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(54) Method and unit for producing tear strips.

(57) A method and unit (1) for producing tear strips (2), whereby a continuous strip (4) of sheet material is unwound off an input reel (10) and fed in a given direction (14) to a cutting station (5) where it is cut transversely by a movable suction blade (17) into a succession of tear strips (2); the movable suction blade (17) retains each tear strip (2) and feeds it, parallel to itself, on to a suction conveyor (7) presenting a portion (35) extending through the cutting station (5) and substantially parallel to the movable suction blade (17).

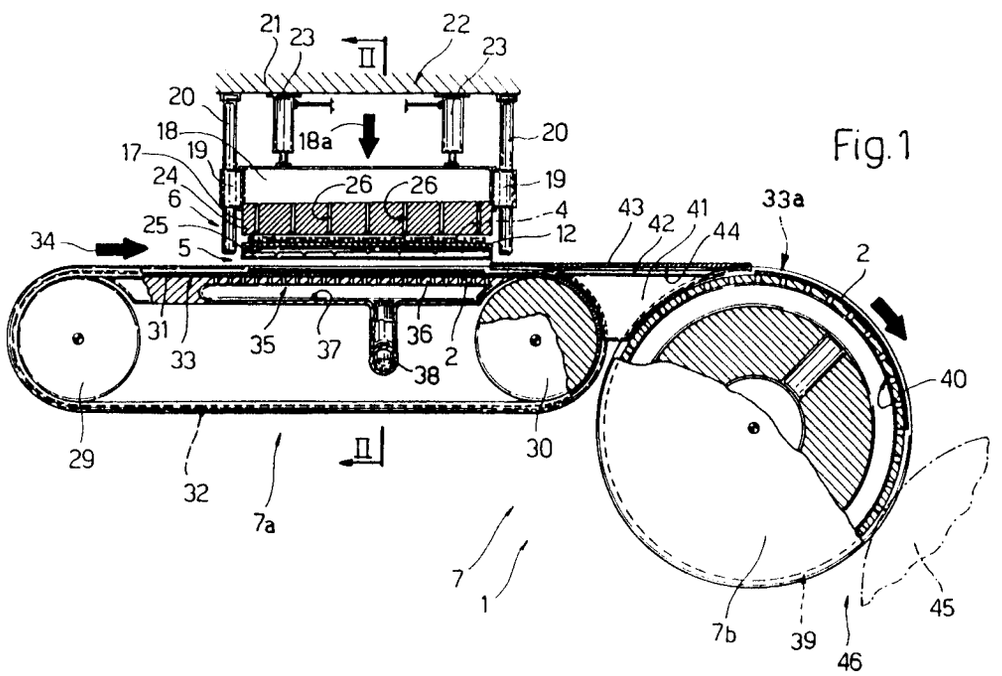

Fig.1

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The present invention relates to a method of producing tear strips.

Here and hereinafter, the term "tear strip" is intended to mean a strip normally made of transparent synthetic material, and which, when applied to a sheet of wrapping material from which to form a wrapping, presents one end projecting from the wrapping and which, when pulled, provides for tearing the wrapping open.

Tear strips are normally produced by cutting a continuous strip transversely by means of a cutting unit comprising a fixed blade, and a movable blade mounted so as to oscillate in relation to the fixed blade with which it forms a scissor device. The continuous strip is fed axially in steps crosswise to the fixed blade, so that an end portion equal in length to the width of the tear strip projects beyond the edge of the fixed blade, and is cut off by the movable blade to form the tear strip.

The front cutting surface of the movable blade presents a number of suction holes for retaining the tear strip cut off the continuous strip; and, after cutting off the tear strip, the movable blade continues moving into a position substantially tangent to a cylindrical conveyor roller rotating about an axis parallel to the traveling direction of the continuous strip and which in turn presents a number of peripheral suction holes for engaging the tear strip, removing it from the movable blade, and feeding it axially along a given path. Since, for the tear strip to remain correctly positioned, the suction through the holes in the movable blade cannot be cut off until the tear strip is actually transferred on to the conveyor roller, the conflicting axial forces to which the tear strip is subjected by the movable blade and the conveyor roller may result in the tear strip slipping in relation to the conveyor roller to such an extent as to alter the spacing of the tear strips.

It is an object of the present invention to provide a method of producing tear strips, designed to overcome the aforementioned drawbacks.

According to the present invention, there is provided a method of producing tear strips, the method comprising the steps of feeding a continuous strip in a first direction along a first given path extending through a cutting station; transversely cutting the continuous strip at the cutting station by means of a cutting unit to form a succession of tear strips; transferring each tear strip to a release position located along a second path extending in a second direction crosswise to said first direction; and feeding the tear strips axially in said second direction and along said second path; characterized in that said second path comprises a portion extending parallel to the tear strip in said release position and presenting a length at least equal to the length of the tear strip; the tear strip, on reaching said release position, being retained positively, along at least part of its length, on said portion of said second path.

According to a first preferred embodiment of the above method, each tear strip is transferred from the first to the second path by traveling, preferably translating, along a trajectory crosswise to said first and second paths.

According to a second preferred embodiment of the above method, each tear strip is transferred from the first to the second path by traveling, preferably translating, along a trajectory crosswise to said first path and tangent to said second path in said release position.

The present invention also relates to a unit for producing tear strips.

According to the present invention, there is provided a unit for producing tear strips, the unit comprising first conveyor means for feeding a continuous strip in a first direction along a first given path extending through a cutting station; a cutting unit located at the cutting station and for transversely cutting the continuous strip into a succession of tear strips; and second conveyor means for successively receiving the tear strips and feeding them in a second direction crosswise to said first direction and along a second path; the cutting unit comprising a movable blade presenting a suction portion for retaining the tear strip; and the blade being movable between said paths and between a cutting position along the first path, and a release position wherein the tear strip is released on to said second conveyor means; characterized in that said second conveyor means comprise a suction portion extending through the cutting station and tangent to at least part of the suction portion of the blade in said release position.

As such, when the movable blade is in the release position, the entire length or a large portion of the length of the tear strip is positioned contacting the suction portion of the second conveyor means, so that the suction along the suction portion of the movable blade may be cut off, and the tear strip removed by the second conveyor means with no danger of it slipping.

According to a first preferred embodiment of the above unit, the blade is movable between the first path and the second path along a trajectory crosswise to said first and second paths.

According to a second preferred embodiment of the above unit, the blade is movable between said first and second paths along a trajectory crosswise to said first path and tangent to said second path.

A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a side view, with parts in section and parts removed for clarity, of a first preferred embodiment of the unit according to the present invention;

Figure 2 shows a section along line II-II in Figure 1;

Figure 3 shows a side view, with parts in section and parts removed for clarity, of a variation of the Figure 1 unit;

Figure 4 shows a side view, with parts in section and parts removed for clarity, of a second preferred embodiment of the unit according to the present invention;

Figure 5 shows a side view, with parts in section and parts removed for clarity, of a variation of the Figure 4 unit.

Number 1 in Figure 1 indicates a unit for producing tear strips 2 and comprising a device 3 for feeding a continuous strip 4 of sheet material to a cutting station 5 where a cutting unit 6 - forming part of unit 1 - cuts continuous strip 4 transversely into tear strips 2 and feeds strips 2 successively to a suction conveyor 7 forming the output element of unit 1.

As shown more clearly in Figure 2, feed device 3 comprises a roller 8 for supporting, in use, a reel 10 of continuous strip 4, and mounted to rotate clockwise (in Figure 2) about a substantially horizontal axis 9 perpendicular to the Figure 2 plane. Device 3 also comprises a powered traction roller 11 cooperating with the upper surface of a suction type guide plate 12 tangent to it, so as to unwind strip 4 off reel 10 and feed it in steps along a straight path 13 extending in direction 14 crosswise to axis 9 and through cutting station 5.

An end portion of plate 12 is located at station 5, and defines a fixed blade 15 with a cutting edge 16 crosswise to path 13 and forming part of cutting unit 6. In addition to fixed blade 15, cutting unit 6 also comprises a movable blade 17 connected integral with a cross member 18 extending crosswise to direction 14 and presenting, at opposite ends, two bushes 19 fitted in sliding manner to two guide rods 20 perpendicular to plate 12 and direction 14, and integral with a frame 21.

Cross member 18 and blade 17 integral with it are moved along rods 20, and in a direction 18a crosswise to direction 14, between a withdrawn idle position and a forward operating position by means of a drive device 22 comprising a pair of jacks 23 interposed between frame 21 and cross member 18, and a central control unit (not shown) for operating jacks 23 at a given rate and in time with the step travel imparted to continuous strip 4 by roller 11.

Movable blade 17 comprises a plate 24, the end surface 25 of which is at least as long as the width of plate 12 and strip 4, is substantially parallel to plate 12, and presents a number of suction holes 26 connected to a suction manifold 27 communicating with a known suction device (not shown). Surface 25 presents a width substantially equal to the step imparted to strip 4 by roller 11, and presents a lateral cutting edge 28 which, when cross member 18 is moved between said withdrawn and forward positions, moves along a trajectory tangent to cutting edge 16 of fixed blade 15 and which extends through path 13 from an idle position wherein surface 25 (Figure 1) is positioned over plate 12, through a cutting position wherein surface 25 is coplanar with edge 16, to a release position (not shown) wherein surface 25 is positioned beneath plate 12. The suction device (not shown) connected to manifold 27 is so regulated by known valve devices (not shown) as to only form a vacuum inside manifold 27 when surface 25 is between said cutting and release positions.

As shown in Figure 1, conveyor 7 comprises a conveyor belt 7a in turn comprising two pulleys 29 and 30 (at least one of which is powered) rotating clockwise (in Figure 1) and subtending an endless belt 31 made of permeable material and presenting a longitudinal groove 32 of a width approximately equal to but no less than the width of surface 25. Pulleys 29 and 30 define, on belt 31, a transportation branch 33 in turn defining the input portion of a path 33a along which tear strips 2 are fed axially. Branch 33 is located beneath plate 12, parallel to and facing surface 25; travels through cutting station 5 in a direction 34 crosswise to directions 14 and 18a; and comprises an intermediate portion 35 which is tangent to surface 25 when this is in the release position. Transportation branch 33 and, in particular, intermediate portion 35 extend in contact with a perforated plate 36 forming the top wall of a suction box 37 mounted between pulleys 29 and 30 and presenting an outlet conduit 38 communicating with a known suction device (not shown).

Conveyor 7 also comprises a roller 7b which is tangent to a plane through transportation branch 33 of conveyor 7a, is located downstream from conveyor 7a in direction 34, and presents an external peripheral annular groove 39 of the same width and depth as groove 32. Groove 39 is aligned with groove 32, and communicates with a suction device 40 inside roller 7b.

Conveyor 7 also comprises a plate 41 interposed between conveyor 7a and roller 7b, and presenting a surface 42 which is aligned with the bottom surface of groove 32, is tangent to the bottom surface of groove 39, and faces a guide plate 43 defining, together with plate 41, a channel 44 for the passage of strips 2 from conveyor 7a to roller 7b. Roller 7b forms the output roller of conveyor 7, and provides for successively transferring strips 2 to the input roller 45 of a user unit 46.

In the Figure 3 variation, plate 41 and pulley 30 of conveyor 7 are eliminated, and pulley 30 is replaced by roller 7b, so that belt 31 of conveyor 7a is looped about pulley 29 and roller 7b; the outer periphery of roller 7b still communicates with suction device 40, but presents no groove 39 in that groove 32 of belt 31 also extends about roller 7b; and suction box 37 extends through station 5, along intermediate portion 35, and as far as the outer periphery of roller 7b.

In actual use, roller 11 is so timed in relation to movable blade 17 as to feed strip 4 forward one step when blade 17 is in the idle position shown in Figures 1 and 2. Jacks 23 are then operated to move surface 25 into the cutting position wherein edge 28 cooperates with edge 16 to cut off the portion of strip 4 projecting beyond edge 16 and so form tear strip 2. Since, as already stated, the suction through holes 26 is activated upon surface 25 moving into the cutting position, the newly formed strip 2 adheres to surface 25 and is transferred by movable blade 17 into the release position.

Upon surface 25 moving into the release position, the entire length of strip 2 adhering to it is brought into contact with intermediate portion 35 of belt 31 traveling in steps in direction 34; and at the same time, as already stated, the suction through holes 26 is cut off to transfer strip 2 to belt 31 with no possibility of strip 2 slipping in relation to the surfaces with which it is in contact.

The Figure 4 embodiment relates to a unit 45 which is substantially the same as unit 1 in Figures 1 and 2, except that device 22 is replaced by a device 46 for driving movable blade 17, and conveyor 7 is operated continuously at a substantially constant speed V1 in direction 34.

As shown in Figure 4, device 46 comprises an articulated parallelogram 47 in turn comprising two cranks 48 fitted to two shafts 49 (at least one of which is powered) parallel to direction 14 and fitted to frame 21 so as to rotate anticlockwise (in Figure 4) about their axes. Parallelogram 47 also comprises a connecting rod consisting of blade 17 and hinged by two adjusting devices 50 to the free ends of cranks 48.

Each adjusting device 50 comprises an appendix 51 projecting upwards from a respective end of plate 24 in a direction crosswise to surface 25; a pin 52 projecting from appendix 51 and parallel to direction 14; and an axial slot 53 formed in the free end portion of respective crank 48 and engaged in rotary and transversely adjustable manner by pin 52. Pin 52 is substantially locked in a given transverse position inside respective slot 53 in known manner via known elastic means (not shown).

In actual use, blade 17 and, in particular, surface 25, are moved by device 46 substantially parallel to plate 12 and at a speed V2 along an annular trajectory 54 extending through said cutting and release positions and such as to be crosswise to path 13 at the cutting position and tangent to path 33a at the release position. Annular trajectory 54 is also such that speed V2 is substantially perpendicular to the plane of plate 12 at the cutting position, and substantially parallel to, in the same direction as, and equal to speed V1 at the release position.

In the Figure 5 variation of unit 45, plate 43 is eliminated, and transportation branch 33 of belt 31 of conveyor 7a is shorter than movable blade 17 and strip 2, and is so positioned that, when surface 25 of plate 24 of blade 17 is positioned tangent to path 33a in the release position, only the rear portion 2a (in direction 34) of strip 2 is retained contacting branch 33 by suction box 37, while the front portion 2b of strip 2 is positioned directly contacting the periphery of roller 7b, and is retained by suction device 40 of roller 7b.

Claims

1. A method of producing tear strips (2), the method comprising the steps of feeding a continuous strip (4) in a first direction (14) along a first given path (13) extending through a cutting station (5); transversely cutting the continuous strip (4) at the cutting station (5) by means of a cutting unit (6) to form a succession of tear strips (2); transferring each tear strip (2) to a release position located along a second path (33a) extending in a second direction (34) crosswise to said first direction (14); and feeding the tear strips (2) axially in said second direction (34) and along said second path (33a); characterized in that said second path (33a) comprises a portion (33) extending parallel to the tear strip (2) in said release position and presenting a length at least equal to the length of the tear strip (2); the tear strip (2), on reaching said release position, being retained positively, along at least part of its length, on said portion (33) of said second path (33a).

2. A method as claimed in Claim 1, characterized in that each tear strip (2) is transferred from the first (13) to the second (33a) path by traveling along a trajectory (18a) crosswise to said first and second paths (13, 33a).

3. A method as claimed in Claim 1, characterized in that each tear strip (2) is transferred from the first (13) to the second (33a) path by traveling along a trajectory (54) crosswise to said first path (13) and tangent to said second

path (33a) in said release position.

4. A method as claimed in Claim 3, characterized in that each tear strip (2) is fed along said second path (33a) continuously and at a given speed (V2); said tear strip (2) being fed along said trajectory (54) at a speed (V1) of the same value and sign as said given speed (V2) at said release position.

5. A method as claimed in Claim 2, 3 or 4, characterized in that each tear strip (2) is transferred from the first (13) to the second (33a) path by translating along said trajectory (18a; 54).

6. A unit for producing tear strips (2), the unit comprising first conveyor means (3) for feeding a continuous strip (4) in a first direction (14) along a first given path (13) extending through a cutting station (5); a cutting unit (6) located at the cutting station (5) and for transversely cutting the continuous strip (4) into a succession of tear strips (2); and second conveyor means (7) for successively receiving the tear strips (2) and feeding them in a second direction (34) crosswise to said first direction (14) and along a second path (33a); the cutting unit (6) comprising a movable blade (17) presenting a suction portion (25) for retaining the tear strip (2); and the blade (17) being movable between said paths (13, 33a) and between a cutting position along the first path (13), and a release position wherein the tear strip (2) is released on to said second conveyor means (7); characterized in that said second conveyor means (7) comprise a suction portion (35) extending through the cutting station (5) and tangent to at least part of the suction portion (25) of the blade (17) in said release position.

7. A unit as claimed in Claim 6, characterized in that said blade is movable between said first path (13) and said second path (33a) along a trajectory crosswise to said first (13) and second (33a) paths.

8. A unit as claimed in Claim 6 or 7, characterized in that the cutting unit (6) comprises guide means (20) crosswise to the suction portion (35) of said second conveyor means (7) and to said paths (13, 33a); the blade (17) being connected in sliding manner to said guide means (20); and actuating means (22) being connected to the blade (17) for moving the blade (17) to and from said release position in a direction (18a) parallel to the guide means (20).

9. A unit as claimed in Claim 6, characterized in that said blade (17) is movable between said first (13) and second (33a) paths along a trajectory (54) crosswise to said first path (13) and tangent to said second path (33a).

10. A unit as claimed in Claim 9, characterized in that the cutting unit (6) comprises an articulated parallelogram (47) in turn comprising two cranks (48), a connecting rod, and actuating means (49) for rotating the cranks (48) about respective axes; said blade (17) defining said connecting rod.

11. A unit as claimed in Claim 10, characterized in that the cutting unit (6) also comprises adjusting means (50) for adjusting the position of the blade (17) in relation to said cranks (48).

12. A unit as claimed in any one of the foregoing Claims from 6 to 11, characterized in that said second conveyor means (7) comprise an endless belt (31) permeable to air and presenting a straight transportation branch (33), one portion of which is defined by said suction portion (35) of the second conveyor means (7).

13. A unit as claimed in Claim 12, characterized in that said belt (31) permeable to air is looped about two pulleys (29, 30; 29, 7b); one (30; 7b) of said two pulleys (29, 30; 29, 7b) being located downstream from the transportation branch (33) in said second direction (34).

14. A unit as claimed in Claim 13, characterized in that said pulley (7b) downstream from the transportation branch (33) in said second direction (34) comprises a suction roller (7b).

15. A unit as claimed in Claim 13, characterized in that said belt (31) permeable to air and said two pulleys (29, 30) define a first conveyor (7a); the second conveyor means (7) comprising a second conveyor (7b) in series with the first (7a).

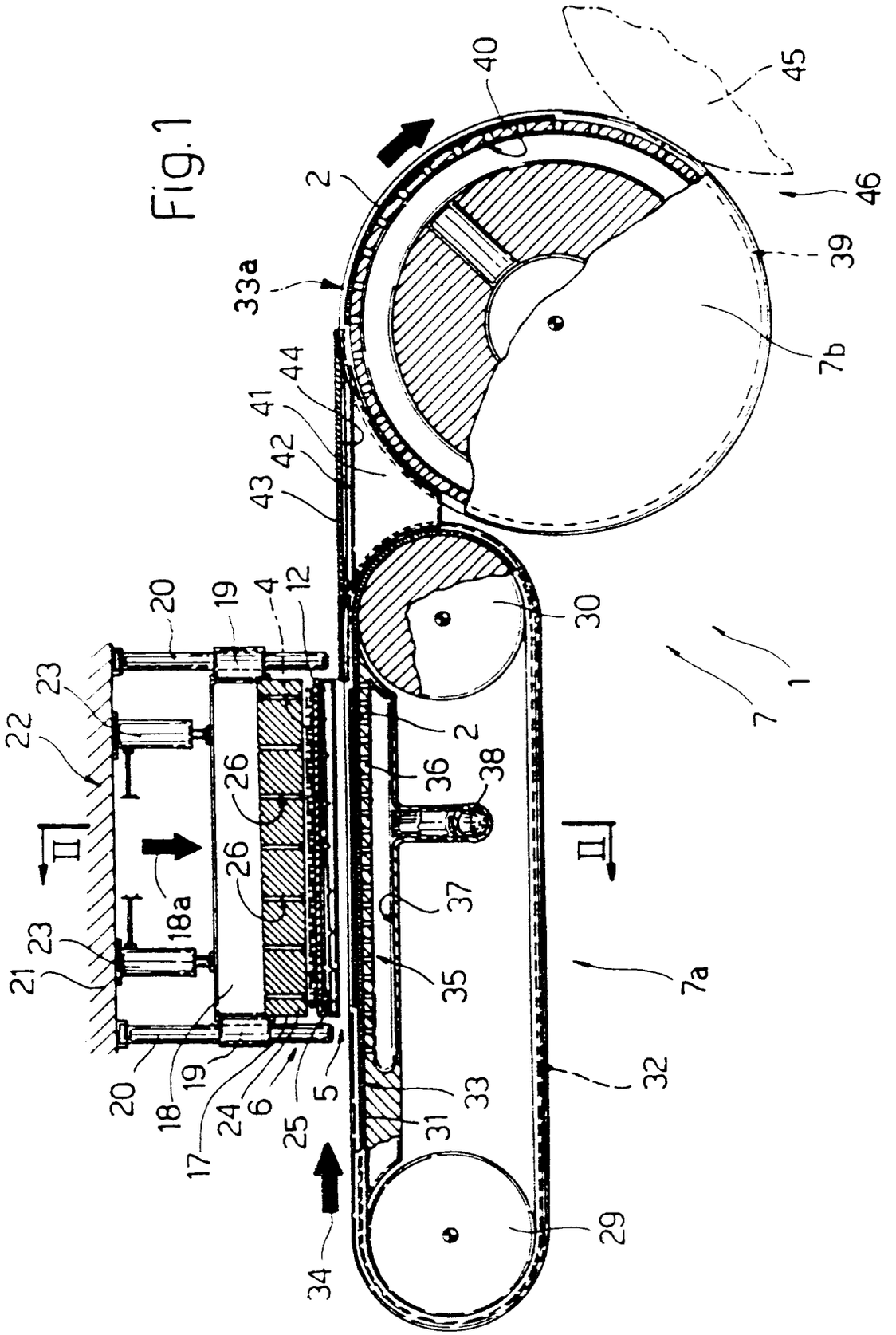
16. A unit as claimed in Claim 15, characterized in that said first and second conveyors (7a, 7b) are connected to each other by a connecting plate (41).

17. A unit as claimed in Claim 16, characterized in that the second conveyor (7b) comprises a suction roller (7b).

18. A unit as claimed in any one of the foregoing Claims from 12 to 17, characterized in that said belt (31) presents an outer axial groove

(32) for successively receiving said tear strips (2).

Fig.1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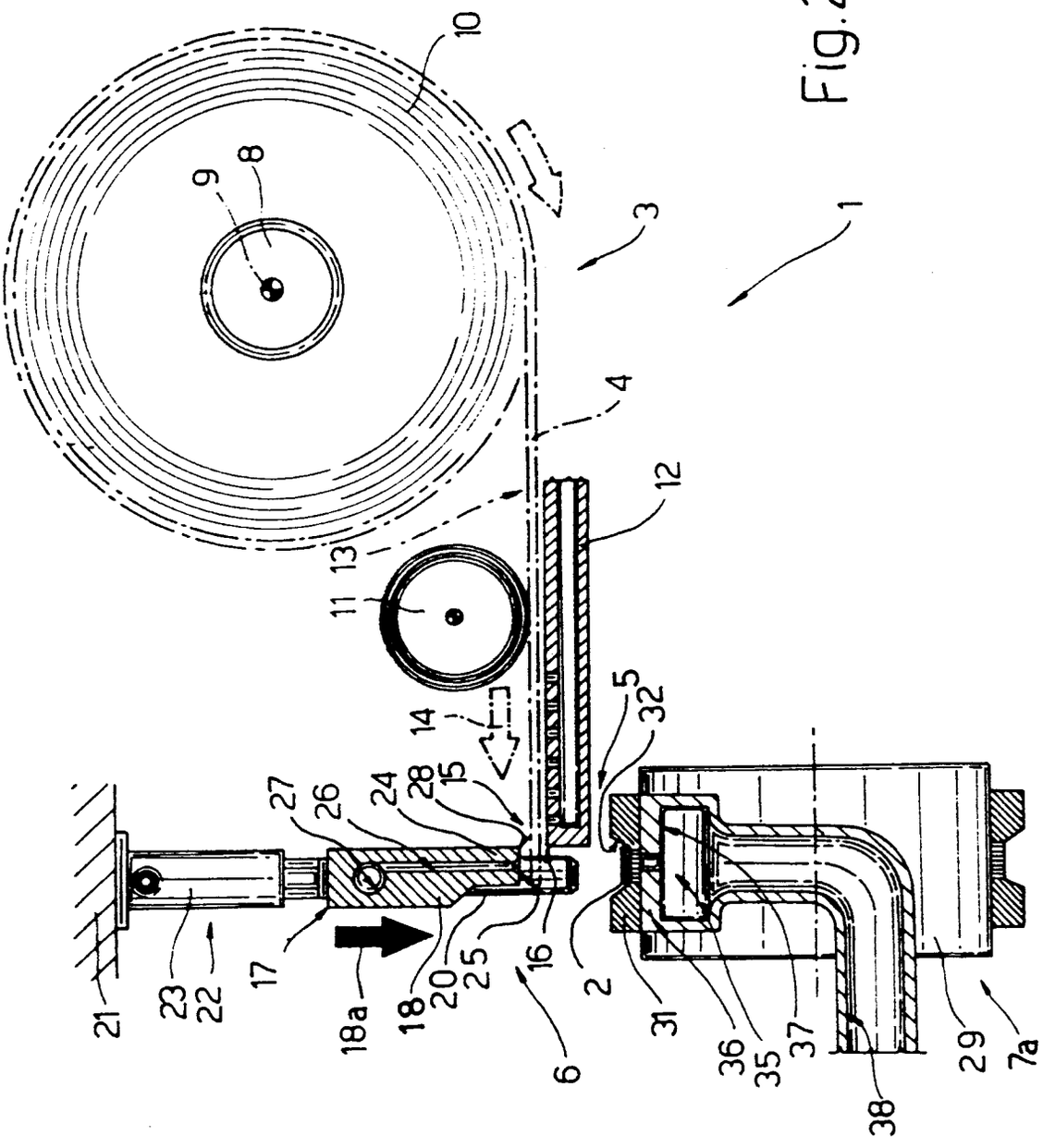
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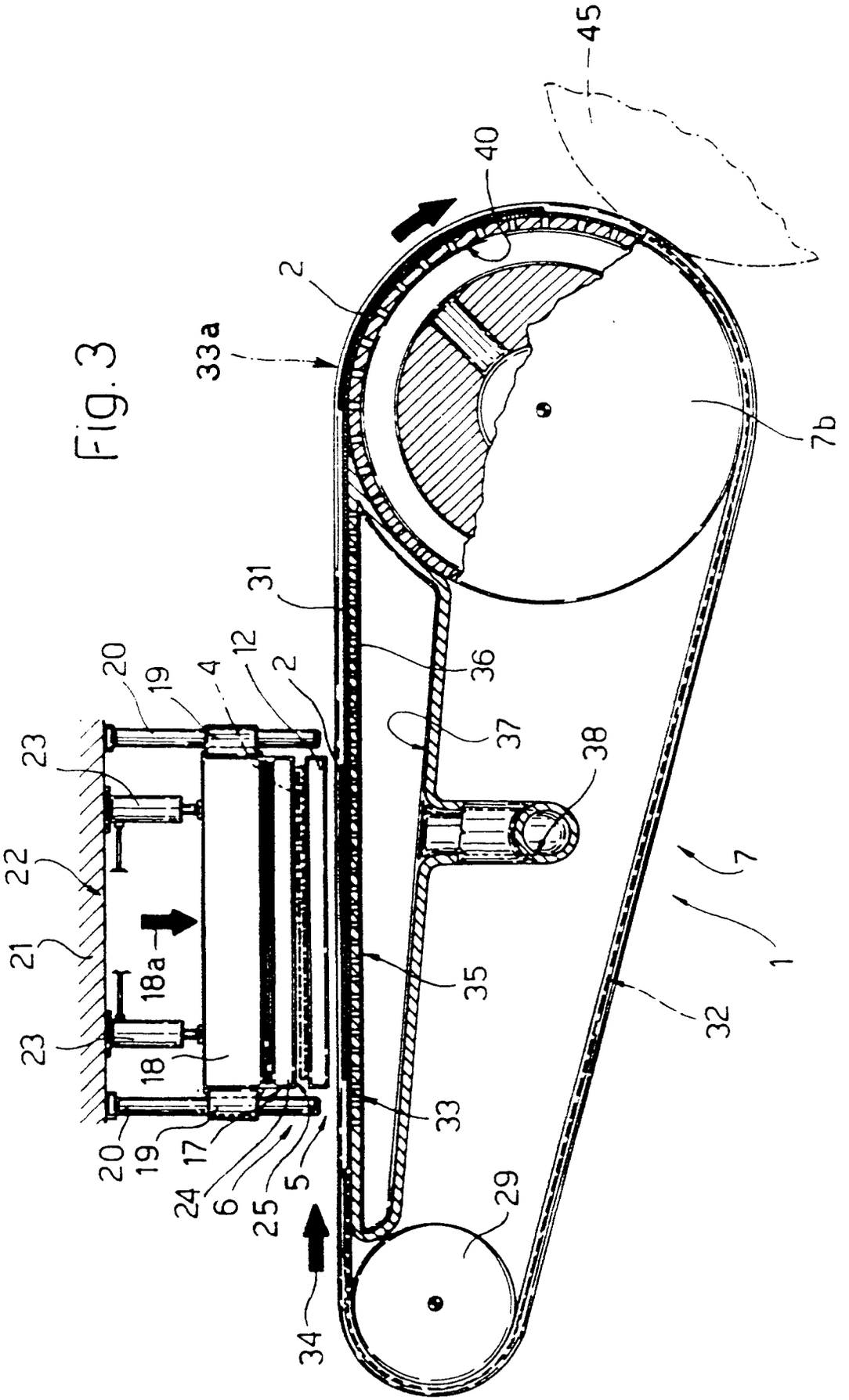
Fig.2

Fig. 3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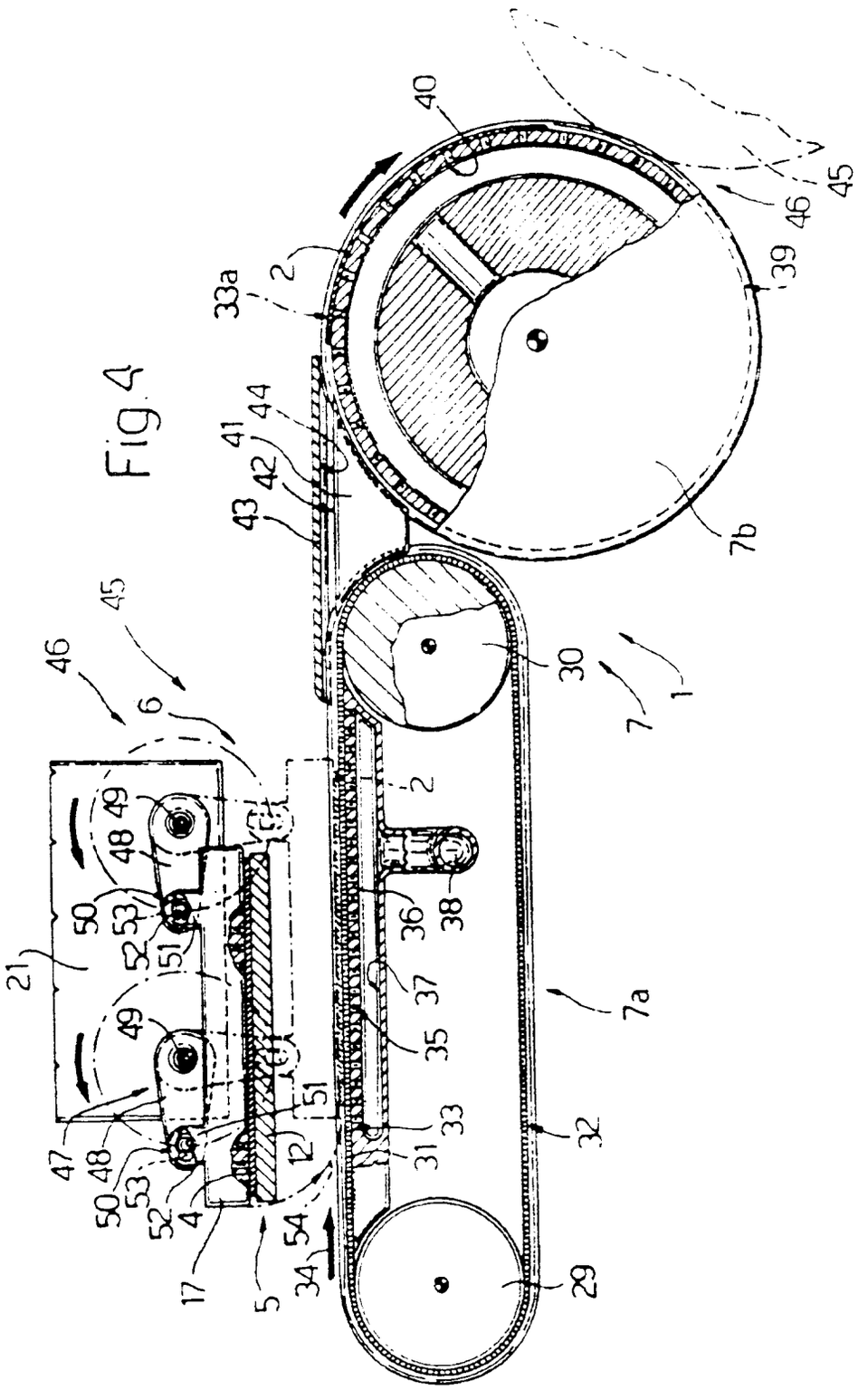
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Fig.4

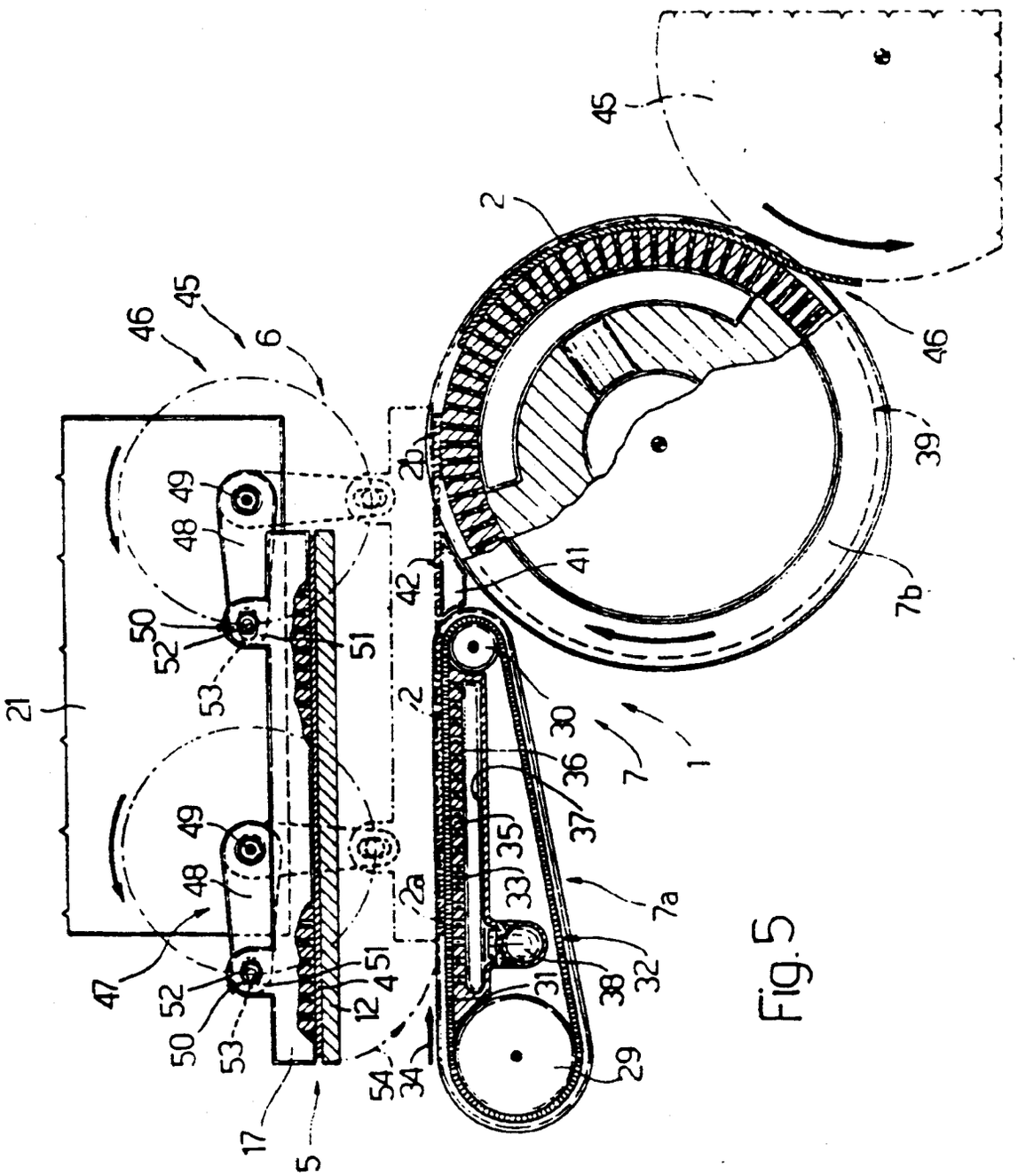
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Fig. 5