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(71) Applicant: **INVESTRONICA S.A.**
Tomás Breton, 62
E-28045 Madrid-7(ES)

(72) Inventor: **Galan, Mario Andrada**
c/ Quintana No. 19
Madrid(ES)
Inventor: **Perez, Bernardo Alcantara**
c/ Rioja No. 13
Madrid(ES)
Inventor: **Gonzalez, Narciso Murillo**
c/ Marques de Lerma No. 7
Madrid(ES)

(74) Representative: **Puschmann, Heinz H. et al**
Spott und Puschmann Patentanwälte
Sendlinger-Tor-Platz 11
D-8000 München 2(DE)

(54) Improvements to a vacuum-grip cutting table.

(57) Improvements to a cutting table with vacuum grip, consisting of the provision of the means required to connect the vacuum to a conveyor (14) on which the strip material (12) to be cut with a numerically controlled machine is fixed.

In particular, the conveyor (14) is of the type made up by a succession of tiles (48) connected to the links of two chains (50) (or group thereof) which are closed and which slip or run along guides and mesh with at least two toothed wheels (54) which provide the movement.

On the upper face of the loop formed by the succession of tiles, a bridge (20) runs with supports and movement devices (30) of its own which provide it with the movement in -the same direction as the conveyor (14). - On this bridge (20), a carriage (22) moves with the tools for working the material (12). -

In order to hold the strip material (12), a vacuum is applied in accordance with the subject of this invention, under the working surface, formed by the upper face of the conveyor (14).-The said vacuum is applied to each of the tiles (48) which are hermetic enclosures with outlets only on the outside faces of the loop created by the conveyor (14).

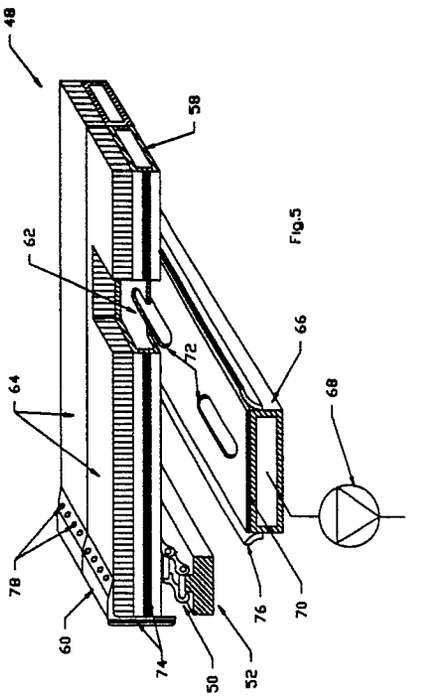

Fig.5

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IMPROVEMENTS TO A VACUUM-GRIP CUTTING TABLE

BACKGROUND TO THE INVENTION

There is a multitude of patents connected with the cutting of textiles or similar materials on fixed tables on which the materials are held in place by a vacuum. Because of the dimensions of the material to be cut (large lengths) mobile tables were provided which feed the material, so operating by sections, thus preventing cutting dimensions which are the same as or larger than those of the material to be cut. With this system, the means of vacuum grip cannot be of such a simple design as can be the case with a stationary table. The problem of sealing the moving parts led to the complete enclosing of the conveyor table in a hermetically sealed "drawer" leaving the top part open; once the fabric is in place, it is closed by some impermeable material which does not allow the passage of air and is normally thrown away once it has been pierced by the cutting blade.

Applications of this technology are to be found in the GERBER GARMENT TECHNOLOGY INC. Patents no. 520,922, 520,923, 520,924 or the STUMPF Patent no. 4,322993.

One of the disadvantages of the said system is the sturdiness required for the drawer, since the vacuum levels used, and the relatively large areas, give rise to very high forces (of some tons).

Other solutions which have been developed include the construction of a hermetically sealed chamber under the cutting table surface which, through valves, communicates with separate sections, as in the Gerber Patent no. 506,931. A suitable synchronism ensures that the open valves provide a vacuum to the area of the material on which the cutting tool is working.

This method only partly solves the problem, since the sectioned area under vacuum must be large enough to cover an area of the material which ensures that it is held fast in spite of the action of the cutter; thus high load levels must be sustained.

Subsequent work led to increased sectioning of the area of the vacuum, and the cutting table became over-complicated; see Gerber Patents 4,485712, 4,528878, in the USA.

The following is a simple solution of the vacuum application, which does not create large sealed chambers nor does it require sectioning, so that construction is dramatically simplified.

SUMMARY OF THE INVENTION

This invention consists of the provision of the devices need to deliver the vacuum to a conveyor table where the strip material to be cut with a numerically controlled machine is held in place.

In specific terms, the table is of the type made up of a succession of tiles connected to the links in two chains (or group thereof) which are closed and slip or run on guides and mesh at least on two toothed wheels which provide the movement.

On the upper surface of the loop formed by the successive tiles, a bridge runs with supports and displacement devices of its own which provide it with movement in the same direction as the conveyor. On this bridge, a carriage runs which has the tools required for working the material.

In order to secure the strip material, a vacuum is applied, in accordance with the subject of this inventtion, under the working surface which is formed by the conveyor's upper face. The said vacuum is communicated to each of the tiles, which are hermetically sealed enclosures with outlets only on the surfaces outside the loop formed by the conveyor.

The following figures are included:

Figure 1 is a cutting machine of the type used in the technology included in this invention.

Figure 2 is a detail of the X-Y axis transmission elements.

Figure 3 is a diagrammatic profile view of figure 1.

Figure 4 is a detail of the mobile table.

Figure 5 is a detail of the section in which the vacuum is delivered to the cutting zone.

Figure 6, sectional view of the mobile tiles.

Figure 7 is a perspective view of the tiles, with another design for the end seal.

Figure 8 is a diagram of the general pressure distribution.

DESCRIPTION OF THE INVENTION

Figure 1 shows the cutting machine which incorporates this invention -1-, of the type generally used in this process, and which is briefly described hereinbelow.

From a spreading table -5-, the stacking of strip-material -12-is fed by the conveyor -14-. The cut panels -18-are withdrawn at zone -16-and, as well, at the adjacent section of the conveyor.

The geometry of the cut is obtained by movement of the bridge -20-or X carriage, and the Y carriage -22-. A controller -24-handles these move-

ments, driving the motors of the X and Y carriages.

The carriage -22-has a suitable cutting tool for the material to be worked which, as can be seen from figure 2, is directed on guides -26-. This figure also shows the drive motor -28-and the belt which transmits the movement -30-. Three motors are to be found in this carriage; the blade drive motor, that for aligning the blade in the tangential direction on the cutting line, and the sharpening motor.

The X axis carriage is directed on the guides -32-and its motor -34-, moored on the frame, moves the bridge by means of belt -36-.

The interaction between the cut and the table movement described in Spanish patent no. 541,826 held by the applicant is briefly described by way of continuation.

The conveyor is divided into three sections, as can be seen in figure 3; a feed zone -38-, a cutting zone -40-and a collection zone -42-.

The material is spread in advance on a table -5-in which holes for the admission of pressurised air facilitate the slippage of the material in the direction of the cutting machine. After cutting the panels which are whole in the cutting zone, beginning at the point of the X = O abscissus, the conveyor, driven by a motor -44-can move along the minimum abscissus, corresponding to the next panel to be cut, and which was not wholly within the cutting window -40-.

The previously cut section of material will be in zone -42-which continues to a collection table -16-.

The panels furthest from the cutting zone will be collected, and, when the bridge is close to the maximum abscissus, those which are closest, for reasons which will be explained below.

The connection between tables -16-and -5-with the conveyor is by means of combs, -46-, which provide a smooth transition in feed and collection.

Figure 4 shows the conveyor table; for clarity, the loading and unloading tables are not shown, nor are the X carriage drives and guides.

The chain of tiles -48-is shown, fixed to the chain -50-which is guided on a suitable section, preferably of plastic material for elimination of friction and noise. The wheels -54-driven by motor -44-move the chains in accordance with the orders and data from the controller, which follows the working sequence previously described. An optical codifier -56-secured to the shaft gives on-going information on the exact position of the chain so that, by comparison against the signal from the codifier which is incorporated into the X carriage drive motor -34-the relative positions of the bridge and conveyor will be available.

Figure 5 shows detail of the construction of the tiles -48-, along with the vacuum communication system which maintains the material to be worked in place under atmospheric pressure, which is the basic purpose of this patent.

The said tiles are made up of a hollow tube -58-which is hermetically sealed at the ends by sections -60-; on the underside there is a large opening -62-and, on the upper surface, a variety of holes which connect with blocks of bristles or mats which are permeable to air -64-.

Figure 6 shows the detail of a preferred connection between the said tube and mats; with this system, by extracting the end section -60-, the mats can be removed. The drill holes -59-and the base -61-, permeable to air, are shown.

The succession of the said blocks forms the working surface which, in this case, is a surface which can be penetrated by a cutting blade.

The tube -66-is secured in the conveyor; with the appropriate connections, it links with the vacuum generated by pump -68-. On the upper face of tube -66-, a strip of plastic material -70-is fixed, with low friction and wear rates. Tube -66-and strip -70-have wide openings -72-delivering the vacuum through holes -62-to the tiles -48-which slip over the said strip. When the chains -50-linked to the tubes -58-, drive the tiles, drill-holes 62 and 72 are always wholly or partially aligned, so that the vacuum can be delivered; this is because the distance between holes -72-is less than their length while, at the same time, they are the same size as the holes -62-in the tiles. From tubes -58-, the vacuum flows to the mats -64-; to prevent leaks between the tiles gaskets -74-are provided. Similarly, to ensure the seal between strip -70-and the tubes -58-, rubber strips are provided -76-to complete the hermetic seal of the inside face of the conveyor's working surface.

Another preferred design replaces the drill-holes -72-for a continuous opening of the length corresponding to the area of application of the vacuum, so that the air movement in the holes -62-in this area is never impeded.

The upper face formed by the mats -64-is the support for the material to be cut; if it is not sufficiently impermeable, throw-away plastic can be used to close this surface, and the material, or the plastic and material is held in place under atmospheric pressure.

In the sections -60-, there are drill holes -78-for securing the covering plastic by means of the vacuum, thus preventing these sections -60-from entering the connections.

Another design for the tile ends shown in figure 7 would be to replace the sections -60-with blocks of flexible material -120-which is also impermeable, e.g. some type of plastic foam, which would be at the same height as the mats -64-, but slightly wider; the compression of this excess over the tile is what would prevent side leaks; in the previous

version, this was the function of the gasket -74-on the side of section -60-.

Depending on the length of zones 38, 40 and 42 in figure 3, the length is fixed of the drilled section of tube -66-or, in other words, the length over which the vacuum is applied to the tiles. Figure 8 shows a general layout of pressures, described qualitatively by way of continuation.

The pump -68-generates a P0 vacuum, part of which is lost in the ducting to the input to tube -66-. If a pressure of P1 is obtained at the said input, there is a further loss of load in the transition to the tiles, in other words, at the mat, pressure P2 will be greater than P1. As the securing of the material -12-is based on the difference between pressures Pa-P2, P2 needs to be as low as possible, thus requiring the smallest possible loss between the pump output and the mat or, in other words, P2 should be similar to P0, which is the lowest pressure in the entire circuit.

The said difference of pressure should be at a maximum in the cutting zone -40-, and, at zone -38-, it should be enough to carry the fabric from the spreading table.

At sections A and B, where the loop begins to curve, there is an opening to the atmosphere, so that pressure P2 should increase progressively through the mat, until reaching atmospheric pressure Pa.

The vacuum application must be introduced as far as possible into zone -38-; however, if in this zone the pressure is P3, the loss of load Pa-P3 needed at opening B will be obtained with high flows, so that the pump's level of impulsion will not be sufficient. This the suction zone tends to be concentrated and to be kept away from the open end sections, so as to obtain a good Pa-P3 difference. This gentle drop, because of the length of mat reached, ensures that the material will be sufficiently secured over an area which will allow it to be moved.

In the A section on the discharge end, the problem is not so great; all that is required is to take the precaution described above in the method for operation of collection from zone -42-, first, of panels which are nearest to Section A and, when the cutting bridge is at the end of the cutting zone -40-, to collect the panels which are inside the collection zone.

Claims

1.-Improvements to a vacuum-grip cutting table, consisting of the provision of the means necessary to connect the said vacuum from a stationary source to the movement table, the cut being done by successive sections of the stacking of the flexible material which is moved forward by the mobile table.

The said means comprise a central suction pipe which is moored to the frame of the machine and which is hermetically sealed except on the top side, where there are holes which are aligned with a further set of holes in the bottoms of tubes or tiles located at right angles to the others and which are driven by chains, to form the supporting base of a penetrable surface which is permeable to the air, e.g. a mat, and on which the material to be worked is placed. The means are provided to ensure that there are no leaks where the vacuum connects from the central pipe to the tiles which form the moving loop, and creating a seal between the tiles themselves, since the vacuum generated inside them must only reach the penetrable surface through holes made for this purpose, and from there to the top face where the fabric is in place. The fabric is secured thanks to the difference in atmospheric pressure (upwards), and the vacuum created in the mat.

2.-Improvement to a vacuum-grip cutting table, pursuant to claim 1, consisting of the placement of a plastic strip with a low friction coefficient on the top surface of the central suction pipe, which has a set of holes in line with those on the said pipe, and on which the tiles slip.

3.-Improvement to a vacuum-grip cutting table, pursuant to claim 1, in which the arrangement of holes in the central suction pipe is such that, for any position of the moving table, there is a complete or partial alignment between these holes and those in the undersides of the tiles, since the distance between the holes in the pipe is less than their length, and the length of the holes in the tiles is also the same.

4.-Improvement to a vacuum-grip cutting table, pursuant to claim 3, wherein, with another preferred design, a continuous slot in the central suction pipe ensures the complete flow of air through the holes in the tiles.

5.-Improvement to a vacuum-grip cutting table, pursuant to the previous claims wherein, so as to prevent vacuum loss (air input) in the link between the fixed pipe and the moving tiles, rubber strips are fitted on to the central pipe, in contact with the plastic support strip, and which rub on the bottom surfaces of the tiles and so guarantee a hermetic seal, in collaboration with the pressurised seal formed by the tile support on the plastic strip.

6.-Improvement to a vacuum-grip cutting table, pursuant to the previous claims, wherein plastic gaskets are fitted between the pipes formed by the tiles, fixed or housed in their sides, at right angles to the direction of movement, to prevent the entry of air from outside the loop in the direction of the mats.

7.-Improvement to a vacuum-grip cutting table, pursuant to claim 1, wherein the ends of the tiles are rigid parts which hermetically seal the pipes and on which gasketting is fitted to prevent air from entering from the sides of the table in the direction of the mats.

8.-Improvement to a vacuum-grip cutting table, pursuant to claims 1 and 7, wherein the end sections, in another preferred design, are made of plastic foam which, when compressed between one tile and another, seal off the admission of air.

9.-Improvement to a vacuum-grip cutting table, as has been described in the foregoing Specifications, shown in the attached drawings, and for the purposes set out.

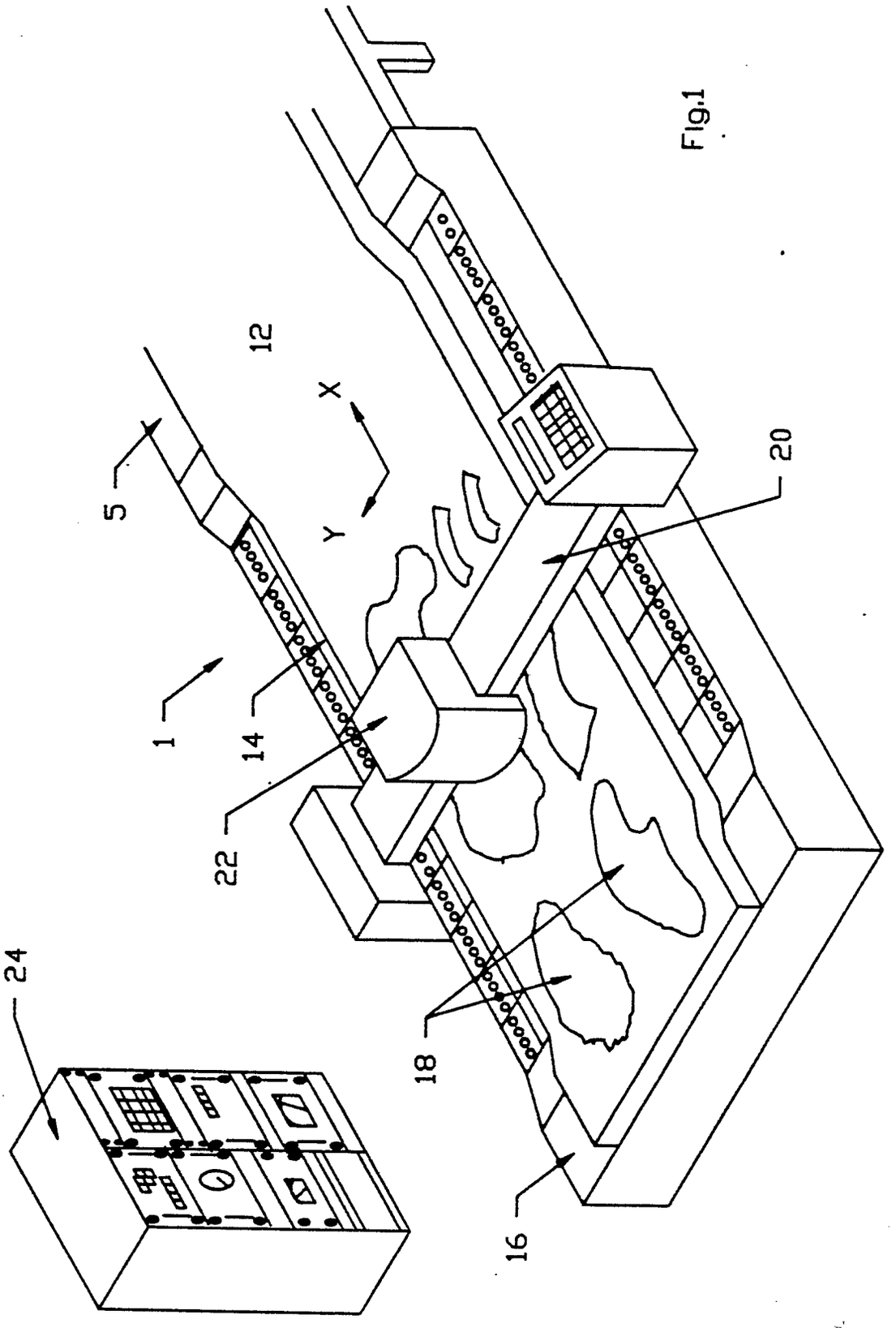

Fig.1

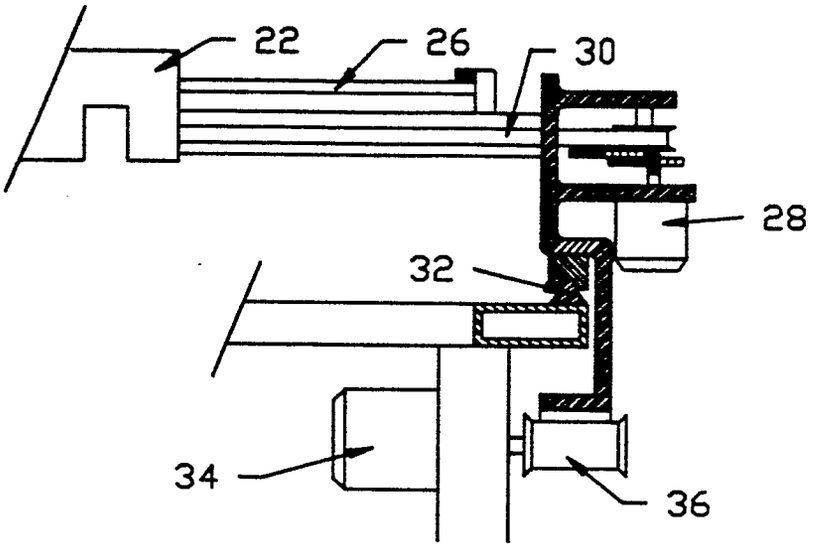

Fig.2

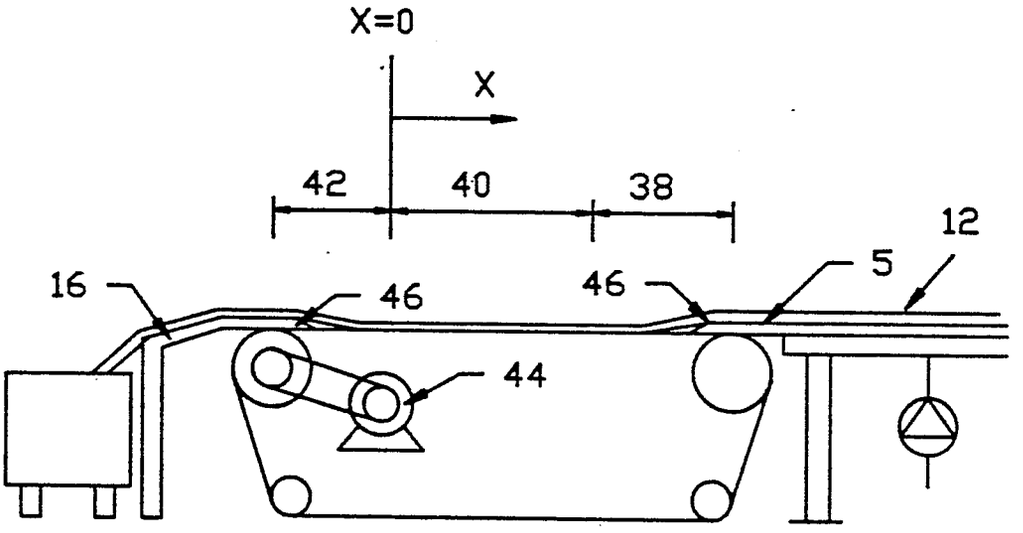

Fig.3

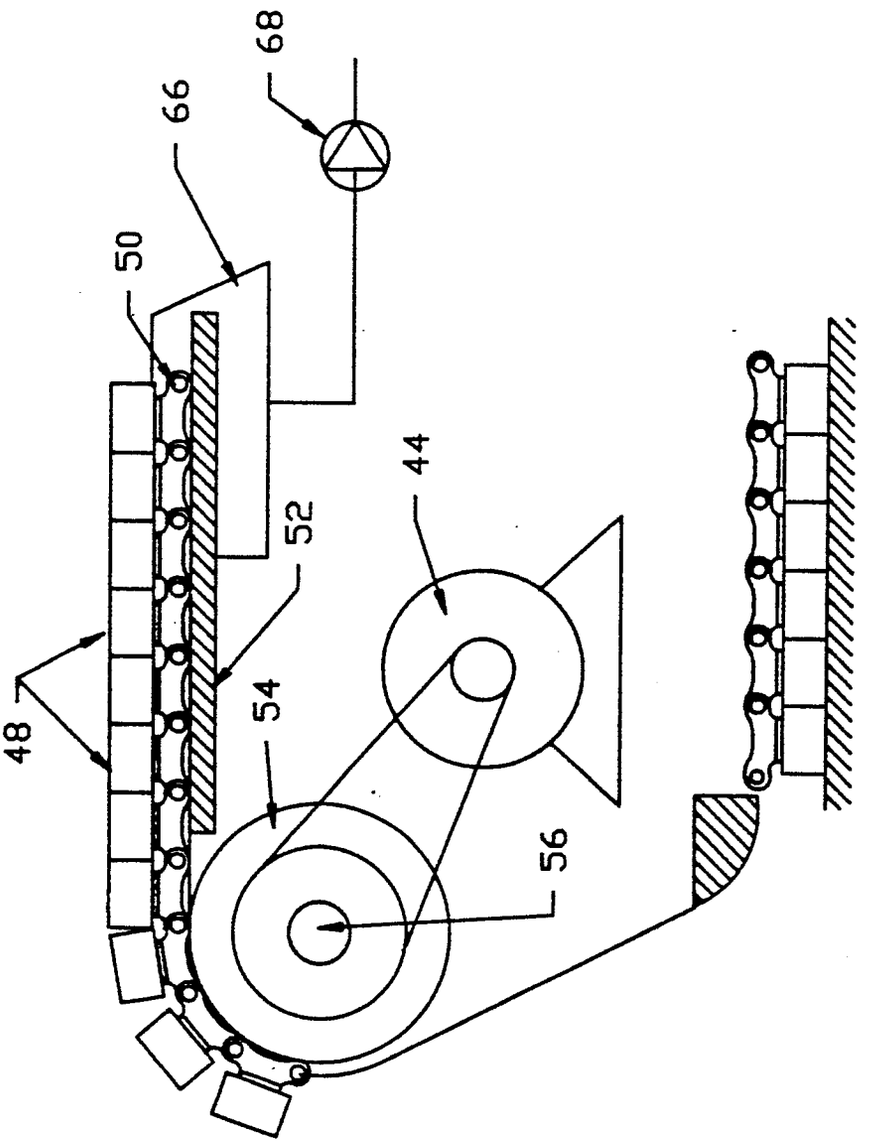

Fig.4

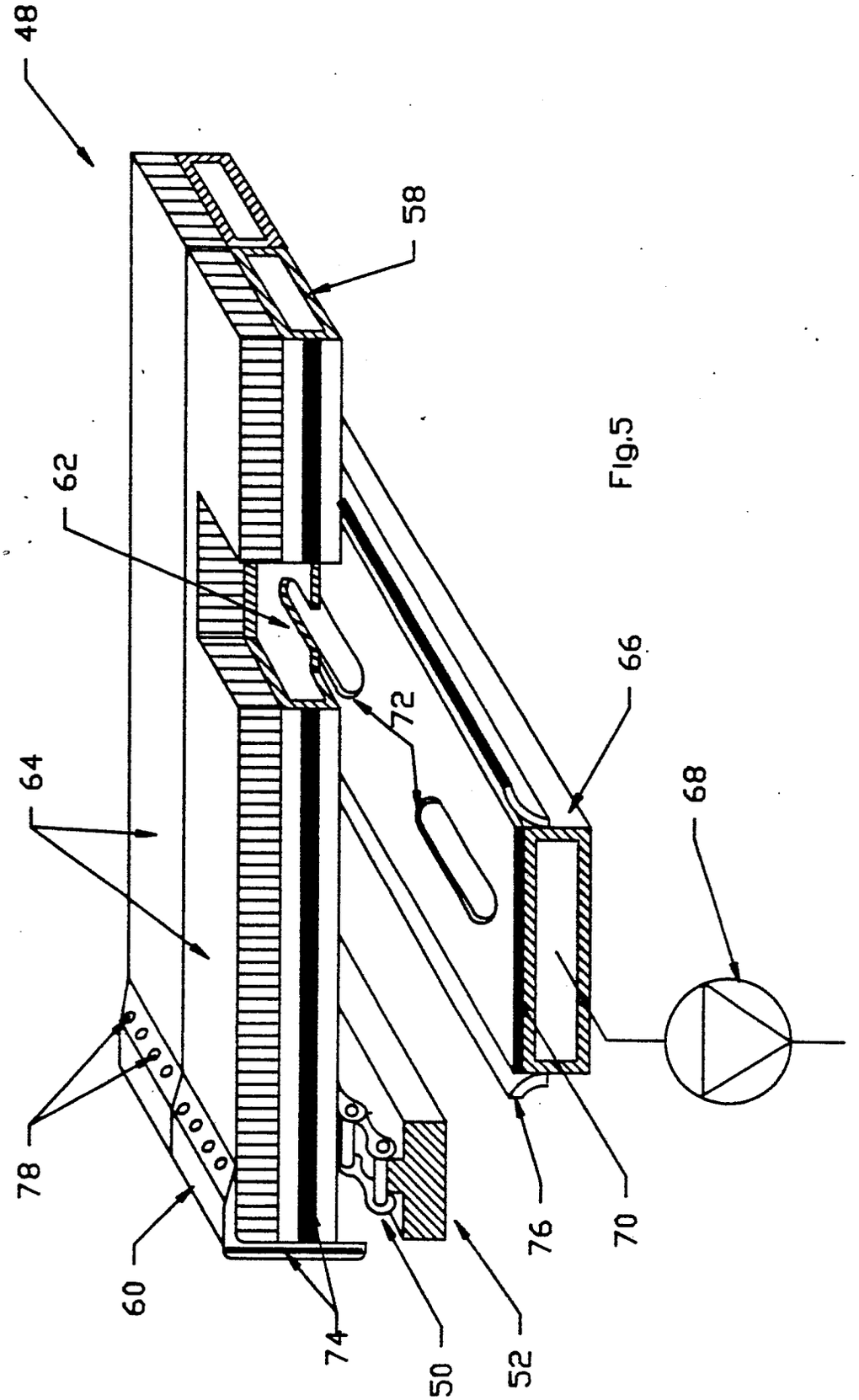

Fig.5

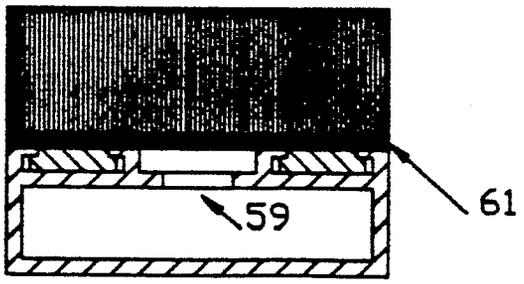

Fig.6

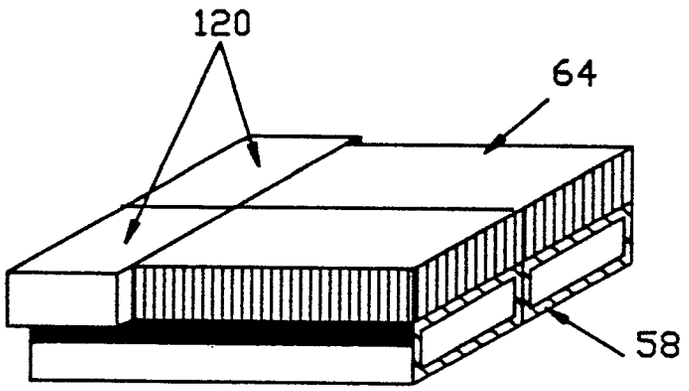

Fig.7

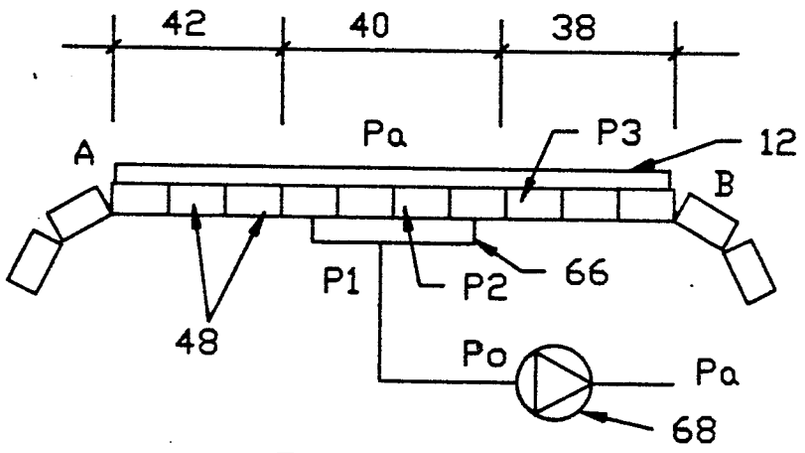

Fig.8

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 87118526.0

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE - A - 2 065 230 (GERBER GARMENT) * Fig. 1; page 5, lines 17-31 * --	1	D 06 H 7/24 B 26 D 7/20
A	US - A - 4 494 433 (GERBER) * Fig. 2; column 3, lines 49-67 * --	1,2,5	
A	DE - A1 - 2 908 701 (STUMPF) * Fig. 3,4 * --	6,7	
A	DE - A1 - 3 616 483 (GERBER SCIENTIFIC) * Fig. 17 * --	1	
A	US - A - 4 345 496 (PEARL) * Totality * --	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	EP - A2 - 0 155 665 (ONTARIO DIE) * Fig. 1; claims * --	1	D 06 H 7/00 B 26 D 7/00 B 26 F 1/00 A 41 H 43/00
D,A	US - A - 4 528 878 (GERBER) * Totality * --	1	
D,A	US - A - 4 485 712 (GERBER) * Totality * ----	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	29-02-1988	WEBER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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