating apparatus for punched sheet can automatically and surely separate the press-off portions from the punched sheet taken out of the puncher regardless of the size and the location of press-off portions in the punched sheet. However, the press roller is not in a rotating motion but in a reciprocating motion relative to the feed roller, and the apparatus needs a device for urging the press roller against the feed roller. Since the apparatus requires a plurality of steps for separating the press-off portions from the punched sheet, there is a limit of speed for separating the press-off portions from the punched sheet.

Further, the separating apparatus of the above type for punched sheet has the following drawback. If the width of a scrap portion located outside the press-off portions in the punched sheet, that is, a frame portion in the punched sheet (scrap portion left after separation of press-off portions from the punched sheet) is wide, the frame portion of punched sheet lacks the flexibility, which would cause the frame portion of punched sheet not to move along the feed roller upon separation of punched sheet. This could cause skid of the feed roller, so that the rear end of scrap portion in the feed direction could sometimes fail to be fed through between the feed roller and the press roller.

## SUMMARY OF THE INVENTION

The present invention has been accomplished taking the above-described points into consideration, and it is an object of the present invention to provide a separating apparatus for punched sheet which enables high-speed separation of press-off portions from a punched sheet taken out of a puncher, regardless of the size, the shape and the location of press-off portions in the punched sheet.

This object is achieved by a separating device according to claim 1. This object is also achieved by a separating device according to claim 6.

In the separating apparatus for punched sheet according to claim 1, the tip portion of punched sheet fed to the feed roller is pinched between the feed roller and the press roller, and the press roller is moved along the circumferential surface of the feed roller at the same speed as that of the punched sheet while pinching the punched sheet between the rollers, whereby press-off portions are separated from the punched sheet, the separated press-off portions are transferred in the horizontal direction and the scrap portion of punched sheet is dropped down below the feed roller.

In the separating apparatus for punched sheet according to claim 6, a pair of press rollers are provided

relative to a feed roller at angular intervals of 180 degrees, the tip portion of punched sheet fed to the feed roller is pinched between one of the press rollers and the feed roller, the actuator actuates the pair of press rollers to move along the circumferential surface of the feed roller to separate the press-off portions from the punched sheet, the separated press-off portions are transferred in the horizontal direction, the scrap portion of punched sheet is dropped down below the feed roller, the actuator further actuates the pair of press rollers to move along the circumferential surface of the feed roller to locate the other one of press rollers at the initial position relative to the feed roller, on the way of rotation of the other press roller it flips up the rear end of scrap portion of the punched sheet thereby to prevent the feed roller from skidding on the scrap portion of punched sheet, whereby the scrap portion of the punched sheet is surely dropped down below the feed roller, and the pair of press rollers are rotated with respect to the feed roller in the same direction thereby to enable higher-speed operation.

Preferably the separating apparatus according to claim 1 includes the additional features of claim 11. In such an apparatus, the separated press-off portions are transferred with guide of the separation helping device in the horizontal direction, and the scrap portion of punched sheet is dropped down below the feed roller. In this case, the provision of separation helping device can surely separate even a press-off portion short in length from the punched sheet.

Preferably the separating apparatus according to claim 6 includes the additional features of claim 16.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic drawing to show a first embodiment of separating apparatus for punched sheet according to the present invention;

Fig. 2 is a drawing to show the main portion of the separating apparatus for punched sheet according to the present invention;

Fig. 3 is a drawing to show positions of press roller and rotation roller at operation start of the separating apparatus for punched sheet according to the present invention;

Fig. 4 is a drawing to show an initial position of the press roller relative to a feed roller;

Fig. 5 is a drawing to show a final position of the press roller relative to the feed roller;

Fig. 6 is a drawing to show an initial position of press rollers relative to a feed roller in another embodiment of separating apparatus for punched sheet according to the present invention;

Fig. 7 is a drawing to show a final position of the press rollers relative to the feed roller;

Fig. 8 is a drawing to show a halfway position of a press roller returning to the initial position with respect to the feed roller;

Fig. 9 is a schematic drawing to show a second embodiment of separating apparatus for punched sheet according to the present invention;

Fig. 10 is a drawing to show the main part of the separating apparatus for punched sheet according to the present invention;

Fig. 11 is a drawing to show positions of press roller and rotation roller before operation start of the separating apparatus for punched sheet according to the present invention;

Fig. 12 is a drawing to show an initial position of the press roller relative to the feed roller;

Fig. 13 is a drawing to show a final position of the press roller relative to the feed roller;

Fig. 14 is a drawing to show another embodiment of the separating apparatus for punched sheet according to the present invention;

Fig. 15 is a drawing to show positions of press rollers and rotation roller at a stage before operation start of the separating apparatus for punched sheet shown in Fig. 14;

Fig. 16 is a drawing to show another embodiment of the separating apparatus for punched sheet according to the present invention;

Fig. 17 is a drawing to show an initial position of the press rollers relative to the feed roller in the separating apparatus for punched sheet shown in Fig. 14; and

Fig. 18 is a drawing to show a final position of the press rollers relative to the feed roller in the separating apparatus for punched sheet shown in Fig. 14.

#### DETAILED DESCRIPTION OF THE INVENTION

##### First Embodiment

The first embodiment of the present invention will be described in detail with reference to the drawings.

In Fig. 1, reference numeral 1 denotes a rotation roller (feed roller) in a separating apparatus for punched sheet. The rotation roller 1 is rotatably supported in the main body of apparatus. The rotation roller 1 is always rotated by a motor 25 in the direction of arrow A. For example, metal powder such as tungsten powder is deposited over the circumferential surface of the rotation roller 1 so as to surely transfer a punched sheet 2 fed thereinto. Also, a transfer roller 4 and a press plate 5 are disposed above a feed table 3 placed on the upstream side of the rotation roller 1, so that a punched sheet 2 to be processed may be fed to the rotation roller 1 through between the transfer roller 4 and the feed table 3 and along the feed table 3 while forced by the press plate 5. The press plate 5 is supported by a pin 5a on the upstream side in the feed direction as vertically rockable.

A press roller 6 is disposed above the rotation roller 1. Metal powder such as tungsten powder is also deposited over the circumferential surface of the press roller 6 in the same manner as on the rotation roller 1. The rotation roller 1 and the press roller 6 are operationally con-

nected to each other by gear units 21, 22 to rotate at the same surface speed. In this case, it is preferable to provide a balancer 17 with the same weight as that of the press roller 6 at a symmetric position with the press roller 6. The press roller 6 is journaled through a pair of supports 8, each of which is provided on a rotation support plate 7 supported on the same axis as the axis of the rotation roller 1 on the side of the press roller 6, as shown in Fig. 2 and Fig. 3. Each support 8 is of L shape in total, which is rotatably supported on the rotation support plate 7 through a pin 9 at the middle position thereof. Each support 8 has a bearing portion formed for the press roller 6 at one end thereof and a recess 10 formed at the other end. A coil spring 11 is set in the recess 10 so that an end of the coil spring 11 elastically contacts with a stop 12 disposed adjacent to the pair of supports 8 to urge the supports 8 counterclockwise about the pin 9. Then the press roller 6 journaled on the supports 8 is always urged to contact with the rotation roller 1. A guide 13 is provided on the outer surface of rotation support plate 7. When the punched sheet 2 fed between the press roller 6 and the rotation roller 1 is moved with the press roller 6 rotating by 90 degrees from the position indicated in Figure 1 along the circumferential surface of the rotation roller 1, the guide 13 is located to extend in the horizontal direction above the press roller 6 to transport in the horizontal direction a press-off portion 2a surrounded by cuts 2c after separated from the punched sheet 2. Since a remaining scrap portion 2b in the punched sheet 2 is pinched between the rotation roller 1 and the press roller 6, it drops down below the rotation roller 1 with rotation of the rotation roller 1 and the press roller 6.

Meantime, a gear 14 is mounted on the outer surface of one of the rotation support plate 7. The gear 14 is connected to an actuator (drive motor) 20 through a timing belt 24 so that the rotation support plates 7 are rotated by the drive motor 20 at the same speed as the feed speed of the punched sheet 2. Namely, the drive motor 20 is controlled by a controller 15 so that when the punched sheet 2 is pinched between the press roller 6 and the rotation roller 1 the drive motor 20 starts operating, that after the rotation support plates 7 are rotated by 90 degrees at the same speed as the feed speed of the punched sheet 2 the drive motor 20 stops, and that when the separation of a punched sheet 2 is completed the motor again starts rotating to return the press roller 6 to the initial position. A sensor unit 16 for sending a detection signal to the controller 15 is disposed at a position apart by distance L from a nip point n between the press roller 6 and the rotation roller 1. The sensor unit 16 detects the position of the tip end of the punched sheet 2 fed between the press roller 6 and the rotation roller 1. When the controller 15 receives the detection signal from the sensor unit 16, it calculates a time necessary for the punched sheet 2 to travel from the sensor unit 16 to the nip between the press roller 6 and the rotation roller 1, from the detection signal from the sensor unit 16 with the speed of punched sheet 2 and the distance L, and a con-

trol signal generated from the controller 15 actuates the drive motor 20 when the punched sheet 2 is pinched between the press roller 6 and the rotation roller 1. The drive motors 20 rotates the press roller 6 mounted on the rotation supports plates 7 by 90 degrees at the same speed as the feed speed of the punched sheet 2 along the circumferential surface of the rotation roller 1. A timer unit may be built in the sensor unit 16.

The operation is next described.

To separate the press-off portion(s) 2a surrounded by cuts 2c from the punched sheet 2, the punched sheet is transported through the transfer roller 4 and the press plate 5 toward the rotation roller 1 on the feed table 3. At the operation start the press roller 6 is located immediately above the rotation roller 1, as shown in Fig. 4, and the press roller 6 journaled on the supports 8 is urged against the rotation roller 1 by the coil spring 11.

When the punched sheet 2 is transported through the transfer roller 4 and the press plate 5 toward the rotation roller 1 on the feed table 3, the position of the tip end of the punched sheet 2 is detected by the sensor unit 16 disposed between the feed table 3 and the rotation roller 1 (on the upstream side of the rotation roller 1) and a detection signal from the sensor unit 16 is sent to the controller 15. The controller 15 calculates a time necessary for the tip end of punched sheet 2 to travel from the sensor unit 16 to the position where the tip end is pinched between the press roller 6 and the rotation roller 1, and generates a control signal to the actuator (drive motor) 20 after the calculated time elapsed.

As the punched sheet 2 moving on the feed table 3 further advances, the tip end of punched sheet 2 reaches the nip point n between the press roller 6 and the rotation roller 1 and then is pinched between the press roller 6 and the rotation roller 1. The portion of punched sheet 2 pinched between the press roller 6 and the rotation roller 1 is the scrap portion 2b, which is the frame portion (scrap portion 2b) of punched sheet 2. The press roller 6 journaled on the supports 8 moves away from the rotation roller 1 against the force of coil spring 11 depending upon the thickness of the scrap portion 2b, whereby the scrap portion 2b is surely pinched between the press roller 6 and the rotation roller 1.

The controller 15 generates a control signal to the actuator 20 at the same time as the frame portion 2b of punched sheet fed to the rotation roller 1 is pinched between the press roller 6 and the rotation roller 1. With the control signal the actuator 20 actuates the rotation support plates 7 to rotate at the same speed as the feed speed of punched sheet 2 by 90 degrees from the separation start position to the separation end position. Since the supports 8 mounted on the rotation support plate 7 are also rotated similarly, the press roller 6 rotates 90 degrees along the circumferential surface of rotation roller 1 in the same manner (Fig. 5). This moves the frame portion 2b of punched sheet 2 pinched between the press roller 6 and the rotation roller 1 downward with the press roller 6. As the frame portion 2b of punched sheet 2 is transferred downward, the punched sheet 2 is

bent along the circumferential surface of the rotation roller 1, which separates the press-off portion 2a from the punched sheet 2. The thus separated press-off portion 2a is transferred by the rotational force of the rotation roller 1 in the horizontal direction and then is stored in a container for sorting and arrangement.

When the sensor unit 16 detects the rear end of punched sheet 2, a detection signal is sent to the controller 15. With the detection signal the separation end is judged for the press-off portion 2a from first punched sheet 2. Then the actuator 20 actuates the rotation support plates 7 to further rotate then to return to the initial position. A second punched sheet 2 will be processed in the same manner as the above procedure.

Fig. 6 to Fig. 8 show another embodiment of the present invention, in which a pair of supports 8a, 8b are arranged in each rotation support plate 7. The pair of supports 8a, 8b have the same structure as that of the above support 8, and press roller 6a or 6b is arranged on one end of each support. The pair of supports 8a, 8b are journaled on each rotation support plate 7 through pins 9 positioned on the extension line of the diameter passing through the center of the rotation roller 1. The press rollers 6a, 6b are located on the extension line of the diameter passing through the center of the rotation roller 1. In other words, at the operation start one press roller 6a out of the pair of press rollers 6a, 6b arranged on the rotation support plates 7 is located immediately above the rotation roller 1, and the other press roller 6b is located immediately below the rotation roller 1. The sensor unit 16 provided on the upstream side of the rotation roller 1 is set to detect the tip end position of the punched sheet 2 fed into between the press roller 6a and the rotation roller 1 and the position of the rear end side of the scrap portion 2b of the punched sheet 2. When the controller 15 receives a detection signal from the sensor unit 16, it generates a control signal to the actuator 20. With the control signal the actuator 20 actuates the rotation support plates 7 to rotate 90 degrees around the rotation roller 1. Since two press rollers are arranged at angular intervals of 180 degrees, two rotation actions locate either one of the press rollers 6a, 6b at the initial position.

Then, when the tip end of the punched sheet 2 is pinched between one press roller 6a and the rotation roller 1, with a control signal, which is generated from the controller 15 receiving a signal from the sensor unit 16 which detected the tip end of punched sheet 2, the actuator 20 actuates the rotation support plates 7 to move 90 degrees from the separation start position as shown in Fig. 6 to the separation end position at the same speed as the speed of the punched sheet 2 along the circumferential surface of the rotation roller (Fig. 7). This also moves the pair of press rollers 6a, 6b by 90 degrees along the circumferential surface of the rotation roller 1, so that the frame portion 2b of the punched sheet 2 pinched between the press roller 6a and the rotation roller 1 is transferred downward with the rotation roller 6a. When the frame portion 2b of the punched sheet 2

is transferred downward, the punched sheet 2 is bent along the circumferential surface of rotation roller 1 so as to separate the press-off portion 2a from the punched sheet 2. The thus separated press-off portion 2a is transported by the rotational force of the rotation roller 1 in the horizontal direction and then is stored in a container for sorting and arrangement. The scrap portion 2b of punched sheet drops down below the rotation roller 1.

When the sensor unit 16 detects the rear end side of the scrap portion 2b of punched sheet 2, with a control signal generated from the controller 15 which received a signal from the sensor unit 16, the actuator 20 actuates the rotation support plates 7 to further move by 90 degrees at the same speed as that of punched sheet 2 along the circumferential surface of the rotation roller 1. Since the pair of press rollers 6a, 6b provided on the rotation support plates 7 are also moved by 90 degrees along the circumferential surface of rotation roller 1, the other press roller 6b comes to be located at the initial separation start position with respect to the rotation roller 1. Even if the scrap portion 2b of the punched sheet 2 is long enough for the rear end side of the scrap portion 2b to bridge between the feed table 3 and the rotation roller 1 during rotation of the press roller 6b (Fig. 8), which is a condition in which the scrap portion 2b of punched sheet 2 cannot be fed out by the rotation roller, the other press roller 6b flips the rear end side of the scrap portion 2b (bridging portion) of punched sheet 2 upward by the rotational motion returning to the initial position relative to the rotation roller 1. Then the press plate 5 moves upward about the pin 5a, which prevents the rotation roller 1 from skidding on the scrap portion of punched sheet 2. Therefore, the scrap portion 2b of the punched sheet 2 surely drops down below the rotation roller 1. Also, since the pair of press rollers 6a, 6b are rotated in the same direction relative to the rotation roller 1, high-speed operation of apparatus can be made possible.

As described above, the separating apparatus according to the present invention is so arranged that the press roller is moved along the circumferential surface of the feed roller to separate the portion surrounded by cuts from the punched sheet, so that the press-off portions can be automatically and surely separated from the punched sheet taken out of the puncher, regardless of the size, the shape and the location of the press-off portions in the punched sheet. Also, if the separating apparatus is so arranged that the press rollers are arranged at angular intervals of 180 degrees relative to the feed roller and that the press rollers are rotated while detecting the tip end position of punched sheet fed into between a press roller and the feed roller and the rear end side scrap portion of punched sheet, during rotation of press rollers the rear end side scrap portion of punched sheet can be flipped upward, which ensures the drop of scrap portion of punched sheet down below the roller. Further, rotating the pair of press rollers in the same direction relative to the feed roller enables the high-speed operation.

## Second Embodiment

The second embodiment of the present invention will be described in detail with reference to the drawings.

Fig. 9 is a schematic drawing to show a separating apparatus for a punched sheet according to the present invention. In the separating apparatus for a punched sheet a rotation roller (feed roller) 101 is rotatably supported on an unrepresented main body of apparatus and is connected for example to an inverter motor 125 to be always rotated in the direction of arrow A. Metal powder such as tungsten powder is deposited with necessity over the circumferential surface of the rotation roller 101 to increase a frictional force, whereby a punched sheet 102 fed thereto is surely fed out. Also, a transfer roller 104 and a press plate 105 are disposed above a feed table 103 located on the upstream side of the rotation roller 101 in the feed direction of punched sheet 102, so that the punched sheet 102 to be processed may be transported through between the transfer roller 104 and the feed table 103 and then toward the rotation roller 101 along the feed table 103 while being forced by the press plate 105. The press plate 105 is supported by a pin 105a on the upstream side in the feed direction as vertically rockable.

A press roller 106 is disposed above the rotation roller 1. Metal powder such as tungsten powder may be deposited with necessity on the circumferential surface of the press roller 106 to increase a frictional force. Also, a separation helping plate 107 is arranged adjacent to the rotation roller 101 before the press roller 106, that is, on the upstream side in the feed direction of the punched sheet 102. The separation helping plate 107 helps the separation of a portion 102a surrounded by cuts 102c from the punched sheet 102 in cooperation with the press roller 106. As shown in Fig. 14, the separation helping plate 107 is composed of an arcuate portion 107a and a plane portion 107b to cover about one third of the circumference of the rotation roller 101. The separation helping plate 107 is arranged so that when the press roller 106 is located above the rotation roller 101, the tip end of the arcuate portion 107a is below the end face of the feed table 103 and that when it rotates by about 90 degrees around the rotation roller 101 together with the press roller 106, the plane portion 107b becomes horizontal. The rotation roller 101 and the press roller 106 are operationally connected to each other through gears 108a, 108b to rotate at the same surface speed, as shown in Fig. 10.

The press roller 106 is journaled at the middle position of a pair of supports 109 provided on both sides of the press roller 106 and having an overall shape of substantial arc, as shown in Fig. 10 and Fig. 11. One end of each support 109 is journaled through a pin 111 on a rotation support plate 110 supported coaxially with the rotation roller 101. There is a recess 112 formed in the other end of each support 109, and a coil spring 113 is set in the recess 112. The upper end of the coil spring 113 elastically contacts with a stop portion 114 disposed

adjacent to each support 109 to constantly push the press roller 106 journaled about the pin 111 on the support 109 against the rotation roller 101. Also, the separation helping plate 107 is fixed to the rotation support plates 110 by appropriate fixing means. The separation helping plate 107 is arranged to guide the punched sheet 102 fed into between the press roller 106 and the rotation roller 101, and when the press roller 106 is rotated by a certain angle, for example 90 degrees, from the position indicated in Figure 9 along the circumferential surface of the rotation roller 101, the plane portion 107b is horizontally located above the rotation roller 101, whereby the press-off portion 102a surrounded by cuts 102c is fed out in the horizontal direction after separated from the punched sheet 102. Since a remaining scrap portion 102b in the punched sheet 102 is pinched between the rotation roller 101 and the press roller 106, it drops down below the rotation roller 101 by the rotation of the rotation roller 101 and the press roller 106. It is preferable in this case that a balancer having the same weight as that of the press roller 106 is placed at a position which is symmetric with the press roller 106 on a line connecting between the center of press roller 106 and the center of the rotation support plate 110.

Further, a gear 115 is attached to the outer surface of one of the rotation support plate 110. The gear 115 is connected to an actuator (drive motor) 130 through a timing belt 124 or gear so that the drive motor 130 rotates the rotation support plates 110 at the same speed as the feed speed of the punched sheet 102. In other words, a controller 116 controls the drive motor 130 so that when the punched sheet 102 is pinched between the press roller 106 and the rotation roller 101 the motor 130 starts rotating the rotation support plate 110 at the same speed as the feed speed of the punched sheet 102 by a certain angle, for example 90 degrees and then stops, and that after completion of separation of the punched sheet 102 the motor is again actuated to return the press roller 106 to the initial position. A sensor unit 117 for sending a detection signal to the controller 116 is arranged at the position apart by distance L from a nip point n between the press roller 106 and the rotation roller 101. The sensor unit 117 detects the position of the tip end of the punched sheet 102 fed into between the press roller 106 and the rotation roller 101. The controller 116 receiving the detection signal from the sensor unit 117 calculates a time necessary for the punched sheet 102 to travel from the sensor unit 117 to the nip point between the press roller 106 and the rotation roller 101 from the detection signal from the sensor unit 117 with the speed of the punched sheet 102 and the distance L. The controller 116 generates a control signal to actuate the drive motor 130 when the punched sheet 102 is pinched between the press roller 106 and the rotation roller 101. The drive motor 130 rotates the press roller 106 and the separation helping plate 107 disposed on the rotation support plate 110 by a certain angle, for example 90 degrees along the circumferential surface of the rotation roller 101 at the same speed as the feed speed of punched sheet 102.

The sensor unit 117 may include a timer device. A rotary encoder may be provided on the shaft of the rotation roller 101 so that the rotation roller 101 may be returned to the initial position with the rotary encoder.

The operation is next described.

At a stage before the operation start the press roller 106 is located about 10 degrees in the rotation direction of rotation roller 101 behind the vertical line passing through the rotation center of the rotation roller 101, as shown in Fig. 11. At this stage the press roller 106 is urged against the rotation roller 101 by the coil spring 113. Also at the position shown in Fig. 11, the press roller 106 is additionally urged against the rotation roller 101 by its weight, because the support 109 supporting the shaft of the rotation roller 106 rotates about the pin 111 located beside the rotation roller 101.

When the punched sheet 102 is transported through the transfer roller 104 and the press plate 105 toward the rotation roller 101 on the feed table 103 to carry out the separation of punched sheet 102, the tip end position of the punched sheet 102 is detected by the sensor unit 117 disposed between the feed table 103 and the rotation roller 101 (on the upstream side of the rotation roller 101). When a detection signal from the sensor unit 117 is sent to the controller 116, the controller 116 calculates the time necessary for the tip end of the punched sheet 102 to travel from the sensor unit 117 to the nip point between the press roller 106 and the rotation roller 101, and generates a control signal to the actuator 130 after the calculated time elapsed.

As the punched sheet 102 moving on the feed table 103 further advances, the tip end of the punched sheet 102 reaches the nip point *n* between the press roller 106 and the rotation roller 101. Then the tip end of the punched sheet 102 is pinched between the press roller 106 and the rotation roller 101. The pinched portion of punched sheet 102 between the press roller 106 and the rotation roller 101 is a scrap portion 102b, which is a frame portion in the punched sheet 102. The press roller 106 journaled on the supports 109 moves away from the rotation roller 101 against the force of coil springs 113 depending upon the thickness of the scrap portion 102b, whereby the scrap portion 102b is surely pinched between the press roller 106 and the rotation roller 101.

When the frame portion 102b of punched sheet 102 fed to the rotation roller 101 is pinched between the press roller 106 and the rotation roller 101, with the control signal generated from the controller 116 the actuator (drive motor) 130 simultaneously starts rotating the rotation support plate 110 at the same speed as the feed speed of the punched sheet 102 from the separation start position to the separation end position. Since the supports 109 and the separation helping plate 107 are fixed to the rotation support plates 110, the press roller 106 supported on the support 109 and the separation helping plate 107 rotate along the circumferential surface of rotation roller 101.

Fig. 12 shows the stage at which the press roller 106 and the separation helping plate 107 start rotating along

the circumferential surface of rotation roller 101. At this stage the rotation roller 106 is located immediately above the rotation roller 101. At this stage the punched sheet 102, the tip end of which is pinched between the press roller 106 and the rotation roller 101, is also supported by the tip end portion of separation helping plate 107.

Fig. 13 shows the separation end state after the press roller 106 and the separation helping plate 107 rotated not less than 100 degrees, preferably about 115 degrees from the initial stage along the circumferential surface of the rotation roller 101. In this state the arcuate portion 107a of separation helping plate 107 is located ahead of the vertical line passing through the rotation center of rotation roller 101. Thus a distance between the arcuate portion 107a located after the second row in the punched sheet 102 and the nip point between the press roller 106 and the rotation roller 101 becomes shorter than the distance between the top end 101a of the rotation roller 101 and the nip point in the case that the separation helping plate 107 is absent. This assures the separation of short press-off portions. Namely, since the separation after the second row in the punched sheet 102 starts from the arcuate portion 107a because of the separation helping plate 107, short portions can be more surely separated as compared with the arrangement in which the separation starts from the top end 101a of rotation roller 101.

While the press roller 106 and the separation helping plate 107 move from the state in Fig. 12 to the state in Fig. 13, the punched sheet 102 is bent along the circumferential surface of rotation roller 101, whereby the press-off portion 102a is separated. In this case, since the frame portion 102b of the punched sheet 102 is pinched between the press roller 106 and the rotation roller 101, it is transported down below the rotation roller 101 in the direction as shown by arrow B in Fig. 9. Since the plane portion 107b of separation helping plate 107 is located in the horizontal state as shown in Fig. 13, the press-off portion 102a separated from the punched sheet 102 is horizontally transported by a rotational force of the rotation roller 101 in the direction shown by arrow C in Fig. 9 from the separation helping plate 107, and is then stored in a container for sorting and arrangement.

When the sensor unit 117 detects the rear end portion of the press-off portion 102a, a detection signal is sent to the controller 116. Based on the detection signal, the separation end is judged for the press-off portion 102a from the first punched sheet 102. Then the actuator 130 starts operating to rotate the rotation support plate 110 so as to return it the initial position. Thus the press roller 106 and the separation helping plate 107 are located at the wait position shown in Fig. 11, and then a second punched sheet 102 is processed in the same manner as the above procedure. The press roller 106 is so arranged on the supports 109 that the weight of press roller 106 acts away from the rotation roller 101 during the return operation, which reduces the friction between the press roller 106 and the rotation roller 101.

Fig. 14 to Fig. 16 show further embodiments of the present invention. In the embodiment shown in Fig. 14 and Fig. 15, a pair of supports 109a, 109b are provided on each rotation support plate 110. The pair of supports 109a, 109b have the same structure as that of the above supports 109. A press roller 106a is arranged on the support 109a, and a press roller 106b on the support 109b. The pair of supports 109a, 109b are journaled through pins 111 on the extension line of the diameter passing through the center of rotation roller 101 on the rotation support plate 110, respectively. A separation helping plate 107 is provided to each of the press roller 106a on the support 109a and the press roller 106b on the support 109b. The separation helping plates 107 have the same structure as that of the separation helping plate 107 shown in Fig. 11. Since the press rollers 106a, 106b are located on the extension line of the diameter passing through the center of the rotation roller 101, the one rotation roller 106a out of the pair of press rollers 106a, 106b set on the rotation support plates 110, is located immediately above the rotation roller 101 or in the vicinity thereof, while the other press roller 106b immediately below the rotation roller 101 or in the vicinity thereof, at the operation start. The press roller 106b located immediately below the rotation roller 101 or in the vicinity thereof is at a rest position.

In the embodiment shown in Fig. 14 and Fig. 15, the sensor unit 117 provided on the upstream side of the rotation roller 101 detects the tip end position of the punched sheet 102 fed into between the press roller 106a and the rotation roller 101. Also, the rear end position of the press-off portion 102a in the last row in the punched sheet is detected for example by a rotary encoder provided on the rotation roller 101. The actuator 130 starts operating by the control signal generated by the control unit 116 which received the detection signal from the sensor unit 117 or the rotary encoder, so that the rotation support plate 110 is rotated by 90 degrees for each operation around the rotation roller 101. This is because the two press rollers are located at angular intervals of 180 degrees and either one of the press rollers is located at the initial position through two rotation actions.

In the embodiment shown in Fig. 16, a separation helping device 120 is arranged to surround the rotation roller 101. The separation helping device 120 is composed of two half members 121, 121 substantially of U shape in cross section. The combination of the half members 121, 121 forms a square barrel with an opening portion 122 on each side. Using the separation helping device 120, only one of the opening portions is used for one press roller shown in Fig. 11, whereas two of the opening portions are used for two press rollers 106 shown in Fig. 14.

Then, when the tip end portion of punched sheet 102 is pinched between one press roller 106a and the rotation roller 1, the actuator 130 is actuated by a control signal generated from the controller 116 which received the signal from the sensor unit 117 detecting the tip end posi-

tion of punched sheet 102, so as to move the rotation support plate 110 at the same speed as the feed speed of punched sheet 102 along the circumferential surface of the rotation roller 101 by 90 degrees from the separation start position in Fig. 17 to the separation end position in Fig. 18. This moves the pair of press rollers 106a, 106b and the separation helping plates 107, 107 simultaneously along the circumferential surface of rotation roller 101, whereby the frame portion 102b of punched sheet 102 pinched between the press roller 106a and the rotation roller 101 is transported downward together with the press roller 106a. When the frame portion 102b of the punched sheet 102 is transported downward, the punched sheet 102 is bent along the circumferential surface of rotation roller 101, which separates the press-off portion(s) 102a from the punched sheet 102. The thus separated press-off portion 102a is horizontally transported by the rotational force of rotation roller 101 and the separation helping plate 107 and is then stored in a container for sorting and arrangement. On the other hand, the scrap portion 102b of punched sheet drops down below the rotation roller 101.

Then, when the sensor unit 117 detects the rear end position of the press-off portion 102a in the last row in the punched sheet 102, the actuator 130 is actuated by a control signal generated from the controller 116 receiving a signal from the sensor unit 117, so as to further move the rotation support plate 111 at the same speed as that of the punched sheet 102 along the circumferential surface of rotation roller 110. The pair of press rollers 106a, 106b and the separation helping plates 107, 107 provided on the rotation support plate 110 are also moved simultaneously along the circumferential surface of rotation roller 101, whereby the other press roller 106b is located at the initial position relative to the rotation roller 101. Thus, the rear end side scrap portion of punched sheet 102 bridges between the feed stage 103 and the rotation roller 101. Then, even if the punched sheet is in the condition that it cannot be fed out by the rotation roller 101, the other press roller 106b rotates to the initial position relative to the rotation roller 101 to move the press plate 105 upward about the pin 105a thereby to flip the rear end side scrap portion (bridging portion) of punched sheet 102 upward, whereby the scrap portion of punched sheet 102 surely drops down below the rotation roller 101 (see Fig. 8). As described above, high-speed operation of the apparatus can be made possible by rotating the pair of press rollers 106a, 106b in the same direction relative to the rotation roller 101.

According to the present invention as described above, the press roller(s) and the separation helping plate(s) are moved along the circumferential surface of the feed roller to separate the portion(s) surrounded by cuts from the punched sheet, so that the press-off portion(s) may be automatically and surely separated from the punched sheet taken out of the puncher, regardless of the size, the shape and the location of press-off portion(s) in the punched sheet. If the press rollers are

arranged at angular intervals of 180 degrees relative to the feed roller and rotated while detecting the tip end position of punched sheet fed into between a press roller and the feed roller and the rear end position of a press-off portion in the last row in the punched sheet, during rotation of the press rollers the rear end side scrap portion of punched sheet can be flipped upward, which assures the certain drop of scrap portion of punched sheet down below the roller. Further, the highspeed operation can be done by rotating a pair of press rollers in the same direction relative to the feed roller.

#### Claims

1. A separating apparatus for a punched sheet having a portion surrounded by cuts comprising:
  - a feed roller (1,101) for feeding the punched sheet;
  - a press roller (6,106) disposed above the feed roller;
  - means for continuously urging the press roller (6,106) towards the feed roller (1,101) so that, in use, the press roller (6,106) elastically pinches with the feed roller (1,101) a forward portion of the punched sheet fed therebetween;
  - an actuator (20,130) for rotationally displacing the axis of the press roller (6,106) along a circumferential surface of the feed roller (1,101) at a same rotational speed as that of the feed roller (1,101) to separate the portion surrounded by the cuts from the punched sheet; and
  - a connector (108A,108B) for rotating the press roller and the feed roller about their respective axes in such manner, that the relative speed between their surfaces in engagement with each other or with the punched sheet is always zero.
2. The separating apparatus according to Claim 1, wherein
  - the press roller (6,106) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on a rotation support plate (7,110) disposed on each side of the feed roller (1,101).
3. The separating apparatus according to Claim 2, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support (8,109) and the rotation support plate (7,110) and to urge the press roller (6,106) against the feed roller (1,101).
4. The separating apparatus according to Claim 1, further comprising
  - a sensor unit (16,117) provided immediately before the feed roller (1,101), for detecting a position of the forward portion of the punched sheet and
  - a controller (15,116) for controlling the actu-
- ator (20,130), based on a signal from the sensor unit (16,117), to move the press roller (6,106).
5. The separating apparatus according to Claim 4, wherein
  - the controller (15,116) controls the actuator (20,130) so that, based on a detection signal of the forward portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the press roller (6,106) to move from a separation start position to a separation end position and that, based on a detection signal of a rear portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the press roller (6,106) to move from the separation end position to the separation start position.
6. A separating apparatus for a punched sheet having a portion surrounded by cuts comprising:
  - a feed roller (1,101) for feeding the punched sheet;
  - a pair of rotation support plates (7,110) disposed to support both ends of the feed roller (1,101), the rotation support plates (7,110) being rotatably supported on the same axis as the feed roller (1,101),
  - a pair of press rollers (6A,6B,106A,106B) journaled on the rotation support plates (7,110) as being separate at angular intervals of 180 degrees from each other;
  - an actuator (20,130) connected to the rotation support plates (7,110) to rotate the rotation support plates (7,110) such that the axes of the press rollers (6A,6B,106A,106B) move along a circumferential surface of the feed roller (1,101) at a same rotational speed as that of the feed roller;
  - and a connector (108A,108B) for rotating the press rollers (6A,6B,106A,106B) and the feed roller (1,101) about their respective axes in such manner, that the relative speed of their surfaces in engagement with each other or with the punched sheet is always zero.
7. The separating apparatus according to Claim 6, wherein
  - the each press roller (6A,6B,106A,106B) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on the rotation support plate (7,110).
8. The separating apparatus according to Claim 7, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support and the rotation support plate (7,110) and to urge the press roller (6A,6B,106A,106B) against the feed roller (1,101).



arranged at angular intervals of 180 degrees relative to the feed roller and rotated while detecting the tip end position of punched sheet fed into between a press roller and the feed roller and the rear end position of a press-off portion in the last row in the punched sheet, during rotation of the press rollers the rear end side scrap portion of punched sheet can be flipped upward, which assures the certain drop of scrap portion of punched sheet down below the roller. Further, the highspeed operation can be done by rotating a pair of press rollers in the same direction relative to the feed roller.

#### Claims

1. A separating apparatus for a punched sheet having a portion surrounded by cuts comprising:
  - a feed roller (1,101) for feeding the punched sheet;
  - a press roller (6,106) disposed above the feed roller;
  - means for continuously urging the press roller (6,106) towards the feed roller (1,101) so that, in use, the press roller (6,106) elastically pinches with the feed roller (1,101) a forward portion of the punched sheet fed therebetween;
  - an actuator (20,130) for rotationally displacing the axis of the press roller (6,106) along a circumferential surface of the feed roller (1,101) at a same rotational speed as that of the feed roller (1,101) to separate the portion surrounded by the cuts from the punched sheet; and
  - a connector (108A,108B) for rotating the press roller and the feed roller about their respective axes in such manner, that the relative speed between their surfaces in engagement with each other or with the punched sheet is always zero.
2. The separating apparatus according to Claim 1, wherein
  - the press roller (6,106) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on a rotation support plate (7,110) disposed on each side of the feed roller (1,101).
3. The separating apparatus according to Claim 2, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support (8,109) and the rotation support plate (7,110) and to urge the press roller (6,106) against the feed roller (1,101).
4. The separating apparatus according to Claim 1, further comprising
  - a sensor unit (16,117) provided immediately before the feed roller (1,101), for detecting a position of the forward portion of the punched sheet and
  - a controller (15,116) for controlling the actu-
- ator (20,130), based on a signal from the sensor unit (16,117), to move the press roller (6,106).
5. The separating apparatus according to Claim 4, wherein
  - the controller (15,116) controls the actuator (20,130) so that, based on a detection signal of the forward portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the press roller (6,106) to move from a separation start position to a separation end position and that, based on a detection signal of a rear portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the press roller (6,106) to move from the separation end position to the separation start position.
6. A separating apparatus for a punched sheet having a portion surrounded by cuts comprising:
  - a feed roller (1,101) for feeding the punched sheet;
  - a pair of rotation support plates (7,110) disposed to support both ends of the feed roller (1,101), the rotation support plates (7,110) being rotatably supported on the same axis as the feed roller (1,101),
  - a pair of press rollers (6A,6B,106A,106B) journaled on the rotation support plates (7,110) as being separate at angular intervals of 180 degrees from each other;
  - an actuator (20,130) connected to the rotation support plates (7,110) to rotate the rotation support plates (7,110) such that the axes of the press rollers (6A,6B,106A,106B) move along a circumferential surface of the feed roller (1,101) at a same rotational speed as that of the feed roller;
  - and a connector (108A,108B) for rotating the press rollers (6A,6B,106A,106B) and the feed roller (1,101) about their respective axes in such manner, that the relative speed of their surfaces in engagement with each other or with the punched sheet is always zero.
7. The separating apparatus according to Claim 6, wherein
  - the each press roller (6A,6B,106A,106B) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on the rotation support plate (7,110).
8. The separating apparatus according to Claim 7, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support and the rotation support plate (7,110) and to urge the press roller (6A,6B,106A,106B) against the feed roller (1,101).



9. The separating apparatus according to Claim 6, further comprising
  - a sensor unit (16,117) provided immediately before the feed roller (1,101), for detecting a position of the forward portion of the punched sheet and
  - a controller (15,116) for controlling the actuator (20,130), based on a signal from the sensor unit (16,117), to move the press roller (6A,6B,106A,106B).
10. The separating apparatus according to Claim 9, wherein
  - the controller (15,116) controls the actuator (20,130) so that, based on a detection signal of the tip portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the rotation support plate (7,110), so that one of the press rollers moves by 90 degrees from a separation start position and that, based on a detection signal of a rear portion of the punched sheet from the sensor unit (16,117), the actuator actuates the rotation support plate (7,110) so that the other of press rollers moves by 90 degrees to the separation start position.
11. The separating apparatus according to claim 1, further comprising
  - a separation helping device (13,107,120) for helping separation of the portion surrounded by the cuts from the punched sheet in cooperation with the press roller.
12. The separating apparatus according to Claim 11, wherein
  - the press roller (6,106) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on a rotation support plate (7,110) disposed on each side of the feed roller (1,101).
13. The separating apparatus according to Claim 12, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support (8,109) and the rotation support plate (7,110) and to urge the press roller (6,106) against the feed roller (1,101).
14. The separating apparatus according to Claim 11, further comprising
  - a sensor unit (16,117) provided immediately before the feed roller (1,101), for detecting a position of the forward portion of the punched sheet and
  - a controller (15,116) for controlling the actuator (20,130), based on a signal from the sensor unit (16,117), to move the press roller (6,106) and the separation helping device (13,107,120).
15. The separating apparatus according to Claim 14, wherein
  - the controller (15,116) controls the actuator (20,130) so that, based on a detection signal of the forward portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the press roller (6,106) and the separation helping device (13,107,120) to move from a separation start position to a separation end position and that, based on a detection signal of a rear portion of the punched sheet from the sensor unit (16,117), the actuator actuates the press roller (6,106) and the separation helping device (13,107,120) to move from the separation end position to the separation start position.
16. The separating apparatus according to claim 6, further comprising
  - a pair of separation helping devices (13,107,120) supported on the rotation support plate at angular intervals of 180 degrees to help separation of the portion surrounded by the cuts from the punched sheet in cooperation with the press rollers.
17. The separating apparatus according to Claim 16, wherein
  - the each press roller (6A,6B,106A,106B) is supported by a pair of supports (8,109), each being journaled through a pin (9,111) on the rotation support plate (7,110).
18. The separating apparatus according to Claim 17, wherein
  - a coil spring (11,113) is provided at an end portion of each support (8,109) to connect between the support (8,109) and the rotation support plate (7,110) and to urge the press roller (6A,6B,106A,106B) against the feed roller (1,101).
19. The separating apparatus according to Claim 16, further comprising
  - a sensor unit (16,117) provided immediately before the feed roller (1,101), for detecting a position of the forward portion of the punched sheet and
  - a controller (15,116) for controlling the actuator (20,130), based on a signal from the sensor unit (16,117), to move the press rollers (6A,6B,106A,106B) and the separation helping devices (13,107,120).
20. The separating apparatus according to Claim 19, wherein
  - the controller (15,116) controls the actuator (20,130) so that, based on a detection signal of the forward portion of the punched sheet from the sensor unit (16,117), the actuator (20,130) actuates the rotation support plates (7,110), so that one of the press rollers and one of the separation helping devices moves 90° from a separation start position and that, based on a detection signal of a rear portion of the punched sheet from the sensor unit (16,117), the actuator actuates the rotation support



plates (7, 110), so that the other of the press rollers and the other of the separation helping devices moves 90° to the separation start position.

einem Signal von der Sensoreinheit (16, 117), um die Andrückrolle (6, 106) zu bewegen.

## Patentansprüche

1. Trennvorrichtung für ein gestanztes Blatt, das einen von Schnitten umgebenen Abschnitt aufweist, mit:

- einer Zuführrolle (1, 101), zur Zuführung des gestanzten Blattes;
- einer Andrückrolle (6, 106), die oberhalb der Zuführrolle angeordnet ist;
- einer Einrichtung zum ständigen Andrücken der Andrückrolle (6, 106) an die Zuführrolle (1, 101), so daß die Andrückrolle (6, 106) im Betrieb zusammen mit der Zuführrolle (1, 101) auf elastische Weise einen vorderen Abschnitt des gestanzten Blattes, das dazwischen eingeführt ist, zusammendrückt;
- einem Betätigungselement (20, 130), um die Achse der Andrückrolle (6, 106) rotatorisch entlang einer Umfangsoberfläche der Zuführrolle (1, 101) mit der gleichen Rotationsgeschwindigkeit wie derjenigen der Zuführrolle (1, 101) zu bewegen, um den von Schnitten umgebenen Abschnitt vom gestanzten Blatt abzutrennen; und
- einer Verbindungseinrichtung (108a, 108b), um die Andrückrolle und die Zuführrolle um ihre jeweiligen Achsen auf solche Weise zu drehen, daß die Relativgeschwindigkeit zwischen ihren Oberflächen im Eingriff miteinander oder mit dem gestanzten Blatt immer gleich Null ist.

2. Trennvorrichtung nach Anspruch 1, wobei die Andrückrolle (6, 106) von einem Paar von Halterungen (8, 109) getragen wird, von denen jede über einen Stift (9, 111) an einer Rotationshalteplatte (7, 110) gelagert ist, die an jeder Seite der Zuführrolle (1, 101) angeordnet ist.

3. Trennvorrichtung nach Anspruch 2, wobei eine Schraubenfeder (11, 113) an einem Endabschnitt jeder Halterung (8, 109) angeordnet ist, um eine Verbindung zwischen der Halterung (8, 109) und der Rotationshalteplatte (7, 110) herzustellen und die Andrückrolle (6, 106) gegen die Zuführrolle (1, 101) zu drücken.

4. Trennvorrichtung nach Anspruch 1, ferner mit

- einer Sensoreinheit (16, 117), die unmittelbar vor der Zuführrolle (1, 101) vorgesehen ist, um eine Position des vorderen Abschnitts des gestanzten Blattes zu erkennen, und
- einer Steuerung (15, 116) zur Steuerung des Betätigungselementes (20, 130) basierend auf

5. Trennvorrichtung nach Anspruch 4, wobei die Steuerung (15, 116) das Betätigungselement (20, 130) so steuert, daß, basierend auf einem Erkennungssignal des vorderen Abschnitts des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement (20, 130) die Andrückrolle (6, 106) betätigt, um sie von einer Trennungs-Startposition zu einer Trennungs-Endposition zu bewegen, und daß, basierend auf einem Erkennungssignal eines rückwärtigen Abschnitts des gestanzten Blattes von der Sensoreinheit (10, 117), das Betätigungselement (20, 130) die Andrückrolle (6, 106) betätigt, um sie von der Trennungs-Endposition zur Trennungs-Startposition zu bewegen.

6. Trennvorrichtung für ein gestanztes Blatt, das einen von Schnitten umgebenen Abschnitt aufweist, mit:

- einer Zuführrolle (1, 101) zur Zuführung des gestanzten Blattes;
- einem Paar von Rotationshalteplatten (7, 110), die vorgesehen sind, um beide Enden der Zuführrolle (1, 101) zu halten, wobei die Rotationshalteplatten (7, 110) drehbar auf der gleichen Achse wie die Zuführrolle (1, 101) gelagert sind;
- einem Paar von Andrückrollen (6a, 6b, 106a, 106b), die an den Rotationshalteplatten (7, 110) gelagert sind, und zwar um Winkelintervalle von 180° voneinander getrennt;
- einem Betätigungselement (20, 130), das mit den Rotationshalteplatten (7, 110) verbunden ist, um die Rotationshalteplatten (7, 110) so zu drehen, daß die Achsen der Andrückrollen (6a, 6b, 106a, 106b) sich entlang einer Umfangsoberfläche der Zuführrolle (1, 101) mit der gleichen Rotationsgeschwindigkeit wie derjenigen der Zuführrolle bewegen; und
- einer Verbindungseinrichtung (108a, 108b), um die Andrückrollen (6a, 6b, 106a, 106b) und die Zuführrolle (1, 101) um ihre jeweiligen Achsen auf solche Weise zu drehen, daß die Relativgeschwindigkeit ihrer Oberflächen im Eingriff miteinander oder mit dem gestanzten Blatt immer gleich Null ist.

7. Trennvorrichtung nach Anspruch 6, wobei jede Andrückrolle (6a, 6b, 106a, 106b) von einem Paar von Halterungen (8, 109) gehalten wird, von denen jede über einen Stift (9, 111) an der Rotationshalteplatte (7, 110) gelagert ist.

8. Trennvorrichtung nach Anspruch 7, wobei eine Schraubenfeder (11, 113) an einem Endabschnitt jeder Halterung (8, 109) vorgesehen ist, um eine Verbindung zwischen der Halterung und der Rotati-



onshalteplatte (7, 110) herzustellen und die Andrückrolle (6a, 6b, 106a, 106b) gegen die Zuführrolle (1, 101) zu drücken.

9. Trennvorrichtung nach Anspruch 6, ferner mit:

- einer Sensoreinrichtung (16, 117), die unmittelbar vor der Zuführrolle (1, 101) vorgesehen ist, um eine Position des vorderen Abschnitts des gestanzten Blattes zu erkennen, und
- einer Steuerung (15, 116) zur Steuerung des Betätigungselementes (20, 130), basierend auf einem Signal von der Sensoreinheit (16, 117), um die Andrückrolle (6a, 6b, 106a, 106b) zu bewegen.

10. Trennvorrichtung nach Anspruch 9, wobei die Steuerung (15, 116) das Betätigungselement (20, 130) so steuert, daß, basierend auf einem Erkennungssignal des Spitzenabschnitts des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement (20, 130) die Rotationshalteplatte (7, 110) so betätigt, daß eine der Andrückrollen sich um 90° von einer Trennungs-Startposition wegbewegt und daß, basierend auf einem Erkennungssignal eines rückwärtigen Abschnitts des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement die Rotationshalteplatte (7, 110) so betätigt, daß die andere der Andrückrollen sich um 90° zur Trennungs-Startposition hinbewegt.

11. Trennvorrichtung nach Anspruch 1, ferner mit einer Trennungshilfsvorrichtung (13, 107, 120) zur Unterstützung der Trennung des von Schnitten umgebenen Abschnitts vom gestanzten Blatt in Zusammenarbeit mit der Andrückrolle.

12. Trennvorrichtung nach Anspruch 11, wobei die Andrückrolle (6, 106) von einem Paar von Halterungen (8, 109) gehalten ist, von denen jede über einen Stift (9, 111) an einer Rotationshalteplatte (7, 110) gelagert ist, die an jeder Seite der Zuführrolle (1, 101) vorgesehen ist.

13. Trennvorrichtung nach Anspruch 12, wobei eine Schraubenfeder (11, 113) an einem Endabschnitt jeder Halterung (8, 109) vorgesehen ist, um eine Verbindung zwischen der Halterung (8, 109) und der Rotationshalteplatte (7, 110) herzustellen und die Andrückrolle (6, 106) gegen die Zuführrolle (1, 101) zu drücken.

14. Trennvorrichtung nach Anspruch 11, ferner mit

- einer Sensoreinheit (16, 117), die unmittelbar vor der Zuführrolle (1, 101) vorgesehen ist, um eine Position des vorderen Abschnitts gestanzten Blattes zu erkennen, und

- einer Steuerung (15, 116) zur Steuerung des Betätigungselementes (20, 130), basierend auf einem Signal von der Sensoreinheit (16, 117), um die Andrückrolle (6, 106) und die Trennungshilfsvorrichtung (13, 107, 120) zu bewegen.

15. Trennvorrichtung nach Anspruch 14, wobei die Steuerung (15, 116) das Betätigungselement (20, 130) so steuert, daß, basierend auf einem Erkennungssignal des vorderen Abschnitts des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement (20, 130) die Andrückrolle (6, 106) und die Trennungshilfsvorrichtung (13, 107, 120) betätigt, um sie von einer Trennungs-Startposition zu einer Trennungs-Endposition zu bewegen, und daß, basierend auf einem Erkennungssignal eines rückwärtigen Abschnitts des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement die Andrückrolle (6, 106) und die Trennungshilfsvorrichtung (13, 107, 120) betätigt, um sie von der Trennungs-Endposition zur Trennungs-Startposition zu bewegen.

16. Trennungsvorrichtung nach Anspruch 6, ferner mit einem Paar von Trennungshilfsvorrichtungen (13, 107, 120), die an der Rotationshalteplatte in Winkelintervallen von 180° getragen werden, um die Trennung des von Schnitten umgebenen Abschnitts vom gestanzten Blatt in Zusammenarbeit mit den Andrückrollen zu unterstützen.

17. Trennvorrichtung nach Anspruch 16, wobei jede Andrückrolle (6a, 6b, 106a, 106b) von einem Paar von Halterungen (8, 109) gehalten wird, von denen jede über einen Stift (9, 111) an der Rotationshalteplatte (7, 110) gelagert ist.

18. Trennvorrichtung nach Anspruch 17, wobei eine Schraubenfeder (11, 113) an einem Endabschnitt jeder Halterung (8, 109) vorgesehen ist, um eine Verbindung zwischen der Halterung (8, 109) und der Rotationshalteplatte (7, 110) herzustellen und die Andrückrolle (6a, 6b, 106a, 106b) gegen die Zuführrolle (1, 101) zu drücken.

19. Trennvorrichtung nach Anspruch 16, ferner mit

- einer Sensoreinheit (16, 117), die unmittelbar vor der Zuführrolle (1, 101) vorgesehen ist, um eine Position des vorderen Abschnitts des gestanzten Blattes zu erkennen, und
- mit einer Steuerung (15, 116) zur Steuerung des Betätigungselementes (20, 130) basierend auf einem Signal von der Sensoreinheit (16, 117), um die Andrückrollen (6a, 6b, 106a, 106b) und die Trennungshilfsvorrichtungen (13, 107, 120) zu bewegen.



20. Trennvorrichtung nach Anspruch 19, wobei die Steuerung (15, 116) das Betätigungselement (20, 130) so steuert, daß, basierend auf einem Erkennungssignal des vorderen Abschnittes des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement (20, 130) die Rotationshalteplatten (7, 110) so betätigt, daß eine der Andrückrollen und eine der Trennungshilfsvorrichtungen sich um 90° von einer Trennungs-Startposition wegbewegt und daß, basierend auf einem Erkennungssignal eines rückwärtigen Abschnittes des gestanzten Blattes von der Sensoreinheit (16, 117), das Betätigungselement die Rotationshalteplatten (7, 110) so betätigt, daß die andere der Andrückrollen und die andere der Trennungshilfsvorrichtungen sich um 90° zur Trennungs-Startposition hinbewegt.

### Revendications

1. Dispositif pour la séparation de feuilles poinçonnées possédant une partie entourée par des découpes, comprenant :
  - un galet d'avance (1,101) destiné à faire avancer la feuille poinçonnée;
  - un galet presseur (6,106) disposé au-dessus du galet d'avance ;
  - des moyens pour presser en continu le galet presseur (6,106) vers le galet d'avance (1,101), de sorte qu'en service, le galet presseur (6,106) pince élastiquement avec le galet d'avance (1,101) une partie avant de la feuille poinçonnée avançant entre eux;
  - un actionneur (20,130) déplaçant en rotation l'axe du galet presseur (6,106) le long d'une surface circonférentielle du galet d'avance (1,101) à la même vitesse de rotation que celle du galet d'avance (1,101) afin de séparer la partie entourée par des découpes de la feuille poinçonnée; et
  - un raccord (108a,108b) faisant tourner le galet presseur et le galet d'avance autour de leurs axes respectifs de telle manière que la vitesse relative entre leurs surfaces en prise l'une avec l'autre ou avec la feuille poinçonnée soit toujours égale à zéro.
2. Dispositif pour la séparation selon la revendication 1, dans lequel
  - le galet presseur (6,106) est supporté par une paire de supports (8,109) tourillonnés chacun par un axe (9,111) sur une plaque support de rotation (7,110) disposée de chaque côté du galet d'avance (1,101).
3. Dispositif pour la séparation selon la revendication 2, dans lequel
  - un ressort à boudin (11,113) est prévu à une extrémité de chaque support (8,109) pour assurer la liaison entre le support (8,109) et la plaque sup-

port de rotation (7,110) et pour pousser le galet presseur (6,106) contre le galet d'avance (1,101).

4. Dispositif pour la séparation selon la revendication 1, comprenant en outre
  - une unité de capteur (16,117) placée immédiatement avant le galet d'avance (1,101) afin de détecter une position de l'extrémité avant de la feuille poinçonnée; et
  - un contrôleur (15,116) commandant à l'actionneur (20,130) de déplacer le galet presseur (6,106) sur la base d'un signal provenant de l'unité de capteur (16,117).
5. Dispositif pour la séparation selon la revendication 4, dans lequel
  - le contrôleur (15,116) commande l'actionneur (20,130) de telle sorte que, sur la base d'un signal de détection de l'extrémité avant de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur (20,130) déplace le galet presseur (6,106) depuis une position de début de la séparation jusqu'à une position de fin de la séparation et que, sur la base d'un signal de détection d'une partie arrière de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur (20,130) déplace le galet presseur (6,106) depuis la position de fin de la séparation jusqu'à la position de début de la séparation.
6. Dispositif pour la séparation de feuilles poinçonnées possédant une partie entourée de découpes, comprenant :
  - un galet d'avance (1,101) destiné à faire avancer la feuille poinçonnée;
  - une paire de plaques supports de rotation (7,110) disposées de manière à supporter les deux extrémités du galet d'avance (1,101), les plaques supports de rotation (7,110) étant supportées de manière à pouvoir tourner sur le même axe que le galet d'avance (1,101)
  - une paire de galets presseurs (6a,6b,106a,106b) tourillonnés sur les plaques supports de rotation (7,110) et disposés à des intervalles angulaires de 180 degrés l'un par rapport à l'autre;
  - un actionneur (20,130) relié aux plaques supports de rotation (7,110) de manière à déplacer en rotation les plaques supports (7,110) de façon que l'axe des galets presseurs (6a,6b,106a,106b) se déplace sur une surface circonférentielle du galet d'avance (1,101) à la même vitesse de rotation que celle du galet d'avance (1,101); et
  - un raccord (108a,108b) faisant tourner les galets presseurs (6a,6b,106a,106b) et le galet d'avance (1,101) autour de leurs axes respectifs de telle manière que la vitesse relative entre leurs surfaces en prise l'une avec l'autre ou avec la feuille poinçonnée soit toujours égale à zéro.



7. Dispositif pour la séparation selon la revendication 6, dans lequel  
chacun des galets presseurs (6a,6b,106a,106b) est supporté par une paire de supports (8,109), chacun étant tourillonné au moyen d'un axe (9,111) sur la plaque support de rotation (7,110). 5
8. Dispositif pour la séparation selon la revendication 7, dans lequel  
un ressort à boudin (11,113) est prévu à une extrémité de chaque support (8,109) pour assurer la liaison entre le support et la plaque support de rotation (7,110) et pour presser le galet presseur (6a,6b,106a,106b) contre le galet d'avance (1,101). 10 15
9. Dispositif pour la séparation selon la revendication 6, comprenant en outre  
une unité de capteur (16,117) placée immédiatement avant le galet d'avance (1,101) afin de détecter une position de l'extrémité avant de la feuille poinçonnée; et  
un contrôleur (15,116) commandant à l'actionneur (20,130) de déplacer le galet presseur (6a,6b, 106a,106b) sur la base d'un signal provenant de l'unité de capteur (16,117). 20 25
10. Dispositif pour la séparation selon la revendication 9, dans lequel  
le contrôleur (15,116) commande l'actionneur (20,130) de telle sorte que, sur la base d'un signal de détection de l'extrémité avant de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur (20,130) entraîne la plaque support de rotation (7,110) de telle sorte que les galets presseurs se déplacent de 90 degrés à partir d'une position de début de la séparation et que, sur la base d'un signal de détection d'une partie arrière de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur entraîne la plaque support de rotation (7,110) de telle sorte que les autres galets presseurs se déplacent de 90 degrés vers la position de début de la séparation. 30 35 40
11. Dispositif pour la séparation selon la revendication 1, comprenant en outre  
un dispositif d'aide à la séparation (13,107,120) destiné à aider à la séparation de la partie entourée par des découpes de la feuille poinçonnée en coopération avec le galet presseur. 45 50
12. Dispositif pour la séparation selon la revendication 11, dans lequel  
le galet presseur (6,106) est supporté par une paire de supports (8,109) tourillonnés chacun par un axe (9,111) sur une plaque support de rotation (7,110) disposée de chaque côté du galet d'avance (1,101). 55
13. Dispositif pour la séparation selon la revendication 12, dans lequel  
un ressort à boudin (11,113) est prévu à une extrémité de chaque support (8,109) pour assurer la liaison entre le support (8,109) et la plaque support de rotation (7,110) et pour presser le galet presseur (6,106) contre le galet d'avance (1,101).
14. Dispositif pour la séparation selon la revendication 11, comprenant en outre  
une unité de capteur (16,117) placée immédiatement avant le galet d'avance (1,101) afin de détecter une position de l'extrémité avant de la feuille poinçonnée; et  
un contrôleur (15,116) commandant à l'actionneur (20,130) de déplacer le galet presseur (6,106) et le dispositif d'aide à la séparation (13,107,120) sur la base d'un signal provenant de l'unité de capteur (16,117).
15. Dispositif pour la séparation selon la revendication 14, dans lequel  
le contrôleur (15,116) commande l'actionneur (20,130) de telle sorte que, sur la base d'un signal de détection de l'extrémité avant de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur (20,130) déplace le galet presseur (6,106) et le dispositif d'aide à la séparation (13,107,120) depuis une position de début de la séparation jusqu'à une position de fin de la séparation et que, sur la base d'un signal de détection d'une partie arrière de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur déplace le galet presseur (6,106) et le dispositif d'aide à la séparation (13,107,120) depuis la position de fin de la séparation jusqu'à la position de début de la séparation.
16. Dispositif pour la séparation selon la revendication 6, comprenant en outre  
une paire de dispositifs d'aide à la séparation (13,107,120) supportés sur la plaque support de rotation à des intervalles angulaires de 180 degrés et destinés à aider à la séparation de la partie entourée par des découpes de la feuille poinçonnée en coopération avec les galets presseurs.
17. Dispositif pour la séparation selon la revendication 16, dans lequel  
chacun des galets presseurs (6a,6b,106a,106b) est supporté par une paire de supports (8,109), chacun étant tourillonné au moyen d'un axe (9,111) sur la plaque support de rotation (7,110).
18. Dispositif pour la séparation selon la revendication 17, dans lequel  
un ressort à boudin (11,113) est prévu à une extrémité de chaque support (8,109) pour assurer



la liaison entre le support (8,109) et la plaque support de rotation (7,110) et pour presser le galet presseur (6a,6b,106a,106b) contre le galet d'avance (1,101).

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19. Dispositif pour la séparation selon la revendication 16, comprenant en outre

une unité de capteur (16,117) placée immédiatement avant le galet d'avance (1,101) afin de détecter une position de l'extrémité avant de la feuille poinçonnée; et

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un contrôleur (15,116) commandant à l'actionneur (20,130) de déplacer le galet presseur (6a,6b, 106a,106b) et les dispositifs d'aide à la séparation (13,107,120) sur la base d'un signal provenant de l'unité de capteur (16,117).

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20. Dispositif pour la séparation selon la revendication 19, dans lequel

le contrôleur (15,116) commande l'actionneur (20,130) de telle sorte que, sur la base d'un signal de détection de l'extrémité avant de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur (20,130) déplace l'un des galets presseurs et l'un des dispositifs d'aide à la séparation de 90° à partir d'une position de début de la séparation et que, sur la base d'un signal de détection d'une partie arrière de la feuille poinçonnée provenant de l'unité de capteur (16,117), l'actionneur déplace les plaques supports (7,110) de telle sorte que l'autre galet presseur et l'autre dispositif d'aide à la séparation se déplacent de 90 degrés vers la position de début de la séparation.

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