(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 613 847 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **94102908.4**

(51) Int. Cl.[5]: **B65H 29/58**

(22) Date of filing: **25.02.94**

(30) Priority: **01.03.93 JP 81061/93**

(43) Date of publication of application:
07.09.94 Bulletin 94/36

(84) Designated Contracting States:
DE FR GB

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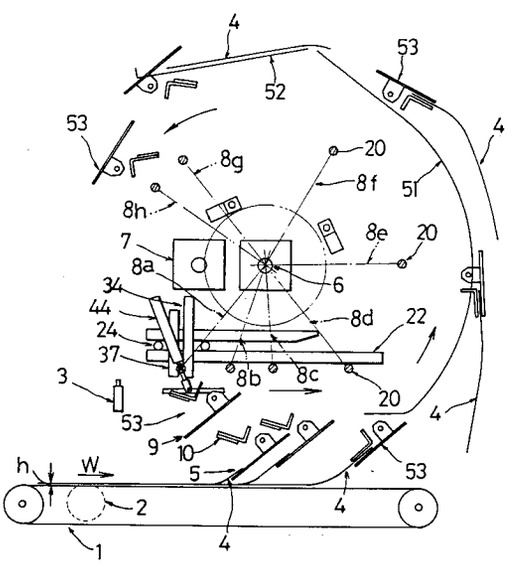
(54) Sampling method for flat products carried by conveyor and apparatus therefor.

(57) An apparatus for sampling from a conveyor (1) part of flat products (4) placed on the conveyor and carried in a manner to be shifted in the carrying direction and to be exposed at the edges (5) on the downstream side of the carrying direction, includes a means (3) for detecting one of the edges (5) of the flat products (4) carried by the conveyor (1); a knife (9) inserted between the flat products (4) from the edge (5) detected by the edge detecting means (3), a means (53) for clamping the flat products (4) piled on the upper surface of the inserted knife (9) on the knife; and a knife moving means (8) for sampling the flat products (4) clamped by the knife (9) from the conveyor (1).

Also the present invention relates to a method of sampling part of flat products (4) from a conveyor (1).

FIG.1



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The present invention relates to a sampling method for flat products carried by a conveyor and an apparatus therefor. More particularly, the present invention concerns a method of and apparatus for sampling one or a plurality of pieces of signatures continuously carried from a printing machine or the like by a conveyor.

In the printing line, printed products continuously carried must be subjected to sampling for inspection. Conventionally, the sampling work has been manually performed by operators. It is desirable to mechanize the manual operation and to achieve the automatic sampling.

An object of the present invention is to provide a method of and apparatus for automatically sampling one or a plurality of pieces of the flat products placed on a carrying conveyor and continuously carried.

Namely, according to the method of the present invention, part of the flat products which are carried while being overlapped on a conveyor, shifted in the carrying direction, and exposed at their edges on the downstream side of the carrying direction, are sampled from the conveyor as follows. First, one of the edges of the flat products carried by the conveyor is detected by means of an edge detecting means provided at a specified position. A knife waiting at a stand-by position on the downstream side from the edge detecting means and upwardly from the conveyor is descended on the basis of an edge detection signal from the edge detecting means. The knife is then inserted between the flat products from the above-described detected edge. Next, the flat products which are held on the upper surface side of the inserted knife are clamped on the knife. Finally, the flat products clamped on the knife are sampled by the movement of the knife.

In the present invention, when the knife is descended, preferably, it softly touches the upper surface of the flat product or the carrying surface of the conveyor. This prevents the flat products from being damaged.

When the knife is inserted between the flat products, the number of the flat products held on the knife can be controlled by stopping the movement of the knife in the moving direction of the conveyor or by moving the knife at a velocity lower than the carrying velocity of the conveyor. Namely, the number of the sampled flat products can be controlled.

At the position where an edge is detected by the edge detecting means, by floating the edge of the flat product from the surfaces of the lower flat products, a distance between the above-described edge and the lower flat products becomes larger. This makes it possible to easily detect the edge, and hence to make easy the insertion of the knife.

After the products being clamped on the knife are sampled from the conveyor, the flat products are reversed upwardly from the conveyor by turning the knife upwardly from the conveyor. Subsequently, the clamping is released at the reverse position, and the flat products are stored in a stacker disposed under the reverse position, thus performing the sampling work in full automation.

As described above, the apparatus of the present invention includes the means for detecting one of the edges of the flat products carried by the conveyor; the knife inserted between the flat products from the edge detected by the edge detecting means; the means for clamping the flat products held on the upper surface side of the inserted knife; and the knife moving device for sampling the flat products clamped on the knife from the conveyor by the movement of the knife.

As the edge detecting means, there is preferably adopted a non-contact type distance sensor fixed upwardly from the conveyor.

The conveyor is provided with a means for floating the edge of the flat product downwardly from the edge detecting means. The edge floating means is preferably constituted of a roller provided so as to project upwardly from the carrying surface of the conveyor.

The knife is preferably formed in a plate in which the side facing to the edge is tapered off, which makes easy the insertion thereof between the flat products.

The clamping means includes a clamping member pivotally supported on the knife so as to be turnable in the vertical direction, and a clamp driving means for turning the clamping means in the vertical direction. The clamp driving means is preferably constituted of an air cylinder.

The knife moving device is constituted of and arm assembly which is disposed upwardly from the conveyor so as to be turnable around the horizontal axis perpendicular to the carrying direction of the conveyor and to be expandable in the turning-radial direction. The knife is provided at the leading edge of the arm assembly.

The arm assembly includes an arm shaft having the horizontal axis perpendicular to the carrying direction of the conveyor, a first expandable arm unit provided on the arm shaft, a second expandable arm unit provided on the first arm unit, and a drive unit for turning the arm shaft.

The first arm unit includes a first block provided on the arm shaft, first arms provided slidably on the first block, second blocks provided turnably at the leading edges of the first arms, rollers provided on the second block, and guide members provided between the upper surface of the conveyor and the arm shaft while extending along the carrying direction of the conveyor for a specified

length. The rollers are guided by the guide members, so that the first arms are slid against the first block.

The second arm unit includes second arms slidably provided on the second blocks, a third block provided at the leading edges of the second arms, and a cylinder provided expandably between the second blocks and the second arms. The second arms are extended/contracted by the extension/contraction of the cylinder. The knife is provided on the third block so as to be turnable in the vertical direction.

A stopper is provided between the third block and the knife, which permits the upward turning but restricts the downward turning of the end portion of the knife on the sided facing to the edge of the flat product. A spring is provided for allowing the stopper to abut on the knife.

In the apparatus of the present invention, a stacker device is disposed under the position where the arm assembly is upwardly turned and the knife is shifted upwardly from the arm shaft. The flat products dropped from the knife by the release of the clamping of the clamping means can be stored in the stacker device.

A second conveyor can be separably provided on the downstream side of the above-described conveyor.

According to the present invention having the above-described construction, one of the edges of the flat products carried on the carrying conveyor is detected with high sensitivity, the knife being certainly inserted between the flat products with accurate timing, and the flat products are clamped, which enables the automatic sampling.

Fig. 1 is a schematic side view showing the construction of an essential portion of an apparatus of the present invention;

Fig. 2 is a front view of a sampling arm assembly;

Fig. 3 is a side view of a first arm unit taken along the line A-A of Fig. 2;

Fig. 4 is a side view of a second arm unit taken along the line B-B of Fig. 2;

Fig. 5 is a view for explaining the starting state in the discarding-sampling by use of the apparatus of the present invention;

Fig. 6 is a view for explaining the returning state of the discarding-sampling;

Fig. 7 is a view for explaining the signatures carried in a manner of tiles of a roof by a conveyor;

Fig. 8 is a view for explaining a stepped roller; and

Fig. 9 is a view for explaining the signatures carried in another manner by a conveyor.

Hereinafter, embodiments of the present invention will be described with reference to the drawings.

Fig. 1 shows the construction of an essential portion of a sampling device according to the present invention. In Fig. 1, a main frame of the device is omitted, and the shape of each portion is simplified.

The sampling device of the present invention includes a means 3 for detecting one of edges 5 of flat products 4 carried by a conveyor 1; a knife 9 inserted between upper and lower flat products 4 and 4 from the edge 5 detected by the edge detecting means 3; a means 53 for clamping the flat products 4 on the upper surface side of the inserted knife 9; and a knife moving device 8 for moving the knife 9 on the downstream side of the carrying direction with a velocity higher than the carrying velocity of the conveyor 1, and sampling the flat products 4 clamped by the knife 9.

The carrying conveyor 1 has endless belts of a double row type in which the belts are disposed in parallel to each other, and which is continuously operated in the direction of the arrow W by a suitable drive source (not shown). As shown in Fig. 7, signatures 4 as one example of the flat products are carried in a manner to be overlapped on the conveyor 1, to be shifted in the carrying direction, and to be exposed at the edges 5 on the downstream side of the carrying direction. Namely, the signatures 4 are continuously carried while being overlapped to each other in a manner of the tiles of a roof.

The material of the belt of the carrying conveyor 1 is not particularly limited; but is preferably constituted of a poly-belt, for example, with the nylon surface. The examples of the flat products 4 include the folded products such as printed products, or one sheet, and films other than paper sheets.

A means 2 for floating the edge 5 of one of the signatures 4 is provided on the conveyor 1. As shown in Fig. 8, the floating means 2 is constituted of a roller 2 provided between the endless belts. The peripheral surface of the roller 2 projects from the upper surface of the carrying conveyor 1 by a specified height. Namely, a stepped portion provided on the carrying surface of the conveyor 1 by use of the roller 2, to float the edge of the signature 4 from the surfaces of the lower signatures 4. The material of the roller 2 is suitably selected from metal, plastic and the like. In the case of the metal, the metal is preferably subjected to rust-preventive treatment such as plating. As for the drive of the roller 2, the peripheral velocity is preferably synchronized with the velocity of the carrying conveyor 1.

As shown in Fig. 1, the edge detecting means 3 is disposed at the position where the edge 5 of the signature 4 can be detected according to the

position of the roller 2. The edge detecting means 3 is constituted of a non-contact distance sensor, which may be of a type capable of detecting the edge 5 of the signature 4, for example, a laser displacement meter, ultrasonic sensor or the like.

In addition, the roller 2 may be provided only in the case that the signature 4 is thinned and the edge 5 of the signature 4 is difficult to be detected by the detecting sensor 3. In the case that the signature 4 is thick, the roller 2 is not necessarily required to be provided.

The knife moving device 8 is constituted of an arm assembly 8, which is disposed upwardly from the conveyor 1 so as to be turnable around the horizontal axis perpendicular to the carrying direction of the conveyor 1.

As shown in Fig. 2, the arm assembly 8 is expandable in the turning-axial direction. Namely, the arm assembly 8 includes an arm shaft 6 having the horizontal axis perpendicular to the carrying direction of the conveyor 1, a first expandable arm unit provided on the arm shaft 6, a second expandable arm unit provided on the first arm unit, and a drive unit 7 constituted of a motor or the like for driving the arm shaft 6.

By turning of the arm shaft 6 by means of the motor 7 as the drive unit, the rocking speed, rocking angle, rocking direction and stopping position of the arm assembly 8 are freely controlled.

As shown in Fig. 3, the first arm unit includes a first block 11 fixed on the turnable arm shaft 6, first arms 14 slidably provided on the first block 11, and second blocks 21 and 30 pivotably supported at the lower ends of the first arms 14 so as to be turnable in the vertical direction.

Sliders 12 and 12 are provided on both sides of the first block 11 while holding the arm shaft 6. The first arms 14 and 14 are respectively inserted in the sliders 12 and 12 so as to be in parallel to each other and to be slidable in the direction perpendicular to the axis of the arm shaft 6. A pair of the first arms 14 and 14 are formed of rods.

The upper end portions of a pair of the first arms 14 and 14 are connected and fixed to each other by an upper plate 13a. The lower end portions of a pair of the first arms 14 and 14 are connected and fixed to each other by a lower plate 13b.

A spring seat 15 is provided on the lower surface of the first block 11. A spring seat 16 is provided on the upper surface of the lower plate 13b. A compression spring 17 is interposed between both the spring seats 15 and 16. Accordingly, a pair of the first arms 14 are usually extended as long as possible by the force of the spring 17. The maximum extension amount of the spring is set by the abutment of the stopper 18 provided on the upper plate 13a on the first block 11.

A downwardly projecting boss 19 is provided at the center portion on the lower surface of the lower plate 13b. A shaft 20 passes through a boss 19, and is thus turnable. The shaft 20 is disposed to be in parallel to the arm shaft 6. The second blocks 21 and 30 are fixed on the shaft 20.

Namely, the second blocks are divided into a triangular plate 21 fixed at one end portion of the shaft 20 and a block 30 fixed at the other end portion thereof.

A pair of front and rear rollers 24 and 24 are rotatably supported on the triangular plate 21. The rollers 24 and 24 are fitted in a rolling manner in a guide groove 23 formed between a pair of guide members 22 and 22 disposed in the vertical direction. The guide groove 23 is provided to extend in the carrying direction of the conveyor 1 for a specified length, and to extend in parallel to the carrying surface. The front and rear end portions of the guide groove 23 are opened, and the rollers 24 can be freely inserted in the guide groove 23 through these opening portions.

A rod 27 for a spring is fixed on the upper plate 13a. A metal fitting 26 is fixed on the triangular plate 21, and a pin 28 is fixed on the metal fitting 26. A stretching spring 25 is hung between the rod 27 for a spring and the pin 28. The triangular plate 21 is biased by the spring 25 in one direction.

Next, the second arm unit shown in Fig. 4 will be described.

Namely, a plate 31 is fixed on the block 30 constituting part of the second block. A pair of sliders 32 and 32 are provided on both the sides of the plate 31 through the shaft 20. Second arms 33 and 33 are slidably inserted in the sliders 32 and 32. The second arms 33 are formed of rods. The upper end portions of a pair of the second arms 33 and 33 are connected to each other by an upper plate 36, and the lower end portions of the second arms 33 and 33 are connected to each other by a third block 35. A boss 38 is projectingly provided on the lower surface of the third block 35. A shaft 39 is inserted in and fixed to the boss 38. The shaft 39 is provided to be in parallel to the arm shaft 6.

Blocks 40 and 40 are turnably inserted in the shaft 39, and the knife 9 is fixed on the lower surfaces of the blocks 40 and 40. The knife 9 is formed in a plate in which the side facing to the edge 5 of the signature 4 is tapered off.

The clamping means 53 is provided on the shaft 39.

The clamping means 53 includes blocks 41 and 41 turnably inserted in the shaft 39, the clamping member 10 fixed on the lower surface of the blocks 41 and 41, and a clamp drive means 44 for turning the clamping member 10 in the vertical

direction. The clamping member 10 is formed in a plate, and which is positioned on the upper surface side of the knife 9.

A cylinder 44 as the clamp drive means is connected to the clamping member 10. Namely, a block 42 is fixed on the clamping member 10, and a leading edge portion 43 of a cylinder rod is connected to the block 42 through a pin. The end portion of the cylinder 44 in which the cylinder rod is slidable is connected to a metal fitting 45 fixed on the upper plate 36 through a pin 46.

Thus, by extending/contracting the rod of the cylinder 44 for turning the clamping member 10, the signatures 4 can be held between the lower surface of the clamping member 10 and the upper surface of the knife 9.

One end of a spring 48 is locked at the rear end portion of the knife 9, and the other end of the spring 48 is locked at a metal fitting 49 fixed on the third block 35. A stopper 50 is mounted on the metal fitting 49, and the lower surface of the stopper 50 separably abuts on the upper surface of the knife 9. Namely, the leading edge side of the knife 9 is permitted to be turned upwardly around the shaft 39, but is restricted to be turned downwardly by the stopper 50. The rear end side of the knife 9 is biased upwardly by the spring 48, and the knife 9 abuts on the stopper 50, thus setting the initial angle of the knife 9.

A cylinder 34 for extension/contraction of the arm is fixed on the plate 31, and the third block 35 is connected to the leading edge of the rod of the cylinder 34. Accordingly, by extension/contraction of the cylinder 44, the second arms 33 are moved in the vertical direction.

A stopper cylinder 37 is provided on the plate 31, and a stopper 47 is fixed on the leading edge of the rod. The stopper 47 separably abuts on the upper surface of the third block 35. Accordingly, the upward movement of the second arms 33 is restricted by the stopper 47.

As shown in Fig. 1, a semi-circular arc guide plate 51 is disposed on the upper surface side of the conveyor 1, which serves to guide the signatures 4 held and dropped by the knife 9 and the clamping member 10.

A stacker device 52 is disposed on the terminal portion of the guide plate 51 at the position upwardly from the arm shaft 6. The stacker device 52 is intended to store the signatures 4 released from the clamping means 53 and dropped.

A second rocking conveyor 60 is provided ahead of the carrying conveyor 1 for opening/closing the connection with the carrying conveyor 1 by the rocking of the conveyor 60. When the connection is opened (shown by the solid line in Fig. 5), the carried signatures 4 are discarded downwardly from the second conveyor 60. On the other hand, when the connection is closed (60a shown by the dashed line in Fig. 5), the signatures 4 are normally carried to the subsequent process. As the conveyor 60, there may be a double row conveyor corresponding to the carrying conveyor 1 or a single row conveyor. As shown in Fig. 5, the conveyor 60 is preferably disposed such that the upper surface of the conveyor has a slight rising gradient when being connected to the carrying conveyor 1. The rising gradient on the upper surface of the conveyor is dependent on the strength of the waist of the signature 4 (mainly strength of holding the shape of the signature itself due to the thickness). In particular, in the case that the thickness of the signature 4 is thin and thereby the strength of the waist is weak and the folding is made small, it is not required to provide the rising gradient on the upper surface of the conveyor.

Next, the action of each portion will be described.

As shown in Fig. 6, the signatures 4 are carried on the carrying conveyor 1 while being overlapped to each other in a manner of tiles of a roof. At the position of the roller 2, as shown in Fig. 8, the signature 4 is lifted up at the height of the roller 2 so that the height of the edge 5 of the signature 4 is certainly distinguished from the preceding signatures 4. An interval can be confirmed between the continuous signatures 4 by the detecting sensor 3.

When the sampling signal is transmitted in association with the preliminary process of a printing machine or the like, the motor 7 as the drive unit is started for turning the arm assembly 8 standing-by at an action starting position 8a.

The arm assembly 8 is rocked between positions shown by 8a, 8b ... 8h around the arm shaft 6 as shown in Fig. 1. Furthermore, at the positions 8a, 8b, 8c, and 8d, the arm assembly 8 is moved along the guide groove 23 of the guides 22 and 22, so that the shaft 20 located at the lower end of the first arm unit is moved in parallel to the carrying conveyor 1.

Along with the start of the turning of the arm assembly 8, the rollers 24 and 24 of the first arm unit advance in the guide groove 23, and thereby the first arms 14 are extended/contracted and the second blocks 21 and 30 are linearly moved in parallel to the carrying conveyor 1 along the guides 22. Subsequently, by operation of the cylinder 34, the second arms 33 are descended, and the lower surface of the knife 9 abuts on the upper surface of the signature 4 carried on the conveyor 1.

Before the leading edge of the knife 9 abuts on the signature 4, the rear end of the knife 9 is biased upwardly by the spring 48 and abuts on the stopper 50. However, when the leading edge of the knife 9 abuts on the signature 4 and is pressed from the signature 4, the leading edge of the knife

9 is turned upwardly against the spring 48, so that the abutment between the rear end of the knife 9 and the stopper 50 is released. Thus, the lower surface of the knife 9 softly abuts on the upper surface of the signature 4, which prevents the signature 4 from being damaged. The leading edge of the knife 9 is descended somewhat downwardly from the upper surface of the conveyor 1, and the knife 9 certainly abuts on the upper surface of the signature 4 (position 8b).

In such a state, the rotational frequency of the motor 7 is controlled such that the moving velocity of the knife 9 is smaller than the carrying velocity of the conveyor 1, or the movement of the knife 9 is stopped for a specified period of time. By forming a difference in the moving velocity between the knife 9 and the signature 4, the leading edge of the knife 9 is inserted between the signatures 4. At this time, the clamping member 10 is turned upwardly such that the signatures 4 are placed on the upper surface of the knife 9. By controlling the above-described difference in velocity or the stopping time, the number of the signatures 4 placed on the knife 9 can be controlled.

After the knife 9 is certainly inserted between the signatures 4, the knife vertically moving cylinder 34 is reversely operated to ascend the second arms 33, thus ascending the knife 9. At this time, the stopper cylinder 37 is previously operated, to set the ascending position of the second arms 33 (position 8c). The ascending position is set at a position where the lower surface of the leading edge of the knife 9 is slightly separated from the upper surface of the signature 4.

By separating the leading edge of the knife 9 from the signature 4, the knife 9 is turned by the spring 48 and abuts on the stopper 50, to be thus stabilized in its posture.

After the posture of the knife 9 is stabilized, the rod of the holding cylinder 44 is extended, and the clamping member 10 is turned, to hold the signatures 4 in a specified number lifted on the knife 9. Along with the completion of the holding of the signatures 4, the sampling motor 7 is accelerated (two to four times the speed of the carrying conveyor 1), to rotate the arm assembly 8 (positions 8d-8f), thus sampling the signatures 4 from the conveyor 4.

One or a plurality of the signatures 4 may be held on the knife. When a plurality of signatures are sampled, the parallel movement of the knife 9 is stopped for a specified time at the position 8b, and the signatures in a specified number are joggled and then held.

Additionally, in the state where the knife 9 is descended, the signatures 4 may be clamped; however, in this state, the spring 48 biases the other end of the knife 9 and thereby the stopper 50 does not abut on the knife 9 so that the operation of the cylinder 44 makes instable the posture of the knife 9, which causes the fear that the signatures 4 contacted with the lower surface of the knife 9 are damaged. Accordingly, to cope with this problem, it is desirable to ascend the knife 9 up to the rising position set by the knife stopper cylinder 37, and to clamp the signatures 4 at the position where the other end of the knife 9 stably abuts on the stopper 50.

After that, the arm assembly 8 is turned, and at the time when the arm assembly 8 reaches the position 8g, the sampling motor 7 is stopped, and then the clamping means 53 is opened to release the signatures 4, so that the signatures 4 are discharged on the stacker 52 with a good posture. After discharge of the signatures 4, the knife vertically moving cylinder 34 and the knife stopper cylinder 37 are reversely operated, and thus the sampling motor 7 is returned at the original point and the clamping means 53 stands by the action starting position.

The foregoing action is performed for sampling the signatures 4 to the upper stacker device 52. Next, an action of sampling a plurality of signatures 4 downwardly from the junction between the carrying conveyor 1 and the second conveyor 60 will be described. Hereinafter, the action is referred to "discarding-sampling".

As shown in Fig. 5, at the start of the discarding-sampling, the knife 9 is inserted between the signatures 4 and is stopped for a specified time at the position 8b wherein they are ascended by the specified height to joggle the signatures 4 (the movement of the signatures on the driving conveyor is temporarily stopped). The joggling operation is as follows: namely, after the second conveyor 60 permits the passing of the preceding signatures 4, and is rocked to fully open the interval with the preceding signatures 4 with the matched timing to release the connection with the carrying conveyor 1.

By rocking the second conveyor 60 for releasing the connection with the carrying conveyor 1, the knife 9 reaches the position 8e, so that the joggling of the signatures 4 are released, the joggled signatures 4 are continuously discarded downwardly from the second conveyor 60.

In return of the discarding-sampling, in the case that the pitch between the signatures 4 is short, the simple rocking of the second conveyor 60 for performing the connection with the conveyor 1 does not desirably separate the continuously carried signatures 4.

To prevent such an inconvenience, by performing the same action as the holding-sampling for holding the one of the signatures 4 and pulling it, and by releasing it at the position 8e, the signa-

tures 4 are placed on the preceding signatures 4, and the second conveyor 60 is rocked thereon, to be connected with the carrying conveyor 1, so that the signatures following the pulled signatures 4 are desirably carried and are returned to a main stream.

In addition, the embodiment described in this specification is illustrative and is not restrictive. For example, the knife vertically moving cylinder 34, the knife stopper cylinder 37, and the clamp cylinder 44 are not limited to a direct moving (linearly moving) cylinder type; but it can apparently achieve its function fully by replacement of the type with a rotary drive means such as a rotary cylinder or pulse motor. Furthermore, the arrangement of the flat products 4 on the conveyor 1 is not limited to the manner of tiles of a roof; but may be of a form in which intervals are generated between the preceding flat products and the following flat products (see Fig. 9).

The scope of the present invention is designated by the appended claims, and all of the modifications in the meanings of the claims fall within in the present invention.

Claims

1. A method of sampling part of flat products (4) from a conveyor (1), said flat products (4) having a side end (5) are placed on said conveyor (1) and carried in a manner to be shifted in a carrying direction and to be exposed at said side end (5), characterized in that said sampling method comprises the steps of:

a) detecting said side end (5) of said flat products (4) carried by said conveyor (1) by means of a side end detecting means (3) provided at a fixed position;

b) inserting a knife (9) under said flat product (4) from said detected side end (5) on the basis of a side end detection signal from said side end detecting means (3);

c) clamping said flat product (4) piled on said knife (9);

d) moving said knife (9) outwardly of said conveyor (1); and

e) unclamping said flat product (4).

2. A method as defined in claim 1, wherein said step (b) has a step of descending said knife (9) waiting at a stand-by position (8a) with soft touch on a carrying surface of said conveyor (1) before inserting said knife (9) under said flat product (4).

3. A method as defined in claim 1, wherein in said step (b) the number of said flat products (4) held on said knife (9) is controllable by stopping the movement of said knife (9) or by moving said knife (9) with a velocity different from that of said conveyor (1).

4. A method as defined in claim 1, further comprising a step of shifting said side end (5) upwardly from an upper surface of said conveyor (1) at a side end detecting position by said side end detecting means (3), before said step (a).

5. A method as defined in claim 1, wherein said step (d) includes a step of reversing said flat product (4) upwardly from said conveyor (1) by turning said knife (9) upwardly from said conveyor (1), said step (e) including a step of releasing said flat product (4) downwardly for storing said flat product (4) in a stacker (52) disposed under a reversed position (8g).

6. A method as defined in any of claims 1 to 5, wherein said flat products (4) are signatures, said signatures being carried on said conveyor (1) in a manner of tiles of a roof.

7. An apparatus for sampling part of flat products (4) having a side end (5) from a conveyor (1), said flat products (4) are placed on said conveyor (1) and carried in a manner to be shifted in a carrying direction and to be exposed at said side end (5), characterized in that said sampling apparatus comprises:

means (3) for detecting said side end (5) of said flat products (4) carried by said conveyor (1);

means (9) for inserting under said flat product (4) from said detected side end (5) detected by said side end detecting means (3);

means (53) for clamping said flat product (4) piled on said inserting means (9); and

means (8) for moving said inserting means (9) outwardly of said conveyor (1).

8. An apparatus as defined in claim 7, wherein said side end detecting means (3) includes a non-contact distance sensor fixed upwardly from said conveyor (1).

9. An apparatus as defined in claim 8, wherein said conveyor (1) is provided with means (2) for shifting said side end (5) upwardly from an upper surface of said conveyor (1) at a side end detecting position by said side end detecting means (3).

10. An apparatus as defined in claim 9, wherein said shifting means (2) includes a roller pro-

vided so as to project upwardly from a carrying surface of said conveyor (1).

11. An apparatus as defined in any of preceding claims 7 to 10 wherein said inserting means (9) is a knife formed in a plate.

12. An apparatus as defined in any of preceding claims 7 to 11, wherein said clamping means (53) comprises a clamping member (10) pivotably supported on said inserting means (9) and a clamp driving means (44) for rotating said clamping member (10).

13. An apparatus as defined in claim 12, wherein said clamp driving means is an air cylinder (44).

14. An apparatus as defined in any of preceding claims 7 to 13, wherein said knife moving means has an arm assembly (8) which is disposed upwardly from said conveyor (1) in a manner to be rotatable about a horizontal axis perpendicular to a carrying direction of said conveyor (1) and to be radially expandable, and said arm assembly (8) is provided with said inserting means at an expandable end thereof.

15. An apparatus as defined in claim 14, wherein said arm assembly (8) includes an arm shaft (6) having the horizontal axis perpendicular to the carrying direction of said conveyor (1), a first expandable arm unit being provided on said arm shaft (6), a second expandable arm unit being provided on said first arm unit, and a drive unit (7) for rotating said arm shaft (6), and said second arm unit is provided with said inserting means (9).

16. An apparatus as defined in claim 15, wherein said first arm unit includes a first block (11) provided on said arm shaft (6), a first arm (14) slidably provided on said first block (11), a second block (21, 30) rotatably provided at a leading end of said first arm (14), a roller (24) provided on said second block (21), and a guide member (22) provided between an upper surface of said conveyor (1) and said arm shaft (6) while extending along the carrying direction of said conveyor (1) for a specified length, wherein said roller (24) is guided by said guide member, thereby said first arm (14) being slidable against said first block (11),

said second arm unit includes a second arm (33) slidably provided on said second block (30), a third block (35) provided on a lower end portion of said second arm (33), and a cylinder (34) expandably provided between said second block (30) and said second arm (33), and

said inserting means (9) is provided on said third block (35).

17. An apparatus as defined in claim 16, wherein a stopper (50) is provided between said third block (35) and said inserting means (9), said stopper (50) permitting an upward rotation of but restricting a downward rotation of said inserting means (9),

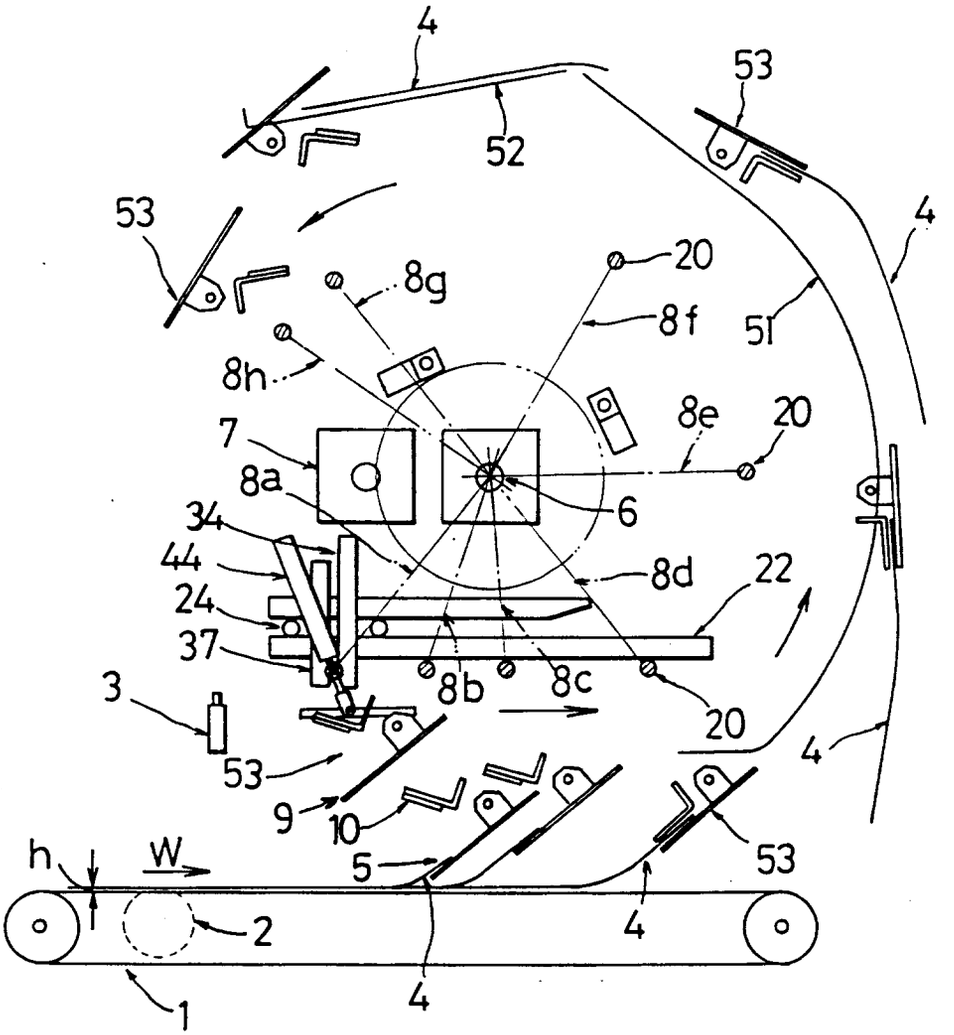
and an elastic member (48) is provided on said stopper (50), said elastic member (48) permitting said inserting means (9) to abut on said stopper (50).

18. An apparatus as defined in claim 17, wherein said clamping means (53) includes a clamping member (10) pivotably provided on said inserting means (9), and a clamp driving means (44) for rotating said clamping member (10).

19. An apparatus as defined in any of preceding claims 14 to 18, wherein a stacker device (52) is disposed under a position where said inserting means (9) is shifted upwardly from said arm shaft (6) by upward rotation of said arm assembly (8), and said stacker device (52) serves to store said flat products (4) dropped from said inserting means (9) by unclamping said clamping means (53).

20. An apparatus as defined in any of preceding claims 7 to 19, wherein a second conveyor (60) is separably provided on a downstream side of said conveyor (1).

FIG.1


4
52
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4
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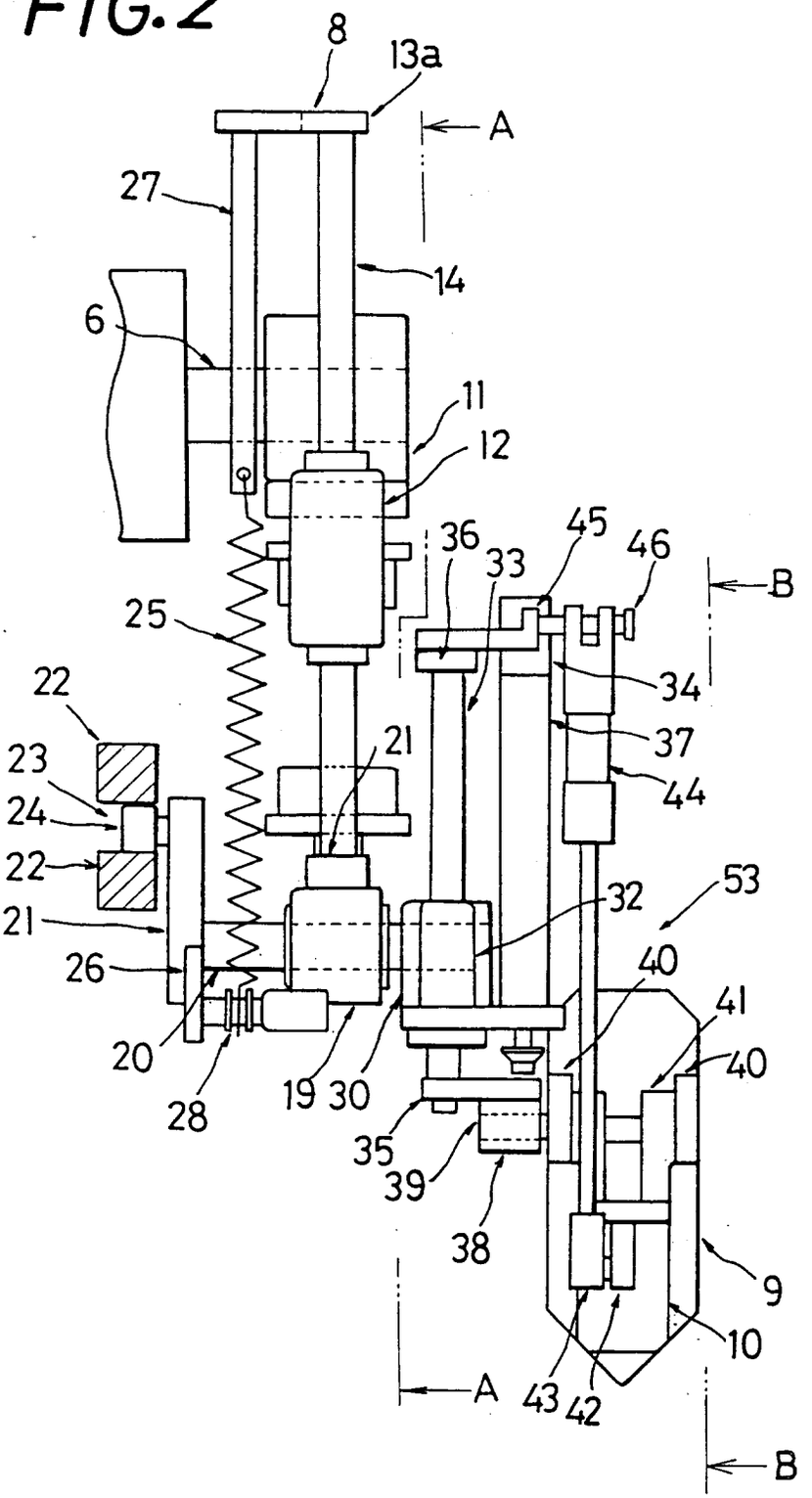
8g
8f
51
8h
8e
20
7
8a
6
34
44
8d
22
24
37
8b
8c
20
3
4
53
9
10
h
W
5
53
2
4
4
1

FIG.2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A
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14
6
11
12
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33
45
46
B
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34
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37
23
21
44
24
22
53
21
32
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28
35
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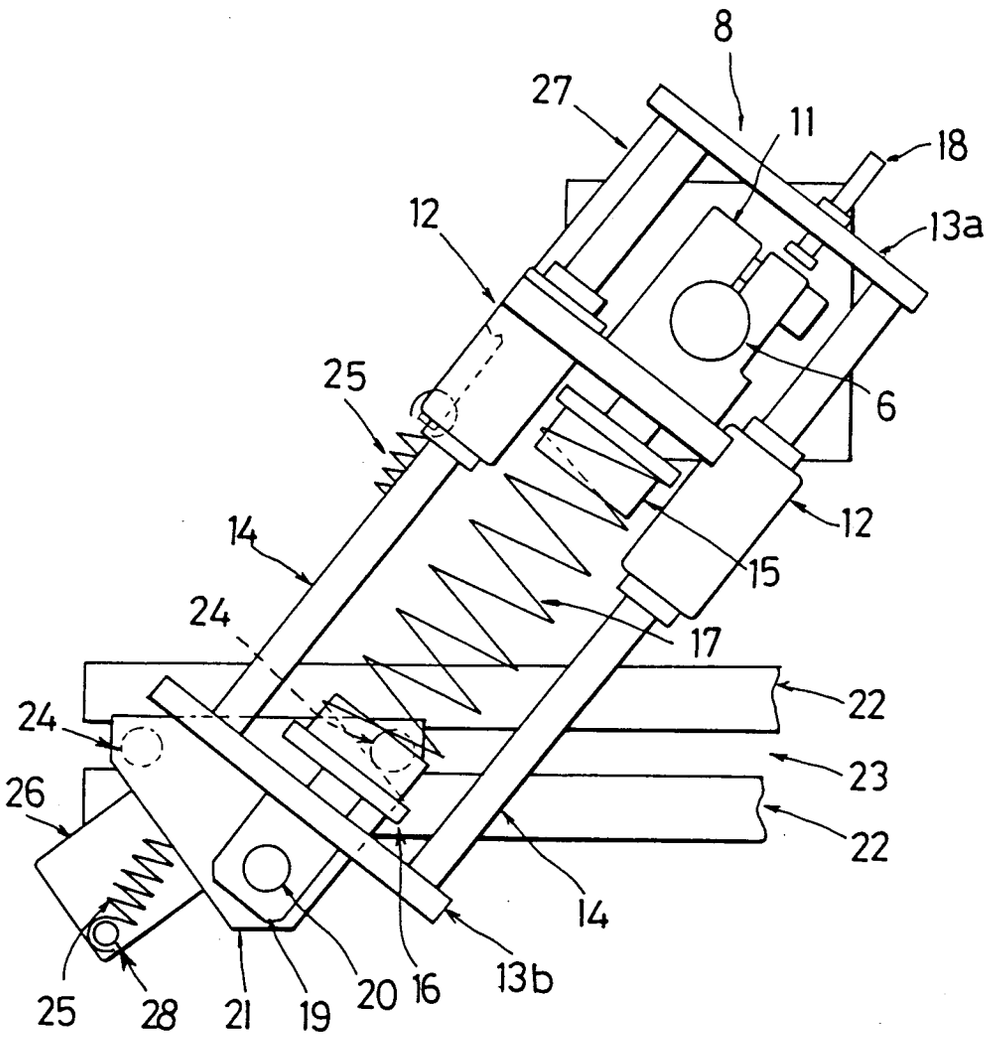
38
9
10
A
43
42
B

FIG. 3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13a
25
6
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17
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25
28
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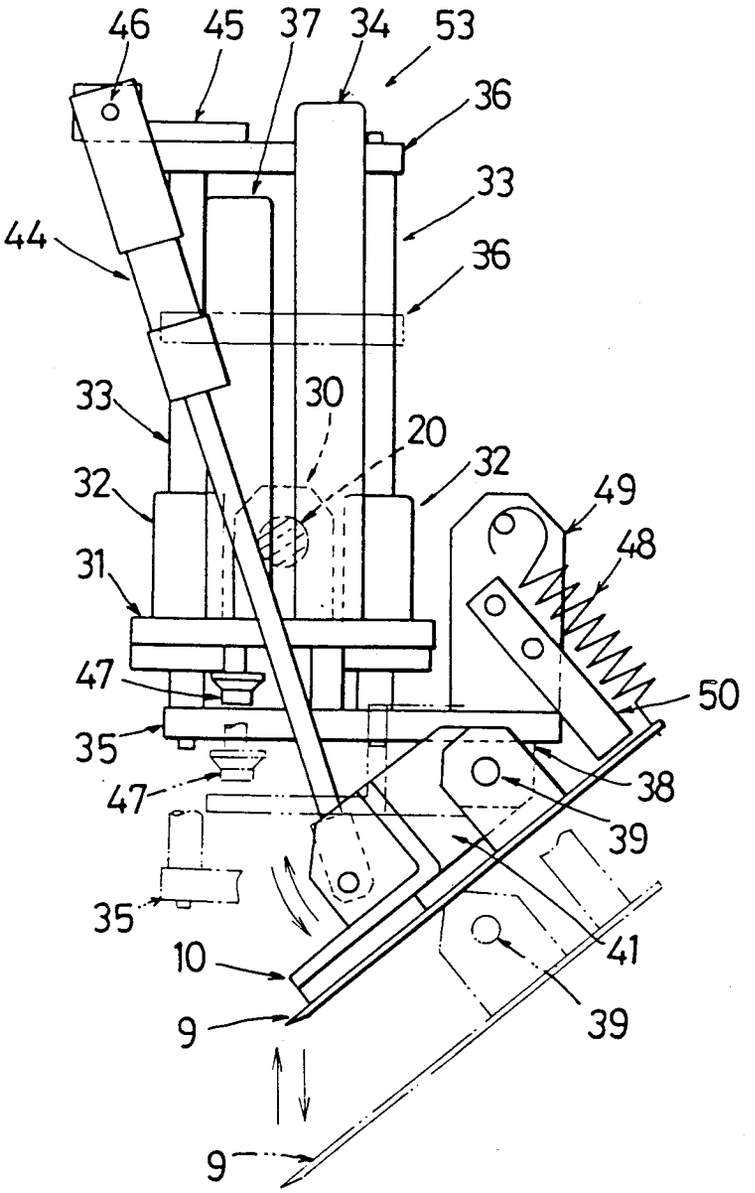
19
20
16
13b

FIG.4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9

FIG.5

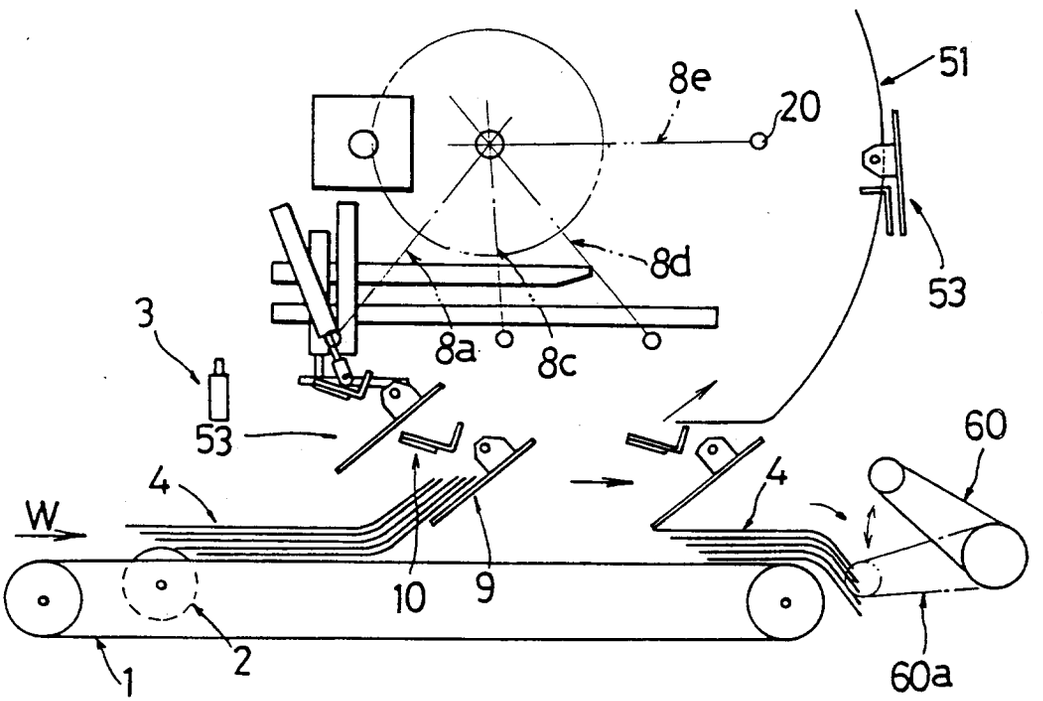


FIG.6

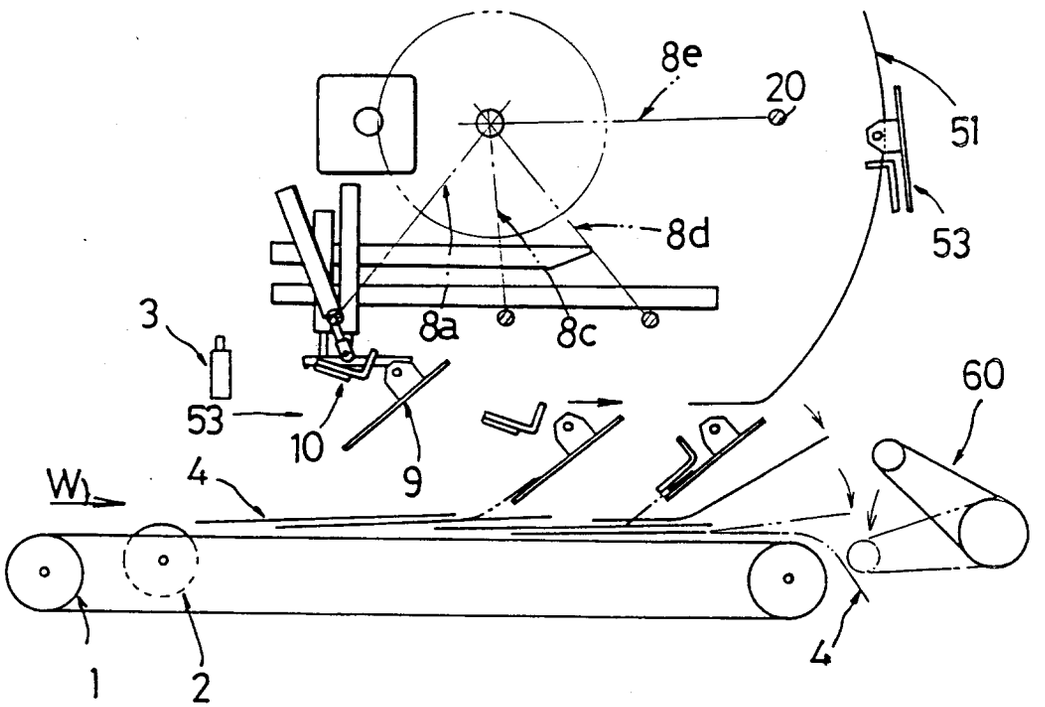


FIG.7

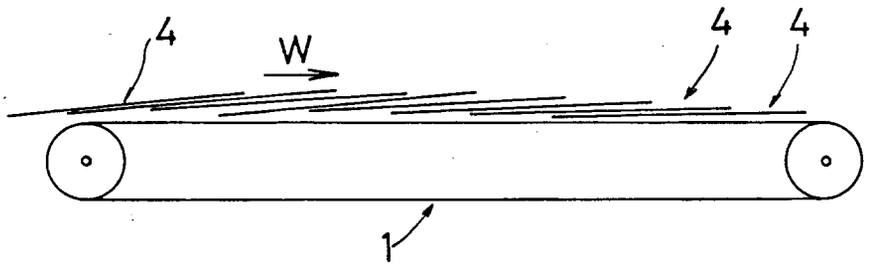


FIG.8

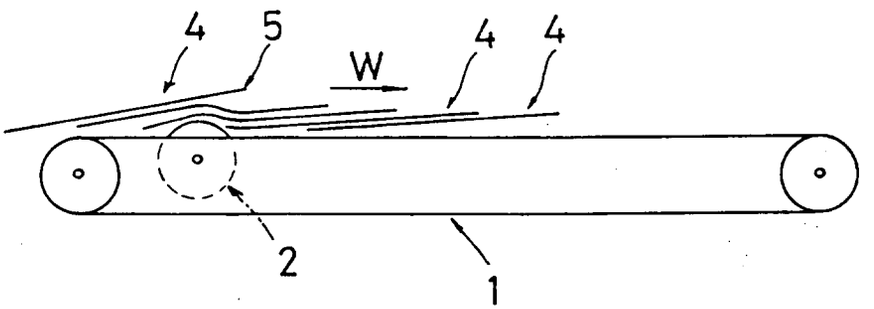
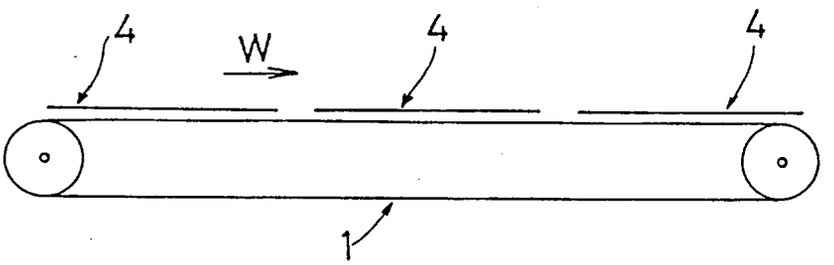


FIG.9



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 10 2908

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 116 015 (FERAMATIC AG)	1-3,5-8, 11-14	B65H29/58
Y	* page 5, line 21 - page 6, line 27; claim 1; figures *	4,9,10	
X	EP-A-0 326 532 (WAMAC AB)	1,3,6-8, 11-14, 19,20	
	* column 3, line 11 - column 4, line 63; figure *		
Y	DE-A-23 46 898 (AAHLEN & AAKERLUNDS FÖRLAGS AB)	4,9,10	
A	* claims 1,2; figures *	1,7,8	
A	DE-A-37 32 589 (VEB KOMBINAT POLYGRAPH "WERNER LAMBERZ") * claim 1; figure *	1,7	
A	US-A-4 072 060 (M. KITAI ET AL.) * claim 1; figures *	1,7	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	6 June 1994	Fuchs, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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& : member of the same patent family, corresponding document

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