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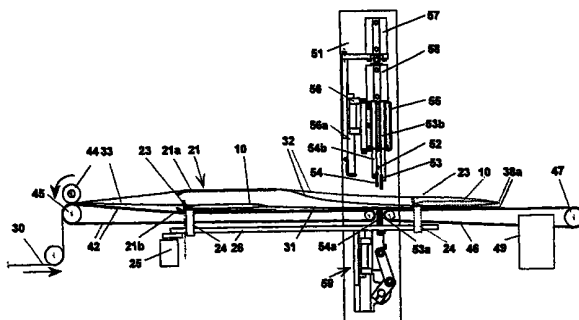
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(54) Title: METHOD AND APPARATUS FOR MAKING ENVELOPE-LIKE PACKAGES AROUND AN ARTICLE BY MEANS OF THERMOPLASTIC WELDING



(57) Abstract: The method allows, in a completely automatic way, to form the envelopes of size of the article without leaving space between the welding line and the article. The steps are provided of: in a feeding direction arranging at least a web (30) of continuous film that can be welded thermoplastically according to two continuous wings overlapping each other in order to present a longitudinal closed continuous line. The folded web (38) has a front closed end transversally in a previous step. Thermoplastic cutting and welding means are provided (52) transversal to the web. After opening a part from each other the wings opposite to the continuous longitudinal closed edge (33) an article (10) is inserted to be packaged that is arranged along the web between the thermoplastic cutting/welding means (52) and the front closed end (38). Then, at the level of the thermoplastic cutting/welding means (52), there is the transversal pinching (53) of the folded web by means of a transversal gripper (53), leaving the web (30) free of sliding through the gripper. Then, there is the pulling of the web upstream of (45) the transversal gripper and the drawing back of the web that slides through the gripper until a front edge of the article contacts the front closed end. Then, there is a further drawing back step of the web until a rear edge of the article contacts the transversal gripper. Follows the transversal cutting and welding of the web next to the transversal gripper whereby an envelope is formed closed at three sides around the article. In this step no elements are present for supporting the article, against the transversal gripper, thus using the gripper same as blocking means. Finally, the envelope is dragged away and further web is fed, the transversal cutting and welding creating a closed front end in the web.

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TITLE

METHOD AND APPARATUS FOR MAKING ENVELOPE-LIKE PACKAGES  
AROUND AN ARTICLE BY MEANS OF THERMOPLASTIC WELDING

DESCRIPTION5      Field of the invention

The present invention relates to a method for packaging articles coming from production lines by means of an envelope made of a film fed continuously that can be welded thermoplastically.

10      In particular, but not exclusively, the method is suitable for packaging articles such as articles of underwear, like for example stockings, collants, etc.

The invention relates furthermore to a packaging apparatus that carries out this method.

15      Description of the prior art

Automatic packaging lines are known suitable to form an envelope-like wrapper around a substantially flat article. These packaging lines have the object of making faster the introduction between them of an article to  
20      package into an envelope, with respect to the manual introduction, whose production rate is low.

By using a single folded film, two welding lines on opposite sides are sufficient, the third closed edge being obtained by the folded edge, opposite to the opening of  
25      the envelope .

The welding lines, made for example by a metal stretched blade heated electrically, cut at the same time also the two films at the edges of the envelope.

Existing production lines, that form an envelope  
30      around articles being packaged, provide a mechanical element for containing the article and prevent it from contacting the welding blade and the transversal counter-gripper for pinching the film. This mechanical element,

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even if of minimum thickness, causes an increase of the size of the envelope that is the sum of the size of the mechanical element and of the article.

Summary of the invention

5        It is an object of the present invention to provide a method for making envelope-like packages by means of thermoplastic welding that allows, in a completely automatic way, to make the envelopes around the article without leaving space between the welding line and the  
10    article same.

      It is another object of the present invention to provide an apparatus that carries out this method.

      It is a particular object of the present invention to provide a method for closing automatically the flap of  
15    the envelopes thus formed.

      These and other objects are achieved by the present invention and in particular by the method for packaging articles coming from production lines by means of an envelope of film continuously fed that can be welded  
20    thermoplastically, comprising the steps of:

- in a feeding direction arranging at least a web of continuous film that can be welded thermoplastically according to two continuous wings overlapping each other in order to present a continuous longitudinal closed edge,  
25    the folded web having a front end closed transversally in a previous step;
- arranging thermoplastic cutting/welding means transversally to the web;
- opening apart from each other the wings and introducing  
30    between them an article being packaged opposite to the closed longitudinal continuous edge;
- arranging the article along the web between the thermoplastic cutting/welding means and the transversally closed front end;

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- at the thermoplastic cutting/welding means, transversal pinching of the folded web by means of a transversal gripper, leaving the web free of sliding through the gripper;

5 - pulling the web upstream of the transversal gripper and drawing back the web that slides through the gripper until a front edge of the article contacts the front closed end;

10 - further drawing back of the web until a rear edge of the article contacts the transversal gripper,

- transversal cutting and welding of the web next to the transversal gripper whereby an envelope is formed closed at three sides around the article;

15 - dragging away the envelope and further feeding the cut web, the transversal cutting and welding creating a closed front end in the web.

20 In the cutting and welding step any element remains for supporting the article, which hits against the transversal gripper using the gripper same as blocking means.

25 Preferably, the step of opening apart from each other the wings and introducing the articles being packaged is carried out in a opening station located upstream of the thermoplastic cutting/welding means, by means of the further steps of:

- in the opening station introducing on a support tray between the wings the articles being packaged;

30 - carrying the article on the tray with a relative movement through the web up to reaching the thermoplastic cutting/welding means and until a front edge of the article is at the front closed end, which has been brought further forward beyond the thermoplastic cutting/welding means together with the article;

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- drawing back the tray upstream of the thermoplastic cutting/welding means towards the loading station, leaving the article at the front closed end.

Advantageously, the step of further drawing back the web, until a rear edge of the article contacts the transversal gripper, without the presence of further mechanical elements, comprises a step of stretching the web between the transversal gripper and the front closed end with the slight resilient deformation of the article, whereby cutting and welding are carried out on a line that is located shifted from the front closed end so that after the raising of the gripper, after that cutting and welding have been made, the film is close to the article that is again in condition not deformed elastically without causing it to fold or crease.

The transversal cutting and welding of the web can be made with the steps of:

- at the end of the further drawing back of the web through the gripper, lowering a transversal parallel counter-gripper upstream of the gripper;
- gripping the web through the gripper and the counter-gripper, so that the web is stretched between the gripper and the counter-gripper;
- passage of the thermoplastic cutting/welding means through the web between the gripper and the counter-gripper for carrying out the transversal cutting and welding;
- opening the gripper and the counter-gripper.

The continuous longitudinal closed edge of the web can be obtained:

- by longitudinal folding a single continuous web of double width; or
- by longitudinal overlapping of two webs with the welding line along a longitudinal side line; or

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- by longitudinal overlapping of two webs of double width with the welding and cutting line along a longitudinal central line, obtaining a double web with accessible wings overlapping each other and that can be opened apart from opposite sides.

According to another aspect of the invention, an apparatus that carries out said method comprises:

- means for feeding/drawing back in a direction of at least a web of continuous film that can be welded thermoplastically having two continuous overlapped wings;

- thermoplastic cutting/welding means arranged transversally to the means for feeding/drawing back the web;

- means for opening apart the wings;

- means for introducing between them an article being packaged at the level of the means for opening apart the wings;

- a transversal gripper provided at the thermoplastic cutting/welding means,

- means for closing the gripper on the web leaving it free of sliding if pulled back from the means for drawing back;

- means for dragging away a formed envelope located downstream of the thermoplastic cutting/welding means around the article after two transversal cuts of a portion of the web.

Preferably the means for opening apart the wings are between the means for feeding/drawing back and the thermoplastic cutting/welding means, the following being furthermore provided:

- support means of the article at the level of the means for opening apart the wings, the support means being located between the wings of the web;

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- means for moving the support means along the web between the means for opening apart the wings and a position located downstream of the thermoplastic cutting/welding means and viceversa, sliding through the wings.

According to a preferred embodiment transversal parallel counter-gripper are provided upstream of the gripper, the thermoplastic cutting/welding means being located between the gripper and the counter-gripper.

Advantageously the gripper and the counter-gripper are formed by a couple of lower parallel jaws and a couple of upper parallel jaws, means being provided for raising the lower jaws and for lowering the upper jaws, the means for raising and for lowering carrying out in turn the closure of the gripper and then of the counter-gripper, the means for drawing back being associated to electronically programmable means that pull back the web of a predetermined length between the closure of the gripper and then of the counter-gripper.

According to a further aspect of the present invention, a device for closing automatically the flap of an envelope formed as above described comprises a guiding support arranged at the side of the means for dragging away the envelopes, on the guiding support a first and a second arm sliding having at an end respectively a first and second gripping finger of the flap, cam means being provided for causing the fingers to follow a respective predetermined trajectory, whereby following the trajectory the first and second finger move above and under the flap and following the trajectory grip it slidably bringing it on the envelope with the interposition of an adhesive layer.

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Advantageously, the support is arranged inclined with respect to the plane of the envelope, whereby the trajectory of the arms is rising for at least a portion.

Brief description of the drawings

5 Further characteristics and the advantages of the method of packaging and of the relative wrapper and final package, according to the present invention, will be made clearer with the following description of an embodiment thereof, exemplifying but not limitative, with reference  
10 to attached drawings wherein:

- figure 1 shows a cross sectional longitudinal view of an apparatus according to the invention that carries out the method form making envelope packages by means of thermoplastic welding;
- 15 - figure 2 shows a top plan view of the apparatus of figure 1;
- figure 3 shows an elevational side transversal view of the thermoplastic cutting/welding means of the apparatus of figures 1 and 2;
- 20 - figure 4 shows a view from below of the support of the thermoplastic cutting/welding means of figure 3;
- figures 5 and 6 show the apparatus of figure 1 in two different steps of the method according to the invention;
- figure 7-11 show a device for closing the flap of the  
25 envelope-like package.

Description of the preferred embodiments

With reference to figures 1 and 2, an apparatus for packaging articles 10 coming from production lines 20 uses  
30 a web 30 of continuous film that can be welded thermoplastically having two continuous wings 31, 32 overlapping each other and a longitudinal edge 33 along which the wings 31 and 32 are foldably connected. Free edge 34 of lower flap 31 exceeds outwardly more than the edge

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free 35 of the upper flap 32 in order to provide, eventually, an envelope 36 (figure 2) with a closure flap 37.

The apparatus comprises a feeding/drawing back system 40 in a direction 41 having a conveyor 42 of the web operated by relative driven rollers 44 and 45. Downstream of it a conveyor 46 is provided operated by a roller 47, for dragging away an envelope 36 formed after two transversal cuts following web 30 as described hereinafter.

Transversally to the direction 41 a unit is provided of thermoplastic welding 50 having a support 51, visible also in figures 3, 4, 5 and 6. The thermoplastic welding is carried out by means of an electrical blade resistance 52 located between a gripper 53 and a counter-gripper 54, formed by relative upper jaws that are aligned vertically with lower jaws 53a and 54a.

The upper jaws of the gripper and counter-gripper 53 and 54 are mounted on guiding sticks 53b and 54b resiliently sliding on a support 55, shown also in figure 5. Support 55, to which cutting and welding blade 52 is integral, is mounted on a slide 56 that moves on guide 56a integral to support frame 51. Two opposite pneumatic cylinders, 57 and 58, respectively integral to the frame 51 and to the support 55, are used for lowering in two times the support 55.

As shown in figure 1, upper jaws 53 and 54 of the gripper and of the counter-gripper are shifted in height and the jaw of the gripper is lower than that of the counter-gripper. the lower jaws 53a and 54a can be raised towards the above, by means of a raising unit 59, being parallel to each other.

Always with reference to figure 1, an opening device 21 is provided at the end of the line 20, shown only in the final part, comprising two jaws distanced in

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height 21a and 21b on which the lower wing 31 and that upper wing 32 respectively slide, in order to keep them open and allowing the introduction of the article 10 by an introducing device 22 not shown in detail.

5       The article 10, can be a desired article to be packaged, which can be for example a collant with the relative inner support cardboard and a outer V-folded sheet with pictures printed thereon for containing it such as a sandwich.

10       The article 10 is inserted between the two jaws 21a and 21b on a support tray 23, integral to a lateral carriage 24 operated by motor 25 and belt 26. The tray 23 can move from the position indicated with the continuous line in figure 1 up to the position indicated with a  
15       dotted line, carrying the article 10 up to reaching with its front edge a transversally closed end 38 of the web 30.

When tray 23 is in the forward position, that it has reached moving through the counter-gripper 54 and  
20       the gripper 53, the article 10 is passed between the two wings 31 and 32 maintaining them in the shape indicated with a dotted line, and eventually slightly pushing the article 10 against the closed transversal end 38 of web 30.

25       Then, according to the invention, the tray 23 moves back leaving the article 10 in this position and returns up to the starting position passing through the jaws 21a and 21b of the opening device 21, for receiving another article to be packaged.

30       As shown in figure 4, then, the first actuator 57 pushes the support 55 towards below along the guide 56a, until the upper jaw of the gripper 53 is closed on the lower jaw 53a, which in the meantime has raised itself. The upper shroud of the counter-gripper 54, being shifted

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in height, instead, is not yet closed. The guide sticks 53b and 54b are not stressed.

In this position the web 30 can slide without tearing itself moving back by means of a back pulling action carried out by the pinch rollers 44 and 45. This movement allows edge 38 to contact the front edge 10a of article 10, bringing the rear edge 10b thereof to contact gripper 53 with the interposition of wings 31 and 32.

The drawing back continues a bit further for slightly bending article 10, so that the envelope 36 that is formed after the cut as described hereinafter is stretched enough around the article 10 same after releasing.

As shown in figure 5, second actuator 58 pushes the upper jaws of the gripper 53 and of the counter-gripper 54 further below so that they press the web 30 against the lower jaws 53a and 54a, with the extension towards the above of the guide sticks 53b and 54b. At the same time, a further push causes the electrical resistance blade to cross the web 30 thus cutting it along the line 38b and welding the two wings 31 and 32 along this line.

Then, finally, the two actuators 57 and 58 raise again themselves and a new cycle starts. The envelope 36 formed (figure 2) has front edge and rear edge 10a and 10b of the article 10 that are located at a direct contact with the welding lines 38 and 38b, achieving the desired object. The conveyor for dragging away 46 brings forward the envelope 36 in an automatic station 49, shown diagrammatically in figure 2, and described in more detail in figures from 7 to 11 for the closure of flap 37, or alternatively in a station of manual closure.

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To this end, with reference to figures 7 and 11, the device 49 for closing automatically the flap 37 of the envelope 36, formed as above described, comprises a guiding support 60 arranged at the side of the conveyor web 46 that carries out the dragging away of the envelopes 36.

On the guiding support, which is inclined with respect to the plane of the envelope 36 and of the conveyor web 42, a carriage 61 slides to which are hinged a first and a second arm 62 and 63 having at an end respectively a first and a second finger 64 and 65 for gripping the flap 37. The second arm 63 is connected through a sliding member to a cam 66, integral to the support 60. A pawl 67 has the function of opening fingers 64 and 65 when the arms 62 and 63 are located in a lowered position. The reciprocation of the carriage 61 is given by a connecting rod 68 operated by a crank 60 operated by a motor 70. By means of the cam 66 the fingers 64 and 65 of arms 62 and 63 follow a trajectory shown in turn in figures from 7 to 10. In particular the first and second finger 64 and 65 move above and under the flap 37 when the arms 62 and 63 are in contact with the pawl 67 (figure 7). Then, while being brought forward by the connecting rod 68 is they slidingly close on the flap 37 (figure 8) raising it from the conveyor for the web, rotating it and arranging it (figure 9) correctly on the envelope with the interposition of an adhesive layer and finally going further on until it is extracted from the fingers same (figure 10).

The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is

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therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could  
5 have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

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CLAIMS

1. A method for packaging articles coming from production lines by means of an envelope made of film fed continuously that can be welded thermoplastically comprising the steps of:

- in a feeding direction arranging at least a web of continuous film that can be welded thermoplastically according to two continuous wings overlapping each other in order to present a continuous longitudinal closed edge, said folded web having a front closed end transversally in a previous step;

- arranging thermoplastic cutting/welding means transversally to said web

- opening apart from each other said wings and introducing between them an article being packaged opposite to said closed longitudinal continuous edge;

- arranging said article along said web between said thermoplastic cutting/welding means and said front closed end transversally;

characterised in that it comprises the further steps of:

- at said thermoplastic cutting/welding means, transversal pinching of said folded web by means of the transversal gripper, leaving said web free of sliding through said gripper;

- pulling said web upstream of said transversal gripper and drawing back said web that slides through said gripper until a front edge of said article contacts said front closed end;

- further drawing back said web until a rear edge of said article contacts said transversal gripper,

- transversal cutting and welding of said web next to said transversal gripper whereby an envelope is formed closed at three sides about said article;

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- dragging away said envelope and further feeding said cut web, said transversal cutting and welding creating a front closed end for said web.

2. A method for packaging articles according to claim 1, wherein said step of opening apart from each other said wings and introducing between them an article being packaged is carried out in an opening station located upstream of said thermoplastic cutting/welding means, comprising the further steps of:

- 10 - in said opening station introducing said articles being packaged on a support tray between said wings;
- carrying said article on said tray with a relative movement through said web up to the achievement or overcoming of said thermoplastic cutting/welding means
- 15 until a front edge of said article is at said front closed end, which has been brought further forward beyond the thermoplastic cutting/welding means together with the article;

**characterised in that** it comprises the further steps of:

- 20 - drawing back said tray upstream of said thermoplastic cutting/welding means towards said loading station, leaving said article at said front closed end;
- carrying out of the further steps according to claim 1.

3. A method for packaging articles according to claim 1, wherein said step of further drawing back said web, until a rear edge of said article contacts said transversal gripper, comprises a step of stretching said web between said transversal gripper and said front closed end with a slight resilient deformation of said article, whereby said cutting and welding are carried out on a line that is located shifted from said front closed end that after the raising of said gripper, after that cutting and welding have been made, said film is close to said article that is again in condition not deformed elastically without

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causing it to fold or crease.

4. A method for packaging articles according to claim 1, wherein said transversal cutting and welding of said web comprises the steps of:

- 5 - at the end of said further drawing back said web through said gripper, lowering a transversal parallel counter-gripper upstream of said gripper;
- gripping of said gripper and said counter-gripper on said web, so that said web is stretched between said gripper and said counter-gripper;
- 10 - passage of said thermoplastic cutting/welding means through said web between said gripper and said counter-gripper for said transversal cutting and welding;
- opening of said gripper and said counter-gripper.

15 5. A method for packaging articles according to claim 1, wherein said continuous longitudinal closed edge is obtained with a step chosen between:

- longitudinal folding of a single continuous web of double width;
- 20 - longitudinal overlapping of two webs with the welding line along a longitudinal side line;
- longitudinal overlapping of two webs of double width with the welding and cutting line along a longitudinal central line, obtaining a double web with accessible wings
- 25 overlapping each other and that can be opened apart from opposite sides.

6. An apparatus for packaging articles coming from production lines by means of an envelope made of film fed continuously that can be welded thermoplastically

30 **characterised in that** it comprises:

- means for feeding/drawing back in a direction of at least a web of continuous film that can be welded thermoplastically having two continuous overlapped wings;

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- thermoplastic cutting/welding means arranged transversally to said means for feeding/drawing back said web
  - means for opening apart said wings;
  - 5 - means for introducing between the wings an article being packaged at the level of said means for opening apart the wings
  - a transversal gripper of said web provided at the level of said thermoplastic cutting/welding means,
  - 10 - means for closing said gripper on said web leaving it free of sliding if pulled back from said means for drawing back;
  - means for dragging away an envelope formed downstream said thermoplastic cutting/welding means about said
  - 15 article after two transversal cuts following a portion of said web.
7. Apparatus according to claim 6, wherein said means for opening apart the wings are arranged between said means for feeding/drawing back and the thermoplastic
- 20 cutting/welding means, the following being furthermore provided:
- support means of said article at the level of said means for opening apart the wings, said support means being located between the wings of said web;
  - 25 - means for moving said support means along said web between said means for opening apart the wings and a position downstream said thermoplastic cutting/welding means and viceversa, sliding through said wings;
8. Apparatus according to claim 6, wherein said means for
- 30 feeding/drawing back comprise means for pulling back said web of a predetermined length.
9. Apparatus according to claim 6, wherein a transversal counter-gripper is provided upstream of said gripper, said thermoplastic cutting/welding means being located between

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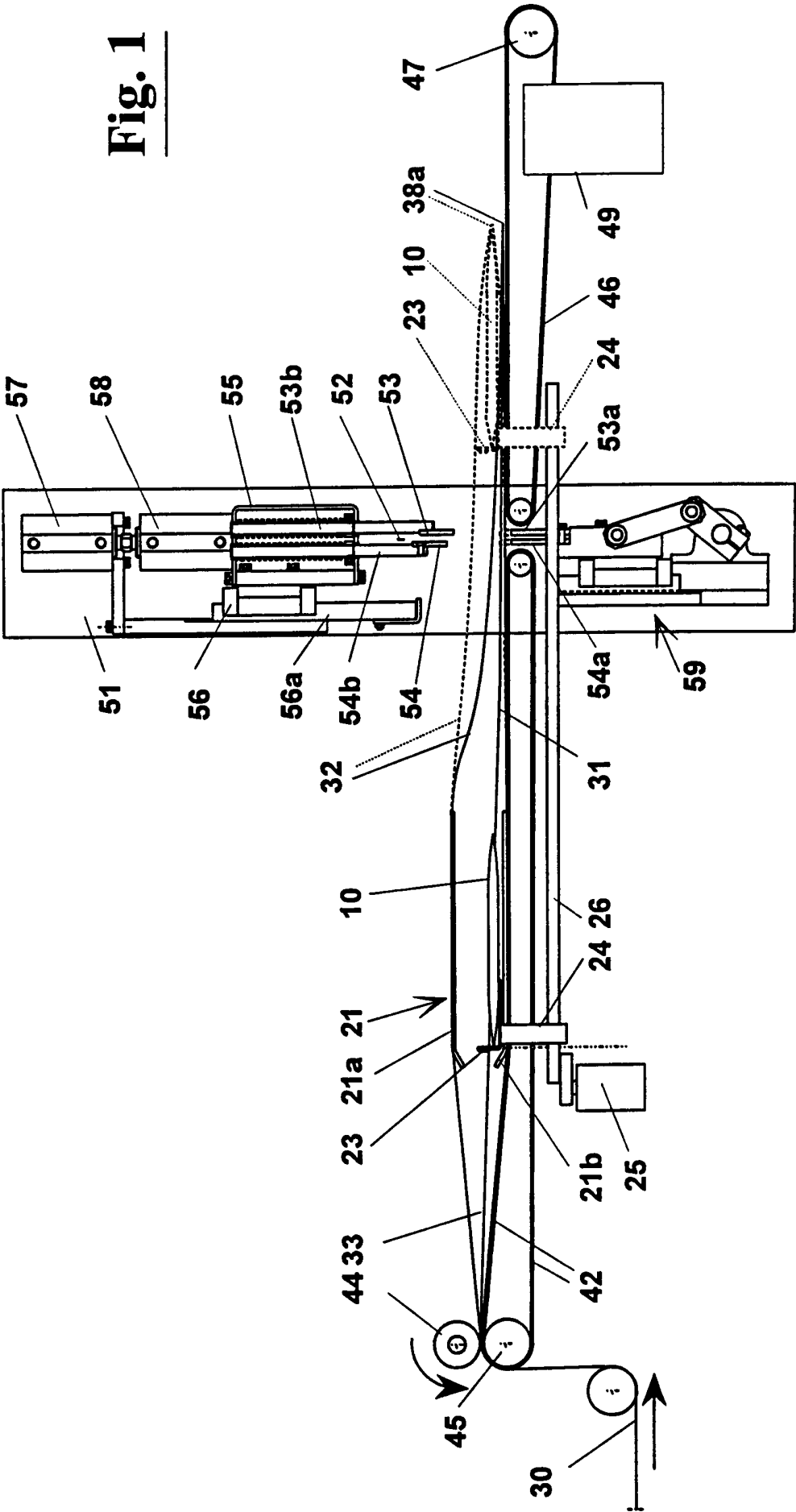
said gripper and said counter-gripper.

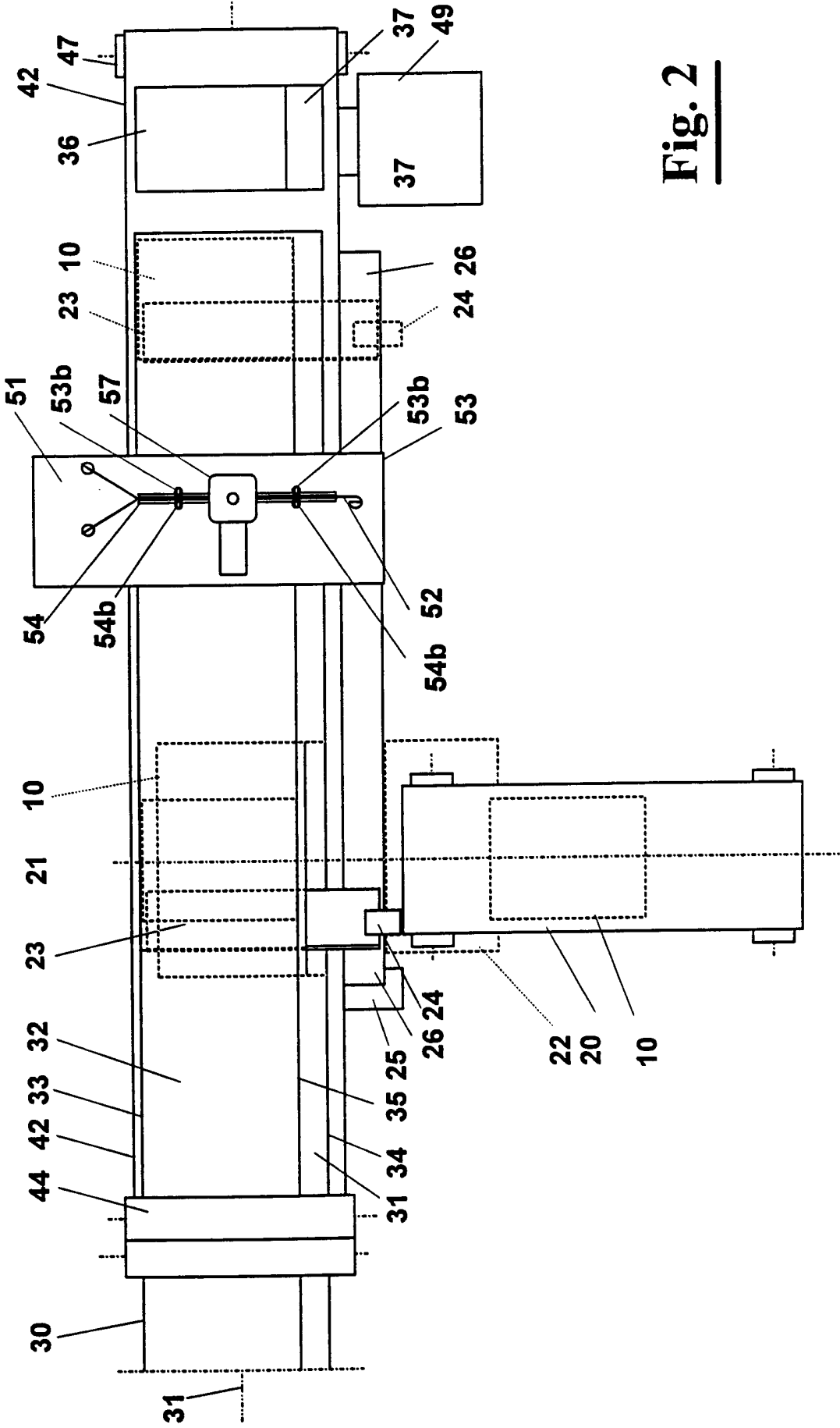
10. Apparatus according to claim 6, wherein said gripper and said counter-gripper are formed by a couple of lower parallel jaws and a couple of upper parallel jaws, means  
5 being provided for raising said lower jaws and for lowering said upper jaws, said means for raising and for lowering carrying out in turn the closure of said gripper and then of said counter-gripper, said means for drawing back operating in the interval between the closure of said  
10 gripper and of said counter-gripper.

11. Apparatus according to claim 6, wherein a device is provided for closing automatically the flap of a said envelopes, comprising a guiding support arranged at the side of the means for dragging away the envelopes, on said  
15 guiding support a first and a second arm sliding having at an end respectively a first and second gripping finger of said wing, cam means being provided for causing said fingers to follow a respective predetermined trajectory, whereby following said trajectory said first and second  
20 finger move above and under said flap and, following said trajectory they grip it slidingly bringing it on said envelope with the interposition of a adhesive layer.

12. Apparatus according to claim 6, wherein said support is arranged inclined with respect to the plane of said  
25 envelope, whereby the trajectory of said fingers is rising for at least a portion.

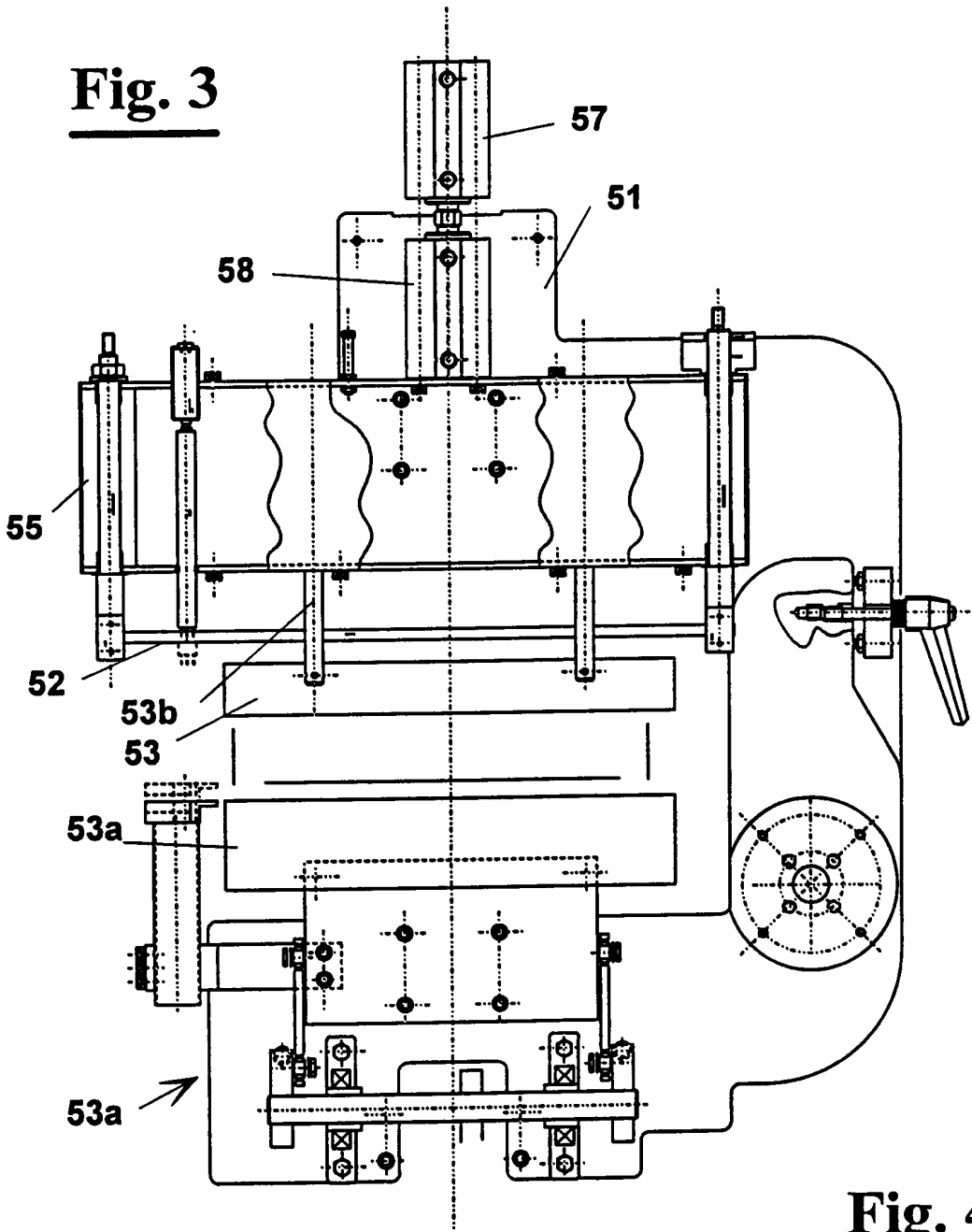
Fig. 1



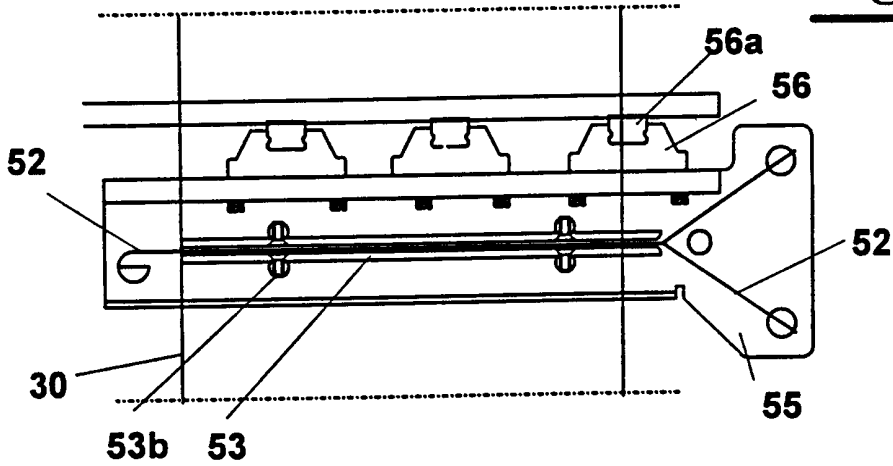


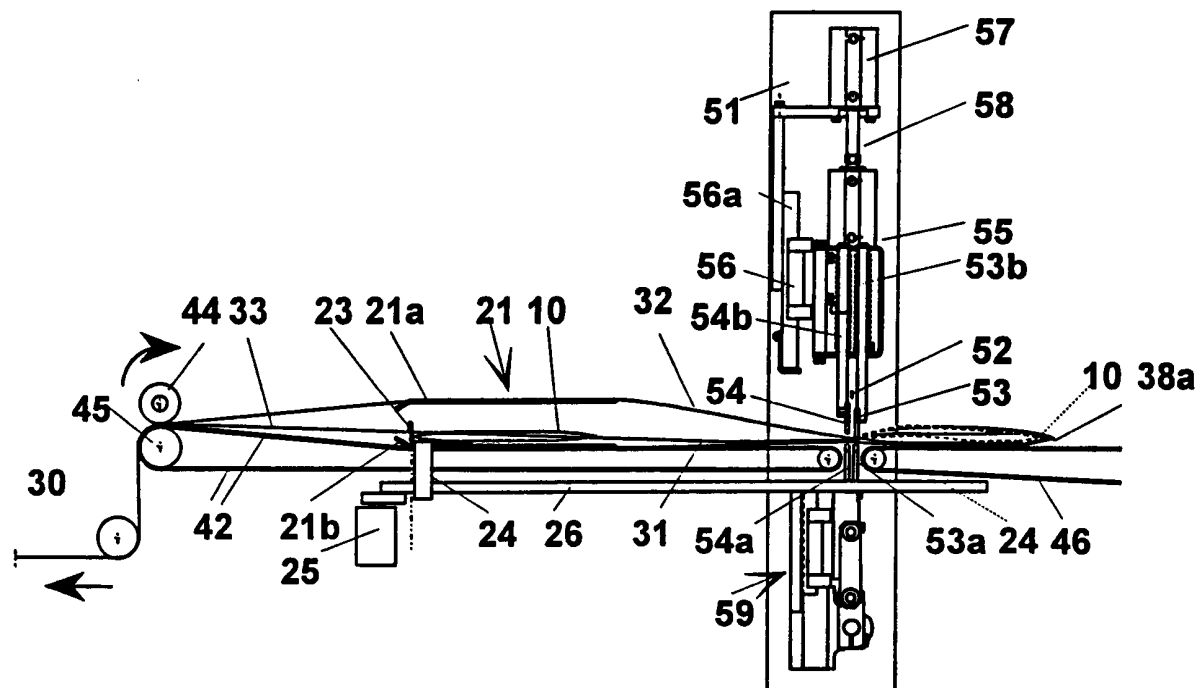
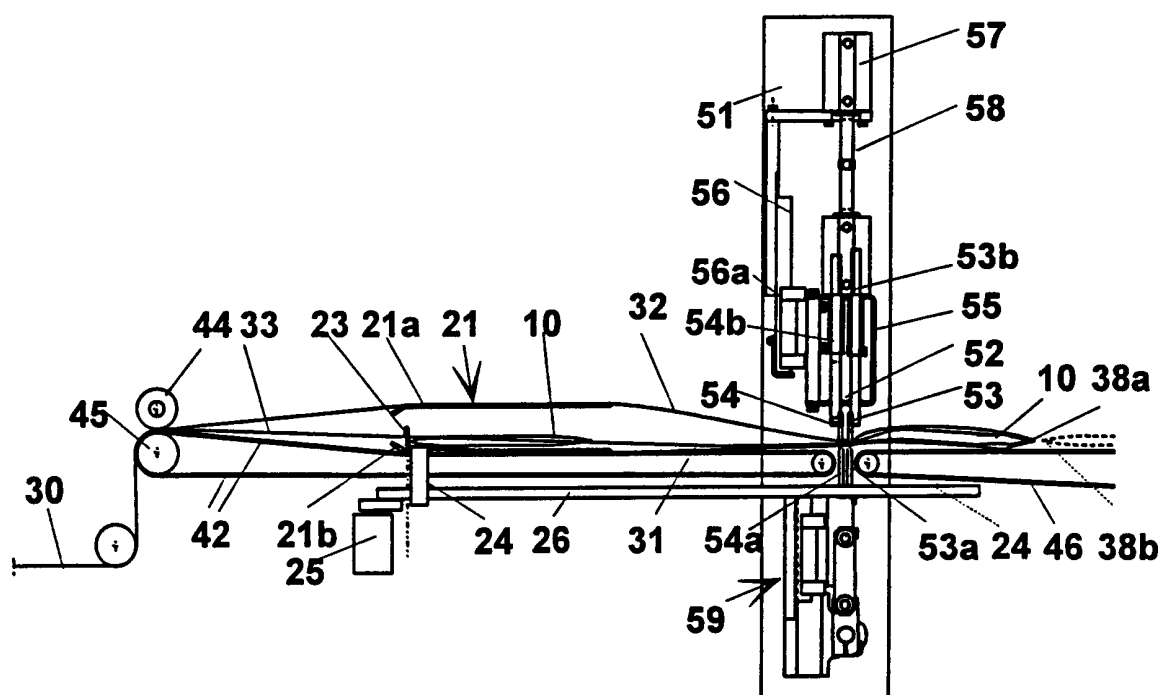
**Fig. 2**

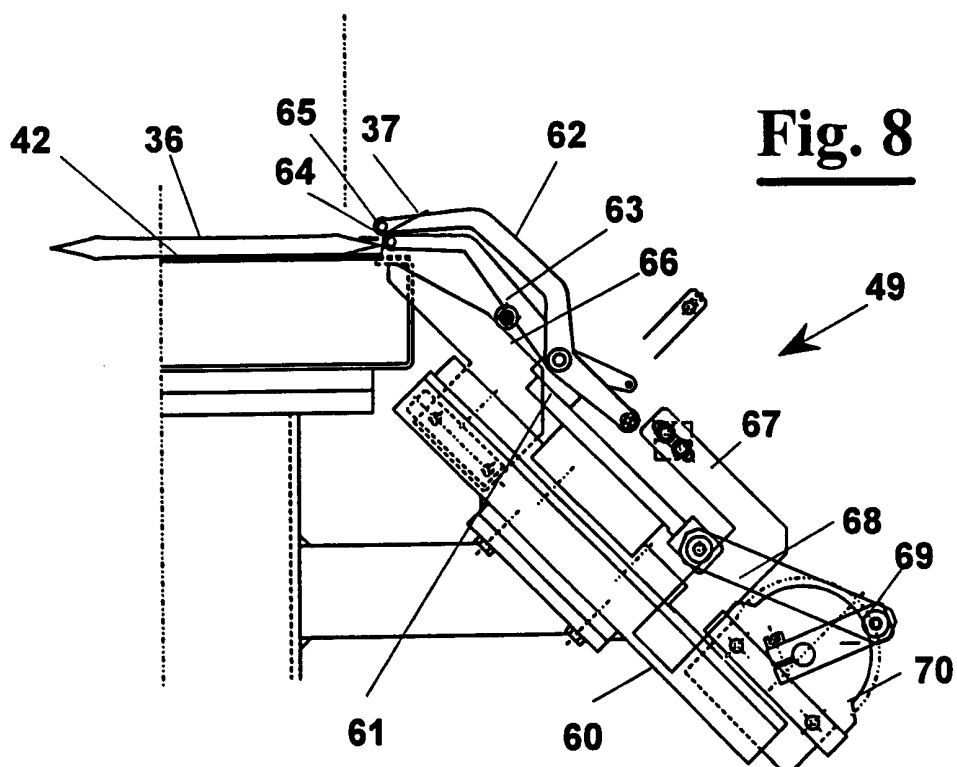
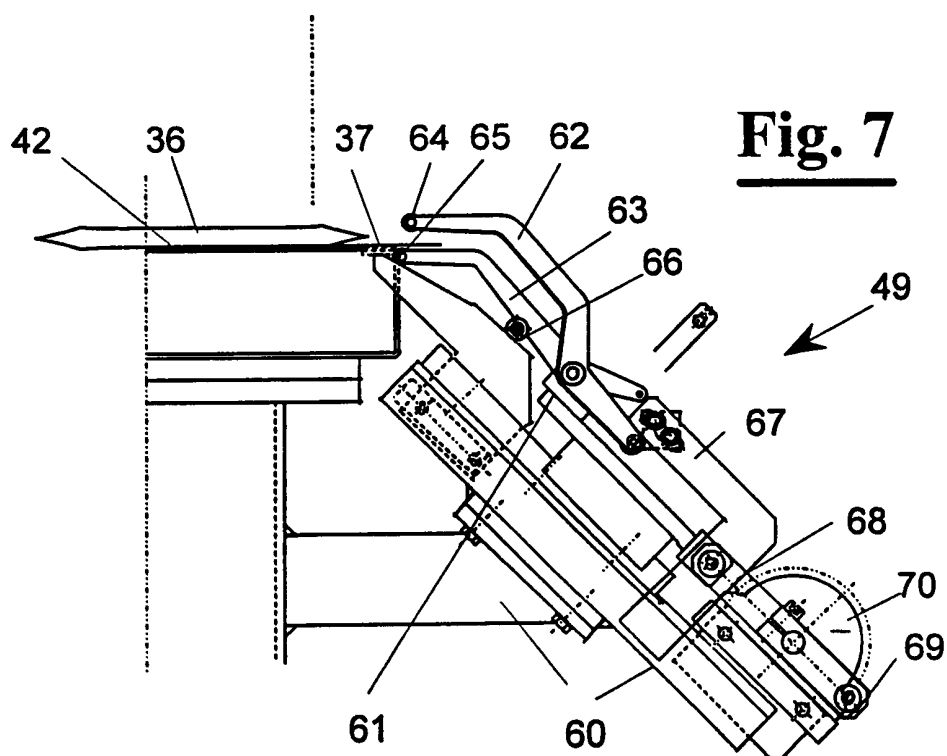
**Fig. 3**

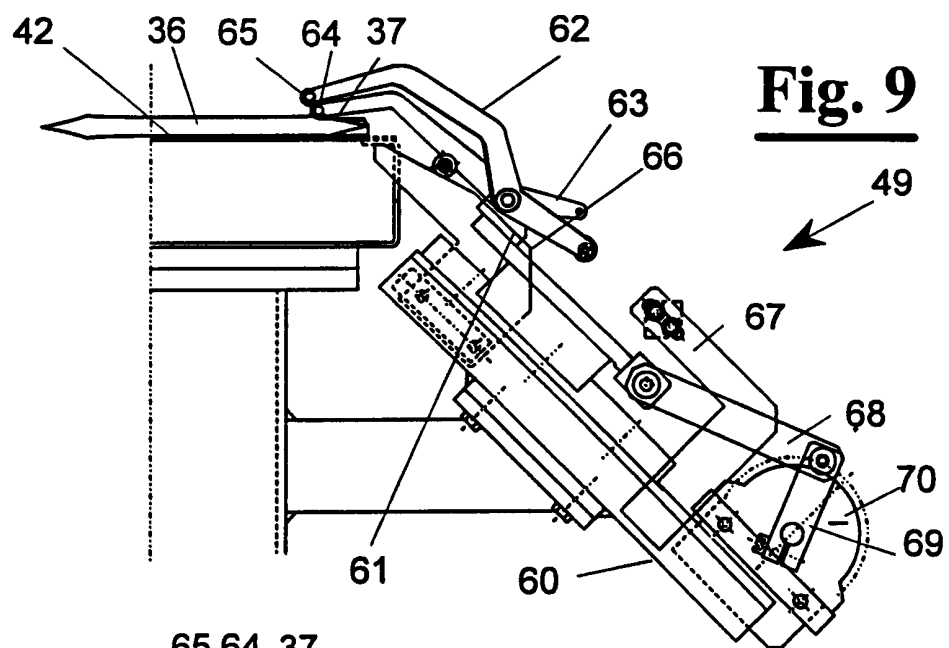


**Fig. 4**

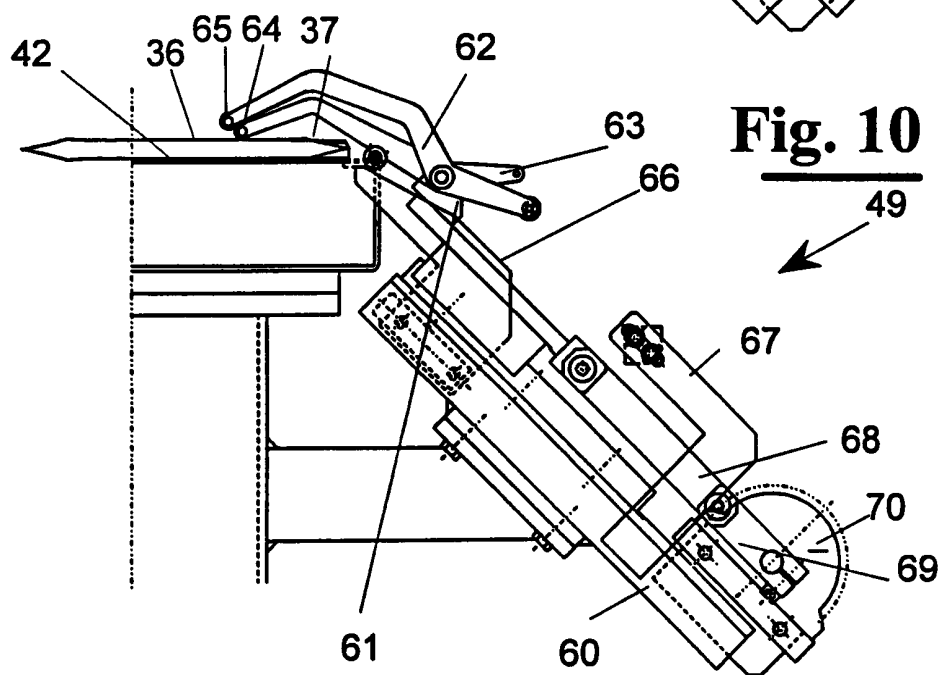


**Fig. 5****Fig. 6**

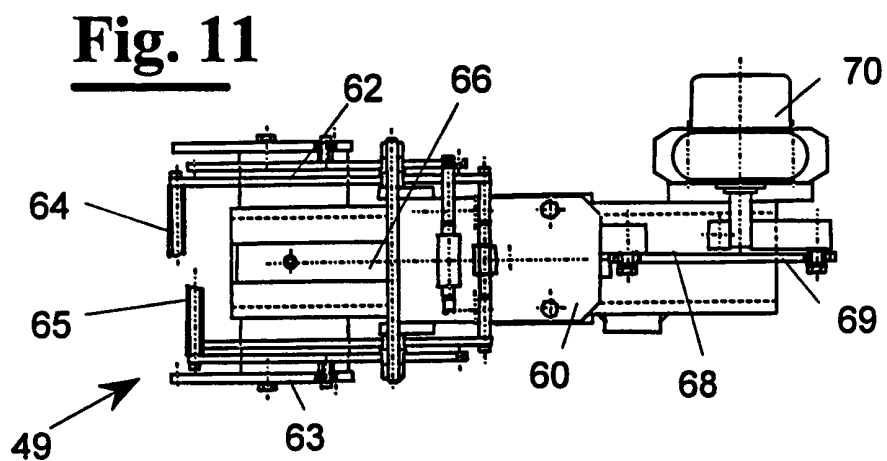




**Fig. 9**



**Fig. 10**



**Fig. 11**