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(54) Machine for inspecting fabrics

(57) Machine for the inspection of fabric in the form of pieces united between them in a unidirectional cascade fashion, with means for weighing the pieces and individually delivering them to a backlighted inspection plane (1), means for carrying out the union of the trailing edge of a piece (4) already inspected, with the head of a piece (5) to be inspected, with an automatic sewer (6) able to carry out either a continuous or intermittent sewing of the two pieces (4, 5) in correspondence of said edges, means for driving the united pieces (4, 5) from the inspection plane (1) to separates stations for the exit (H) or the collection (G) of the inspected pieces, means for collecting the inspected pieces, programmable electronic means (E) for operating the above said members of the machine, further comprising means for superimposing the head of each to-be-inspected piece (5) with the tail of a corresponding inspected piece (4), with a bracket (60) pivoting about a corresponding horizontal axis below said plane (1) and having a plane (61) with members (62) for the temporary fixing of a portion of the head of the to-be-inspected piece (5), to allow for the positioning thereof in correspondence of the sewer (6), in conjunction with the tail of a corresponding inspected piece (4), and hanging down from said plane (1).

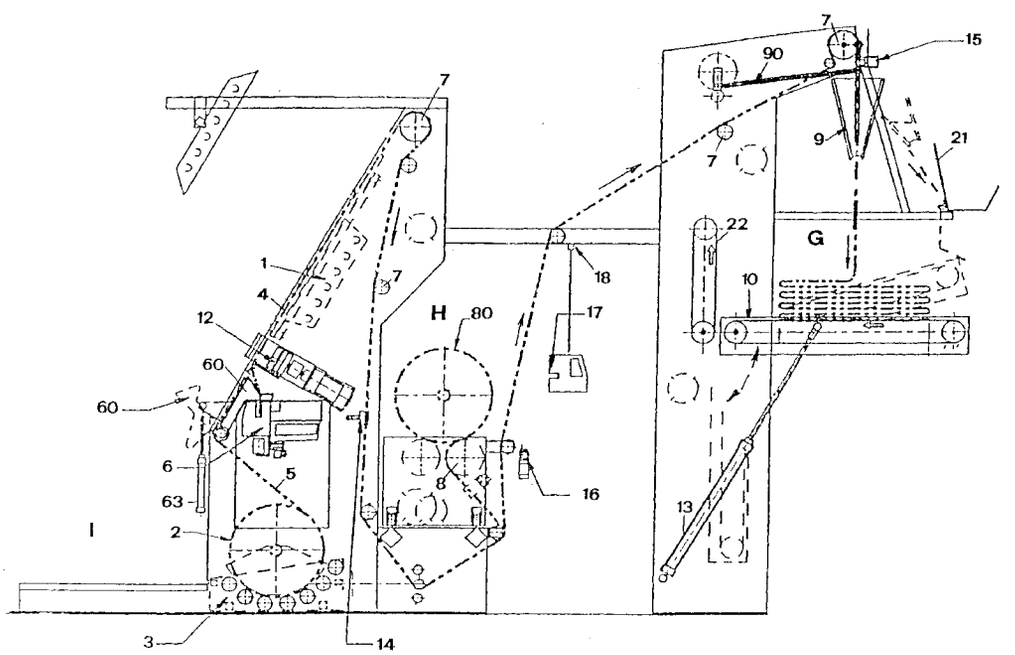

Fig. 1

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Description

The present invention refers to a machine for fabrics inspection.

A process is known for the inspection of fabrics in pieces, which consists, essentially, in the continuous unidirectional drive of a plurality of cascaded pieces for disposing them in correspondence of a backlighted plane for the visual inspection thereof by an operator, and in the subsequent collection of same pieces, for example with plaiting and/or rolling thereof, at a separate unloading station. The pieces of fabric to be inspected are united between them in continuous succession in correspondence of respective leading and trailing edges, so that the trailing edge of each piece will result associated to the leading edge or "head" of the next piece, according to the fabric's direction of advancement . After the inspection, a pieces-marking is operated which consists in applying an adhesive plate to the pieces which bears an indelible code of individualization and recognition of the main characteristics of them such as the weight, serial or article number, fabric nature, color and pattern. Prior to unloading, that is, after the inspection, the pieces thus united are separated from each other.

In order to join the trailing edge of each piece with the corresponding leading edge of the next piece, a technique is known consisting in the insertion of a pin through the head and tail of two pieces of fabric, after they have been manually superimposed, so as to allow for their temporary union. After the fabric inspection step, the pin, which is of a length substantially corresponding to the width of the pieces, is removed and fed to a respective collection site.

This, however, implies a damage, that is, a perforation of the pieces in correspondence of the pin penetration region and, accordingly, the need of removing a considerable amount of fabric, both upstream and downstream of said region, before delivering the fabric to the collection station of the inspected pieces, which represents a drawback the more serious the higher the output of the machine, owing to the heavy incidence of waste material with respect to the production.

A further known technique for operating the said union of pieces to be delivered for inspection, consists in the sewing of the tail of the first piece to the head of the next piece by means of a sewer being moved by the operator who provides for overlapping by hand the edges to be sewn in correspondence of the sewer head: said sewer being positioned on the same side of the operator with respect to the inspection plane.

However, the presence of the sewer reduces the freedom of movement of the operator who has to perform such movements which, in some case, may prevent the correct superimposition of the two pieces edges to be sewn and thus also the correct sewing thereof. The freedom of movement of the operator is further reduced by the presence of pieces-marking means which are usually provided remote of said sewer and which force the operator to dispose the pieces to be marked into such an arrangement as to induce irregular wrinkles with random flow in the fabric, thereby further impairing a successful sewing. Moreover, the time required for the preparation of the fabric to be inspected is excessively long.

The main object of the present invention is to overcome the above drawbacks.

This result has been achieved, according to the invention, by adopting the idea of providing a machine having the features described in the characterizing part of claims 1. Further characteristics being set forth in the dependent claims.

The advantages deriving from the present invention lie essentially in the fact that it is possible to achieve a continuous and precise union of the pieces to be inspected in succession, with no appreciable wastes upon severance of same pieces and with maximum freedom of movement by the operator who also benefits from improved safety conditions; that a machine according to the invention is relatively simple to make, cost-effective and reliable even also a prolonged service life.

These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein: Fig. 1 shows schematically a longitudinal section view of a machine according to the invention, in which the inspected pieces are fed to a rolling cylinder; Fig. 2 shows the machine of Fig. 1, in which the inspected pieces are fed to a lap forming unit; Fig. 3 shows schematically the means in the station for the superimposition of the trailing and leading edges of two consecutive pieces; Fig. 4 shows a simplified block diagram of the system for operating the machine according to the invention; Fig. 5 shows the detail in plan view of the pieces-marking means; Fig. 6 shows the detail in plan view of the sewer operating the head-to-tail union of the pieces; Fig. 7 a detail in side view of the means for positioning the pieces in the station where the same pieces are united by sewing, according to an alternative embodiment: Fig. 8 is a side view of the means located at the output station of the inspected pieces, according to an alternative embodiment.

Reduced to its basic structure, and reference being made to the figures of the attached drawings, a machine for the inspection of pieces of fabric, according to the invention, comprises in combination:

- at a station (I) for the entrance of the pieces to be inspected, means for weighing the pieces and individually delivering them to a backlighted plane (1) for the inspection of the same pieces, with a platform scale and a motor-driven roller (2) for unwinding the pieces and associated to a plurality of corresponding idle, parallel rollers (3) disposed below said plane (1);

- means for carrying out the union of the trailing edge of a piece (4) already inspected, with the head of a piece (5) to be inspected, with an automatic sewer (6) able to carry out either a continuous or intermittent sewing of the two pieces (4, 5) in correspondence of said edges, according to a substantially horizontal sewing line;
- means for driving the united pieces (4, 5) along a predetermined path from the inspection plane (1) to separates stations for the exit (H) or the collection (G) of the inspected pieces, with a plurality of horizontal driving rollers (7) located along said path;
- means for collecting the inspected pieces with a rolling carriage having horizontal rollers (8, 80) for the formation of pieces (station H) downstream of said inspection plane (1), and/or a plaiter (9) engaged to a crank mechanism (90) with an underlying platform (10) provided with a motor-driven loop-closed belt (11) for the laying down of inspected fabric, possibly in the form of laps (station G);
- programmable electronic means (E) for operating the above said members of the machine according to a predetermined but modifiable procedure to meet specific working requirements.

The operation and construction of said rolling carriage and of said plaiter and programmable electronic means as well, are known per se to those skilled in the art and will not, therefore, be described in further detail.

Advantageously, according to the invention, means are provided for holding the head of each to-be-inspected piece (5) superimposed to the tail of an inspected piece (4), with a bracket (60) pivotally mounted on a corresponding horizontal axis below said inspection plane (1) and provided with a plane (61) having members (62) for temporary fixing a portion of the head of the to-be-inspected piece (5), to allow for the positioning thereof in correspondence of the sewer (6) and in conjunction with the tail of a corresponding inspected piece (4) hanging down from the inspection plane (1), in cooperation with a fixed block (64): said sewer (6) being positioned below and backwardly of said inspection plane (1) and being fixed to a motor-driven carriage sliding in a horizontal direction transversally to the direction of movement of the pieces.

Advantageously, according to the invention, said fixing members (62) are made up of a strip of "velcro" material or of a front of needles or points, or of pneumatic suction means able to keep said portion of piece (5) adherent to the plane (61) of the bracket (60).
The said plane (61) of bracket (60) is suitably selected of a width at least corresponding to that of the piece (5) to be inspected.

Advantageously, according to the invention, said bracket (60) is engaged to a corresponding operating cylinder (63) which drives it into rotation: said cylinder (63) being in turn actuated by the operator through a pedal or a push-button or other control interlocked with said programmable electronic means (E).
Means are also provided for marking the pieces, with a press (12) intended to apply labels having indelebly printed thereon the distinctive data of each piece. Such a press is known per se to those skilled in the art and is put on the market by the CO.SVI.TEX company with the trade name E-100 or E-125. Alternatively, means for the direct marking of the pieces with indelible ink may also be provided.

Advantageously, according to the invention, said marking means (62) are located below and backwards of said inspection plane (1), so as to allow for marking the piece either on the reverse side thereof or on the right side thereof, that is, on the same side of the operator.

Advantageously, according to the invention, provision is made for a detector (14) able of detecting the presence and position of the seam operated by said sewer (6), with a spring feeler positioned downstream of said sewer and associated to a microswitch which is interlocked to said programmable electronic means (E) so as to detect instant by instant, the position of the seam downstream of the detector, in relation to the detection position and to the preset pieces-feeding speed, and thus operating the intervention of the carriage of an automatic cutter (15) located upstream and in proximity of said plaiter (9) in order to perform a first and a second horizontal cuts of the pieces astride the seam thereof and thus the separation thereof prior to their laying down onto the platform (10).

Again, advantageously, the said plane (10) located below the plaitinginmg unit (9) is pivotally mounted on a respective horizontal axis and is engaged with a corresponding operating cylinder (13) having inclined axis.
Provided in proximity of said rolling carriage (8, 80), in the station (H) for the formation of the rolls of inspected pieces, are a manually operated cutter (16) and a sewer (17), the latter hanging down from a support carriage (18) which slides on a horizontal crossbeam (19) of the machine-bearing structure.
When it is desired to inhibit the intervention of the plaiter (9), the inspected pieces are fed exclusively to the rolling carriage by means of the rollers (8, 80) and a piece (P) is disposed in fixed position between the points (A) and (B) of the structure as shown in Fig. 2.

The operation of the above described machine, with reference to the embodiment illustrated in Fig. 1, is as follows.
With a piece (4) disposed onto the inspection plane (1), and the respective portion of piece tail projecting from said plane (1) so as to face the sewer (6), the operator picks up the head portion of the next piece (5) exiting from the roller (2) and fixes it onto the plane (61) of the bracket (60) so as to have a part thereof projecting from the plane (61), said bracket (60) being suitably located by the cylinder (63) to a stand-by position. Afterwards, the same operator activates the rotation of the bracket (60) so as to cause the head portion of the piece (5)

projecting from the plane (61) to overlap the corresponding tail portion of the preceding piece (4), and said portions of pieces (4, 5) to come close to each other in front of the sewer (6) which is then operated to obtain the tail-to-head sewing of the two pieces (4, 5). At this point, the pieces are driven forward into motion for a predetermined length - that is, a length sufficient for allowing the second piece to be placed in correspondence of the inspection plane (1) - and under the control of a pair of photosensors, not shown for sake of clarity in the figures of the attached drawings, intended to detect the passage of the tail portion of the pieces (5) coming from the cylinder (2) and operate the stop thereof in correspondence of a preset position, that is, in correspondence of the sewer (6), in order to repeat the preliminary operations described above. Afterwards, the already controlled piece is marked and the bracket (60) moved back to the initial position. During the subsequent advancement of the united pieces (4, 5), the detector (14) detects the passage of the respective seam and operates, after a time preset in relation to the feeding speed of the pieces, the activation of the motor-driven cutter (15) so as to carry out a first trasversal cut below the seam, and a second cut above said seam in order to separate the two inspected pieces (4, 5). Before performing the said second cut, the plaiter (9) is turned towards a scraps-collecting container (21), so that the waste produced from the second cut will result conveyed thereto. After the second cut by the cutter (15) the plaiter (9) is again turned towards the underlying means for the collection of the inspected and marked pieces. When the cutter (15) is at the end of the cut travel, a corresponding electric limit switch sensor is activated which turns off the cutter and causes it to move back to the starting position. In case of plaiting of the pieces, the belt (11) of the platform (10) and possibly a vertical belt (22), are activated before each cut.

With reference to Fig. 5 of the drawings, said pieces marking means (12) comprise a press-cylinder (120) intended for properly applying labels in cooperation with means for the electrical heating thereof in case they are of thermoadhesive type, and a loader-cylinder (121) intended to perform the positioning of each label in correspondence of the piece to be marked. The labels can be inserted into a space (122) beside the loader-cylinder (121), which provides for transferring the label to the fabric-marking area (X) by means of a respective side pushing appendix (123). The press-cylinder (120) acts in cooperation of a fixed abutment (124) located on the opposite side of the cylinder (120) with respect to the fabric to be marked. The said cylinders (120) and (121) can be actuated in alternate sequence so as to have the press-cylinder (120) acting after the positioning of the label, that is, following the retraction of the rod of the loader-cylinder (121). Said abutment element (124) may be provided with labels heating means to allow for the attachment thereof on the right side of the pieces. Indicated in Fig. 5 are the supporting structural elements of the pieces marking means: said structural elements being associated to the bearing frame of the machine.

With reference to Fig. 6, the sewer (6) is provided with a V-guide (600) consisting of two shaped plates which rest on the base of the same sewer (6), with their respective exit section facing the mouth (601) of the latter, so that the juxtaposed edges of the pieces to be sewed together will result guided and presented to the sewer needle more correctly, thereby preventing the formation of crease or wrinkles during the sewing. To further improve the thus operated sewing, two blowing nozzles (602) may be mounted in proximity of the guide (600) with their respective outlets being oriented towards the mouth (601) of the sewer (6). Indicated with (603) in Fig. 6 is the coil for feeding thread to the sewer (6), and numeral (604) indicates the supporting and guiding structural elements of the sewer (6) : said structural elements (604) being associated to the machine bearing frame.

With reference to Fig. 7 of the drawings, according to an alternative embodiment of the means for positioning the edges of pieces (4, 5) ready for their seweing, such means comprise a bar (500) for compressing the pieces (4,5) in proximity of the sewer (6), said bar cooperating with an opposite counteracting bar (501) engaged to a respective actuation cylinder (502): said compressive bar (500) being engaged with a corresponding actuation cylinder (503) and connected to the fixed part of the machine by means of an eccentric hinge rod (504). The said cylinders (502, 503) being suitably constrained to the fixed part (505) of the machine. When seweing the pieces (4, 5), the bars (500, 501) are brought close to each other by the respective actuation cylinders (503, 505), in order to operate the compression of the edges of the pieces in proximity of the sewer mouth (601) and always in such a way as to cause the leading, and respectively trailing, edges of the pieces to be joined to result positioned by gravity inside the mouth (601).

With reference to Fig. 8 of the drawings, provision is made for cutting the pieces uspream and downstream of the head-tail seam in one operating step. This can be achieved by using a pair of parallel cutters (15) acting simultaneously. A pad clamp (150) is able to be positioned between the cutters (15) to compress and block the fabric in proximity of the seweing line of the two pieces during the operation of the same cutters (15). Said pad (150) being also operable by means of a corresponding cylinder (151) engaged to the fixed part of the machine. Numeral (210) indicates a cylinder for moving the container (21) for storing scraps produced upon the severance of the pieces, and numeral (211) indicates a cylinder operating the opening of the bottom (212) of the container (21) upon the unloading of the scraps.

Claims

1. Machine for the inspection of fabric in pieces united between them in a unidirectional cascade fashion, with means for weighing the pieces and individually delivering them to a backlighted inspection plane (1), means for carrying out the union of the trailing edge of a piece (4) already inspected, with the head of a piece (5) to be inspected, with an automatic sewer (6) able to carry out either a continuous or intermittent sewing of the two pieces (4, 5) in correspondence of said edges, according to a substantially horizontal seweing line, means for driving the united pieces (4, 5) from the inspection plane (1) to separates stations for the exit (H) or the collection (G) of the inspected pieces, means for collecting the inspected pieces, programmable electronic means (E) for operating the above said members of the machine, characterized in that it comprises means for superimposing the head of each to-be-inspected piece (5) with the tail of a corresponding inspected piece (4), with a bracket (60) pivoting about a corresponding horizontal axis below said plane (1) and having a plane (61) with members (62) for the temporary fixing of a portion of the head of the to-be-inspected piece (5), to allow for the positioning thereof in correspondence of the sewer (6), in conjunction with the tail of a corresponding inspected piece (4), and hanging down from said plane (1).

2. Machine according to claim 1, characterized in that said sewer (6) is located below and backwards of said inspection plane (1) and fixed to a motor-driven carriage sliding in a horizontal direction transversally to the pieces' direction of motion.

3. Machine according to claim 1, characterized in that said fixing members (62) are made up of a strip of "velcro" material or of a front of needles or points, or of pneumatic suction means able to keep said portion of piece (5) adherent to the plane (61) of the bracket (60).

4. Machine according to claim 1, characterized in that said bracket (60) is engaged to a corresponding operating cylinder (63) which drives it into rotation.

5. Machine according to claim 1, characterized in that it comprises means for marking the inspected pieces.

6. Machine according to claim 1, characterized in that said marking means (62) are located below and backwards of said inspection plane (1), so as to allow for marking the piece either on the reverse side thereof or on the right side thereof, that is, on the same side of the operator.

7. Machine according to claim 1, characterized in that it comprises a detector (14) able of detecting the presence and position of the seam operated by said sewer (6) to enable the intervention of an automatic cutter (15) located at a predetermined station for che unloading of the already inspected pieces and intended to operate the separation of the pieces sewed together before their unloading.

8. Machine according to claim 7, characterized in that said detector (14) comprises a spring feeler positioned downstream of said sewer (6) and associated to a microswitch which is interlocked to said programmable electronic means (E).

9. Machine according to claims 1 and 5, characterized in that the means (12) for marking the pieces comprise a press-cylinder (120) intended for properly applying labels in cooperation with means for the electrical heating thereof, in case they are of thermoadhesive type, and with a fixed abutment element (124) on opposite side with respect to the fabric, and a loader-cylinder (121) intended to perform the positioning of each label in correspondence of the piece to be marked.

10. Machine according to claims 1 and 9, characterized in that said labels can be inserted into a space (122) beside the loader-cylinder (121), which provides for transferring the label to the fabric-marking area (X) by means of a respective side pushing appendix (123).

11. Machine according to claims 1 and 9, characterized in that said abutment element (124) is provided with labels heating means to allow for the attachment thereof on the right side of the pieces.

12. Machine according to claim 1, characterized in that said sewer (6) is provided with a V-guide (600) consisting of two shaped plates which rest on the base of the same sewer (6), with their respective exit section facing the mouth (601) of the latter.

13. Machine according to claims 1 and 12, characterized in that it is provided with one or more blowing nozzles (602) with the respective outles being oriented towards the mouth (601) of the sewer (6) and mounted in proximity of the guide (600).

14. Machine according to claim 1, characterized in that the means for positioning a bar (500) for compressing the pieces (4, 5) in proximity of the sewer (6), said bar cooperating with an opposite counteracting bar (501) engaged to a respective actuation cylinder (502): said compressive bar (500) being engaged with a corresponding actuation cylinder (503) and connected to the fixed part of the machine

by means of an eccentric hinge rod (504).

15. Machine according to claims 1 and 7, characterized in that said cutter is double, that is, it is made up of two parallel units able to simultaneously cut the fabric upstream and respectively downstream of the bolts seam.

16. Machine according to claims 1 and 15, characterized in that it comprises means for retaining the fabric during the separation of the bolts.

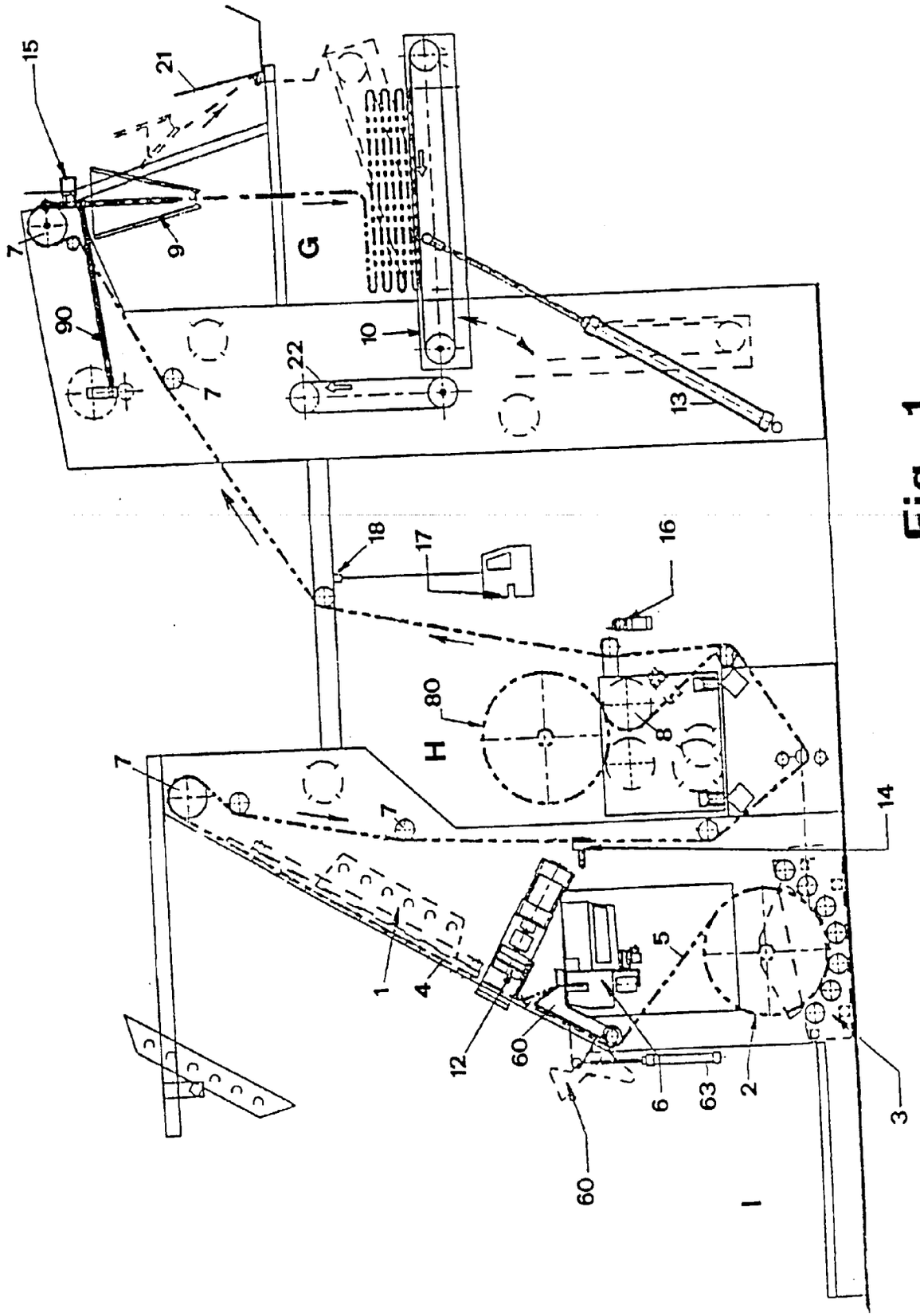

Fig. 1

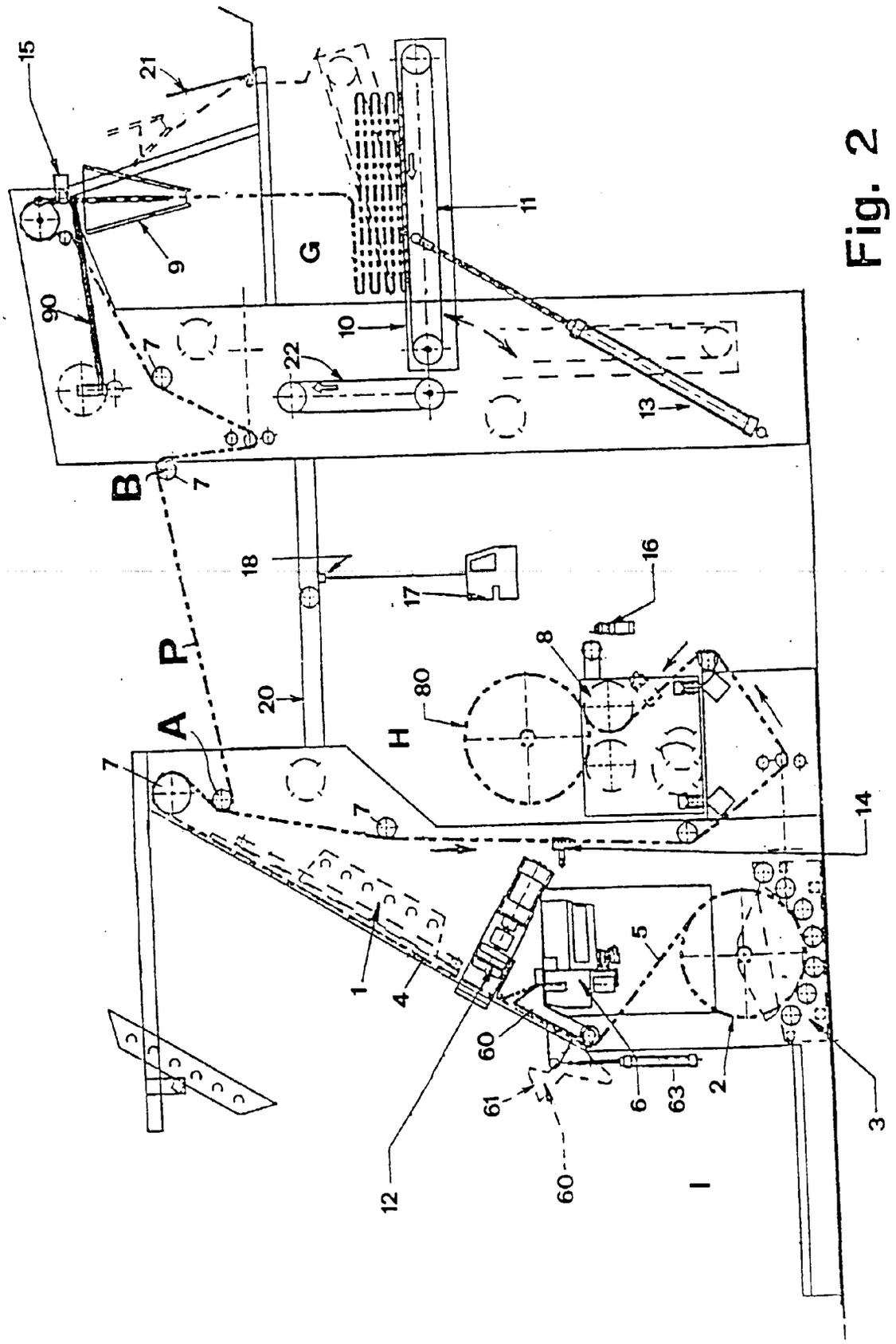
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Fig. 2

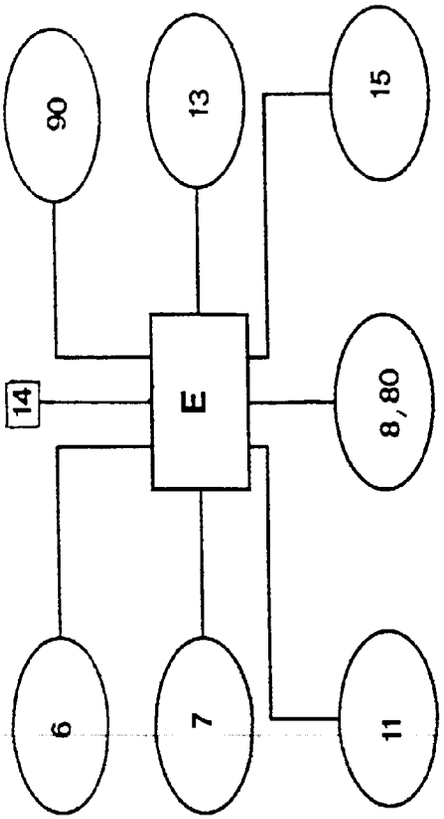


Fig. 4

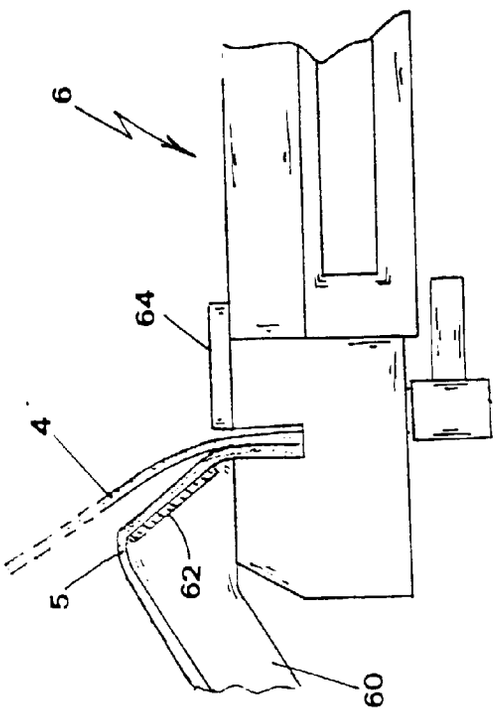
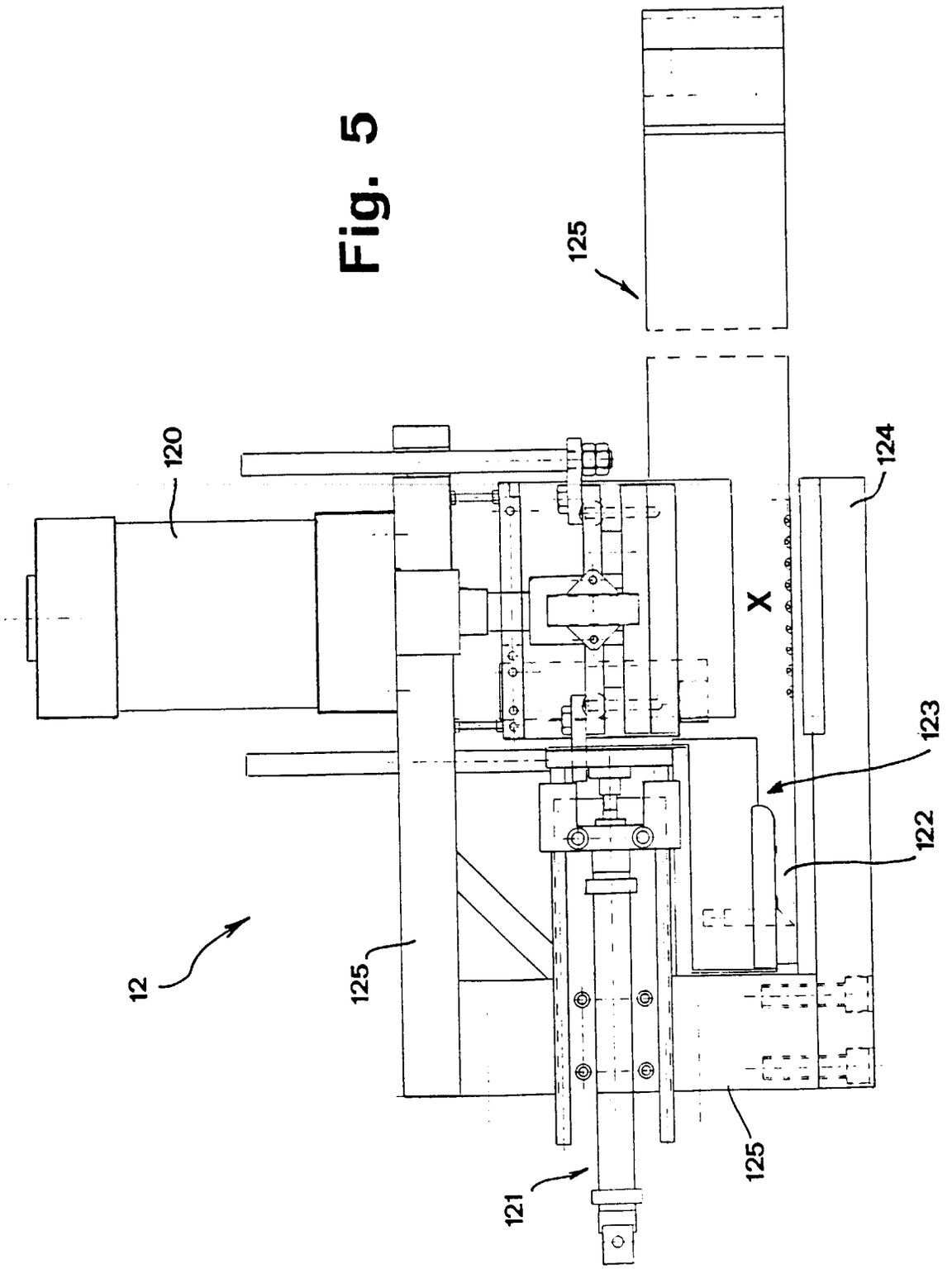


Fig. 3

Fig. 5



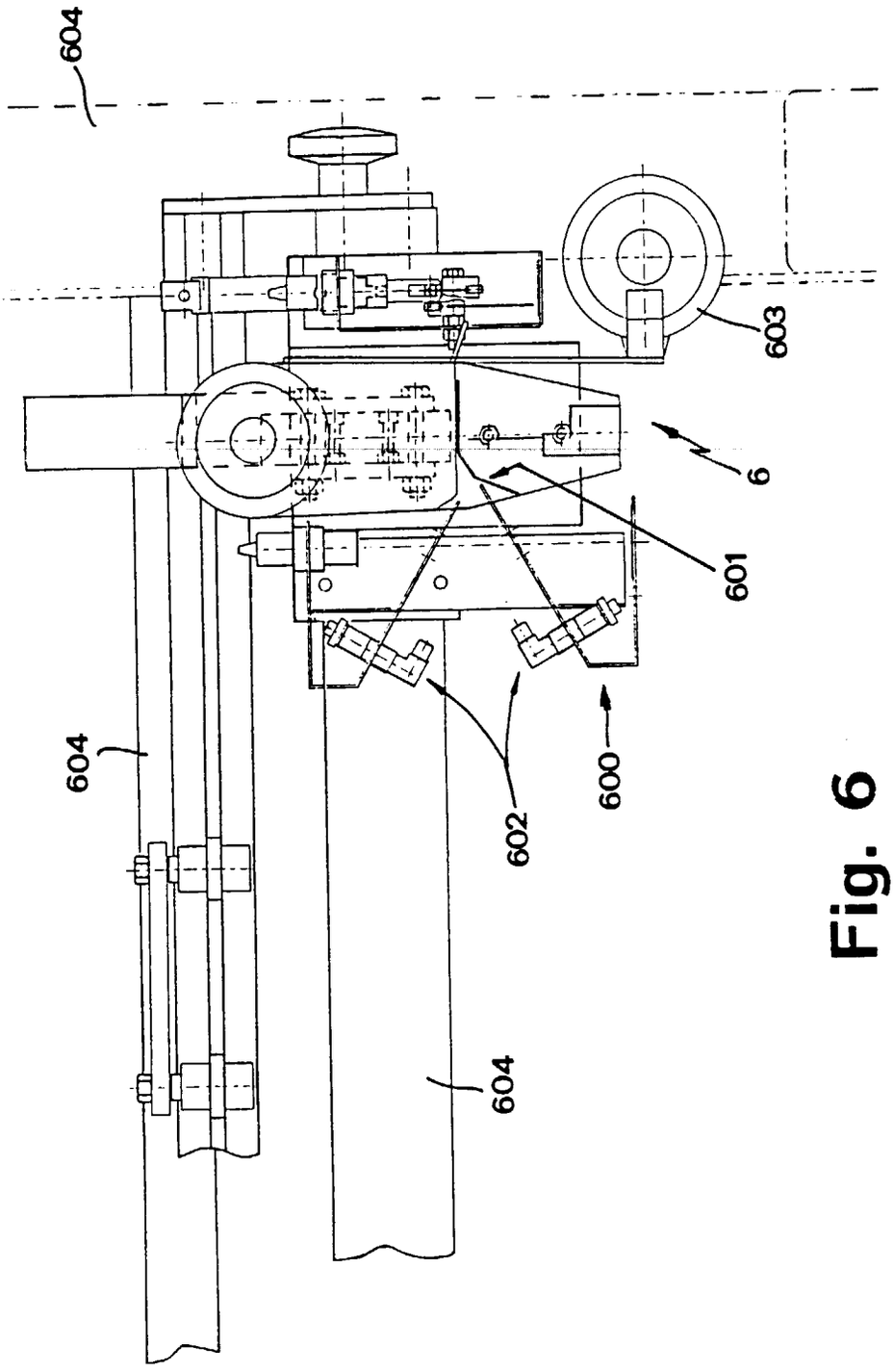


Fig. 6

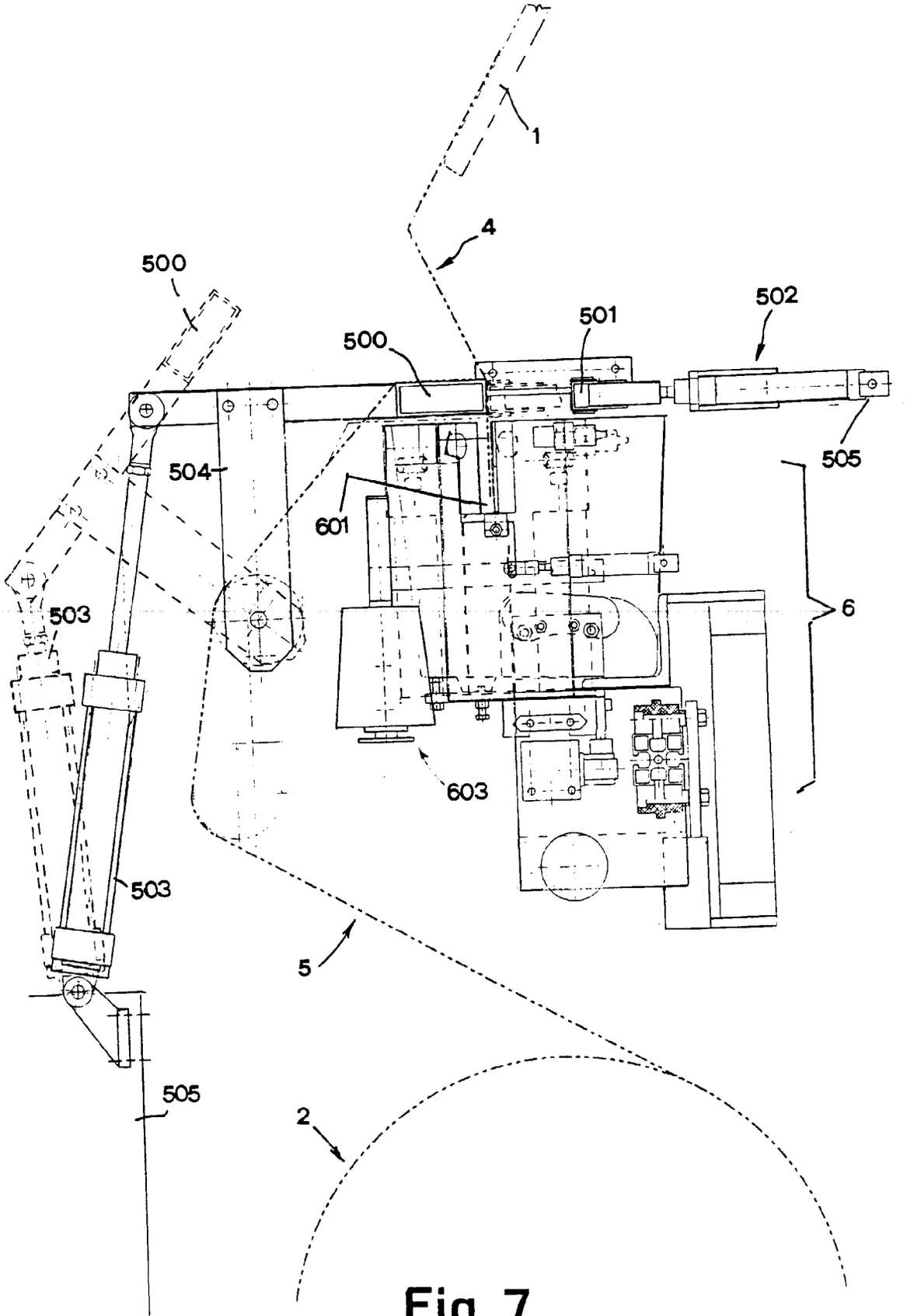


Fig. 7

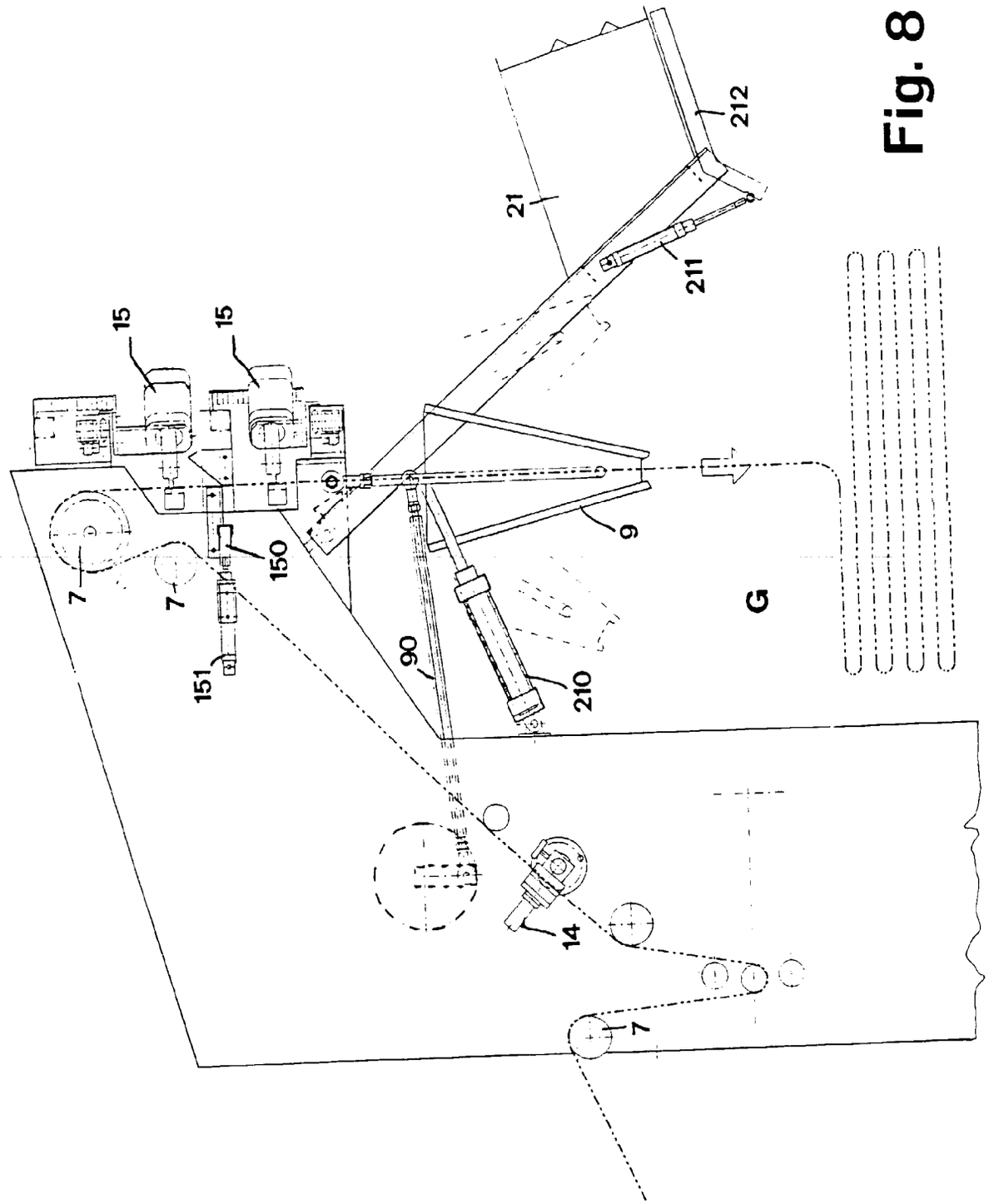


Fig. 8