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(54) **Machine for the automatic cutting of striped or checked fabric or fabric with printed panels**

(57) This document regards a machine for the automatic cutting of striped or checked fabric or fabric with printed panels, including a bench (12) covered with a mat of brushes (26) upon which several overlapping layers of fabric are lain to be cut, a system of electronically-controlled orthogonal axes (14) positioned above said bench (12) for the movement of a blade for cutting fabrics according to a cycle programmed into the machine, a conveyor belt (16) for unloading the fabrics which have

been cut and a suction system positioned under the bench to block the fabric mattress in place during the cutting operation. At least part of said bench (12') is equipped with a series of needles (17) for tapping the fabrics to be cut, which emerge from the mat of brushes (26) to block the fabrics in place before the cutting operation and can be extracted from the mat of brushes (26) to enable the passage of the cutting blade between the bristles of the brushes during the cutting operation.

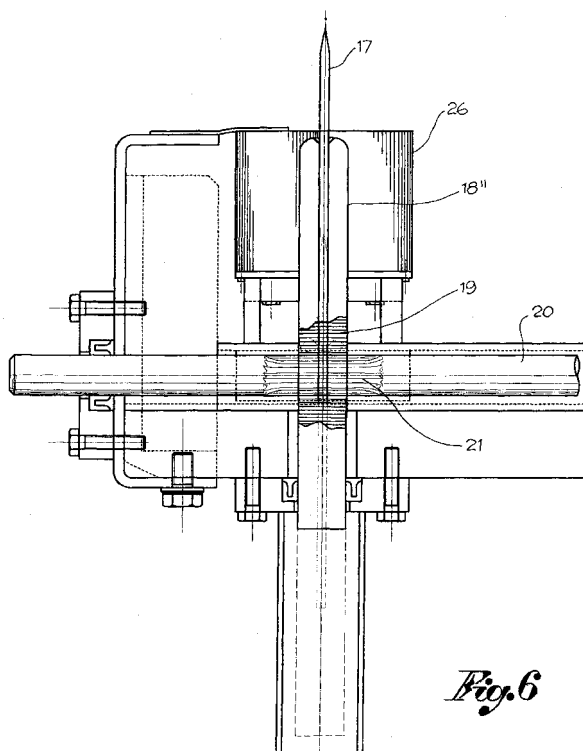


Fig. 6

EP 1 331 070 A1

Description

[0001] This document regards the textiles machinery sector and refers particularly to a machine for the automatic cutting of striped or checked fabric or fabric with printed panels.

[0002] When it is necessary to simultaneously cut several overlapping layers of these types of fabric forming a mattress, the various layers of fabric must be perfectly aligned to obtain a high quality finished product.

[0003] Currently, the cutting of striped or checked fabric or fabric with printed panels can be carried out in various ways, in situations involving a mattress composed of several overlapping layers of fabric on tables or benches equipped with a series of retractable or externally positioned needles which keep the patterns on the various layers of fabric correctly aligned. This laying out of the mattress on the needles is known as "tapping" the fabric. Using a manual, rotary or alternative cutters, a rough cut is made from which to cut the pieces. The more precisely cut pieces are retapped and trimmed using chain saws and templates.

[0004] There are also automatic machines equipped with shears for cutting out fabric pieces for the creation of garments. These machines have brushed surfaces onto which the mattresses of fabric to be cut are lain, and motorised axes to which the alternately vertically movable cutting tool is mounted.

[0005] Depending on the cycle programmed into the machine, the electronically controlled axes are capable of automatically cutting the shapes created according to the sizes and models given. The brush surface enables the cutting tool, during alternate vertical movement, to remain constantly below the base surface on which the mattress of fabric is lain. Moving between the bristles of the brushes when forming the figures.

[0006] To hold the layers of fabric forming the mattress in place during the cutting operation, these machines are equipped with a very powerful suction system to create a vacuum around the mattress, preventing it from moving. For this reason the mattress is covered with a sheet of lightweight plastic material (carthene). The mattress of layers of fabric is usually carried to the cutting machine by a conveyor belt.

[0007] Today's machines however cannot be used to cut striped, checked or panelled fabric due to the fact that, during transportation to the cutting area, the overlapping layers might move and, even if this movement is just slight, when they are locked in place by suction, they may be misaligned. The automatic cutting of fabric tapped with needles is also impossible due to the difficulty in transporting the mattresses from the table to the layout bench and to the cutting area caused by the presence of the needles. So the needles have to be removed before transferring the mattress to the cutting machine.

[0008] The aim of this project is to provide a machine for automatically cutting striped or checked fabric or fabric with printed panels, in which the layers of fabric to be

cut are perfectly aligned one on top of the other so that the cutting operation can be performed with the best possible precision.

[0009] Another aim is to provide a machine for the aforementioned use in which the mattress of layers of fabric to be cut is transported to the cutting area while being held in place with a series of needles, in other words, while it is tapped.

[0010] Yet another aim is to increase the production capacity of the cutting machine and drastically reduce the time required to cut the fabric.

[0011] These aims are achieved with an automatic cutting machine for striped or checked fabric or fabric with printed panels, including a bench covered with a mat of brushes onto which several overlapping layers of fabric to be cut can be laid in mattress form, a system of electronically-controlled orthogonal axes positioned over the same bench for moving a cutting blade held by a special head which cuts the fabric according to a cycle programmed into the machine, a conveyor belt for unloading the cut fabrics and a suction system positioned underneath the bench for holding the mattress in place during the cutting operation, where at least part of said bench is equipped with a series of needles for tapping the mattress to be cut. These needles emerge from the mat of brushes to block the fabric in place before the cutting operation and can be extracted from the mat of brushes to enable the passage of the blade between the bristles of the brushes during the cutting operation.

[0012] Further details of the project will become clearer as the description continues with reference to the drawings enclosed, which are to be considered mere drafts and not binding in any way, and include:

Figure 1, which shows a plan as seen from above of the automatic fabric cutting machine equipped with a bench equipped with brushes and needles; Figure 2, which shows a plan as seen from above of the automatic fabric cutting machine prepared to receive a trolley carrying a bench equipped with brushes and retractable needles; Figure 3, which shows a plan as seen from above of the machine shown in Figure 2 prepared to receive a trolley carrying a standard conveyor belt for feeding in mattresses made of standard fabrics; Figure 4, which shows a needle inserted into a mat of brushes in a first formation; Figure 5, which shows a needle inserted into a mat of brushes in a second formation; Figure 6, which shows a needle inserted into a mat of brushes in another formation; Figure 7, which shows a plan as seen from above of the means of inserting and extracting the needles shown in Figure 6 into and from the mat of brushes.

[0013] In these drawings the number 11 is used to indicate a machine for the automatic cutting of overlapping layers of fabric forming a mattress.

[0014] The machine includes a bench (12) made up of a mat of brushes (26) onto which the mattress (13) of fabric to be cut is lain, a system of electronically-controlled orthogonal axes (14) positioned above said bench (12) for the movement of a cutting blade held by a special head (15) according to a cycle programmed into the machine, a conveyor belt (16) for unloading the fabrics which have been cut and a suction system (not shown) positioned under the bench (12).

[0015] According to the project, at least a part (12') of the bench (12) with brushes is equipped with a series of retractable needles (17), which emerge from the mat of brushes (26), for tapping the fabrics used to make up the mattress which features stripes, checks or printed panels. The needles are housed in needle bushes (18, 18' and 18'') positioned in the required points of the bench, destined for crossovers.

[0016] According to a first formation - Figure 4 - the needles (17) can be inserted into and extracted from the upper part of the related bush (18) housed in the bench (12).

[0017] In a second formation - Figure 5 - the needles are made from flexible material and the related bushes (18') have a curved lower end which can be used to insert them into or extract them from the bench (12) either in parallel or from above.

[0018] In a third formation - Figures 6 and 7 - the needles (17) are fastened into the respective needle bushes (18'') which are vertically moveable compared with the bench (12) between a raised position, in which the needles emerge from the mat of brushes, and a lowered position, in which the needles emerge below the mat of brushes. These bushes are moved by a mechanical system controlled from outside the bench. In particular, each needle bush (18'') has a toothed rack (19) destined to fit into a corresponding pinion or toothed reel (21) along a respective horizontal shaft (20) ending outside the bench (12) with a manoeuvring device. As shown in Figure 7, a control shaft (20) can activate several needle bushes (18'').

[0019] According to a preferred formation of the project, the bench (12') equipped with retractable needles is positioned on a trolley (23) and the cutting machine (11) has a U-shaped extension for receiving the trolley (23) at the opposite side to the conveyor belt.

[0020] Once fitted inside the extension (24), the trolley (23) becomes an integrated part of the machine and can be reached by the cutting blade, the suction system for blocking the overlain mattress and by any other devices fitted to the machine.

[0021] This solution makes it possible to increase the production capacity of the cutting line as, having several trolleys equipped with brushes and needles, it is possible to prepare another mattress on a trolley which can be immediately inserted in the machine as soon as the first is removed. In this way the cutting machine is never idle and its capacity is exploited to the full.

[0022] To enable the machine configured in this way

to operate normally, for cutting fabrics without stripes, checks or printed panels, and therefore not requiring the use of tapping needles, it is possible to make a trolley bearing a conveyor belt (25) instead of a bench of brushes and needles - Figure 3. Once inserted into the cutting machine extension (24), this trolley will transport the standard mattresses onto the bench of brushes (12) which is usually fitted to the machine.

[0023] In order to enable the cutting tool to move under the surface on which the fabric mattress is lain, it is possible to replace the brushes with a polystyrene panel, which can obviously only be used once.

[0024] The machine in question operates intuitively: after laying out the fabric on the mat of brushes equipped with needles, either integrated into the machine or positioned on a trolley, and after forming a mattress made up of several layers of fabric, it is covered with a layer of carthene. The suction device is activated, creating a vacuum which locks the mattress in place while it is still tapped by the needles.

[0025] At this point the needles can be extracted using any of the aforementioned methods in order to allow the passage of the cutting blade according to the geometry of the garment to be made.

[0026] The machine described here would make it possible to fully eliminate the problem created by the shifting of stripes on the fabric during the transferral of the mattress from flat outside tables to the automatic machine mats, obtaining high-precision cutting which would also make it possible to avoid the rough cutting, retapping and trimming phases.

[0027] Obviously the CAD positioning of the tapped figures is prepared for this type of cutting.

Claims

1. Machine for the automatic cutting of striped or checked fabric or fabric with printed panels, including a bench (12) made up of a mat of brushes (26) onto which several overlapping layers of fabric to be cut are lain, forming a mattress, a system of electronically-controlled orthogonal axes (14) positioned above said bench (12) for the movement of a cutting blade held by a special head (15) according to a cycle programmed into the machine, a conveyor belt (16) for unloading the fabrics which have been cut and a suction system positioned under the bench to block the mattress in place during the cutting operation, **characterized by** the fact that at least part (12') of said bench is equipped with a series of retractable needles (17) for tapping the mattress to be cut, which emerge from the mat of brushes (26) to block the fabrics in place before the cutting operation and can be extracted from the mat of brushes to enable the passage of the cutting blade between the bristles of the brushes during the cutting operation.

2. Machine according to claim 1, in which said needles are moveably housed in needle bushes positioned in the required points of the bench.

3. Machine according to claim 2, in which said needles (17) can be inserted into and extracted from the top of the related bushes (18). 5

4. Machine according to claim 2, in which said needles (17) are flexible and in which the related bushes (18") have a curved lower end which can be used to insert them into or extract them from the bench (12) parallel to bench. 10

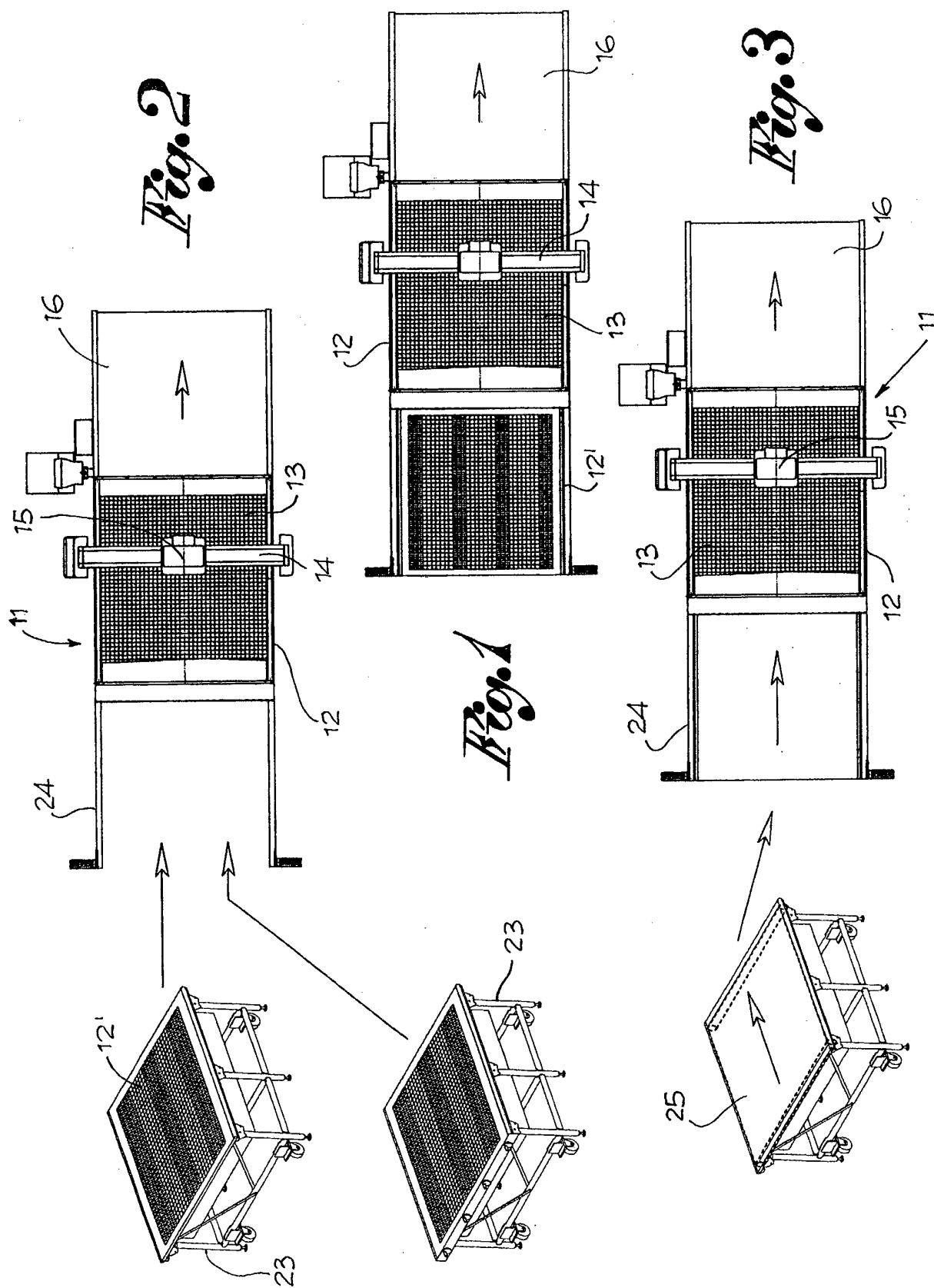
5. Machine according to claim 1, in which every needle (17) is fastened into a respective needle bush (18") which is vertically moveable compared with the bench (12). These bushes are moved by a mechanical system controlled from outside the bench. 15
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6. Machine according to claim 5, in which every each bush (18") has a toothed rack (19) destined to fit into a corresponding pinion or toothed reel (21) along a respective horizontal shaft (20) ending outside the bench (12) with a manoeuvring device for rotation and consequent vertical movement of the associated bush. 25

7. Machine according to any of the above claims, in which the part (12') of the bench (12) equipped with needles (17) is positioned on a trolley (23) which can be moved around the cutting machine and the cutting machine has a U-shaped extension (24) for receiving the trolley (23) at the opposite side to the conveyor belt. The part (12") of the bench positioned on the trolley can be reached by the cutting head and the suction system when it is housed in the machine extension (24). 30
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8. Machine according to claim 7, including at least one trolley (23) bearing a conveyor belt (25) to be inserted into the cutting machine extension (24) to feed the machine with mattresses of fabric which do not require the use of tapping needles. 40
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9. Machine according to any of the above claims, using a polystyrene panel as the surface upon which to lay the mattress of fabric on the bench (12) instead of a mat of brushes. 50
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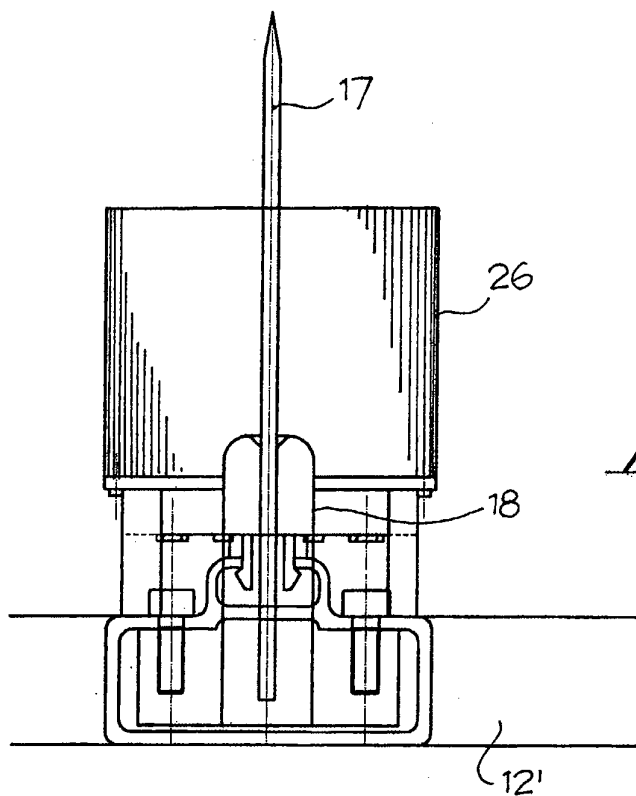


Fig. 4

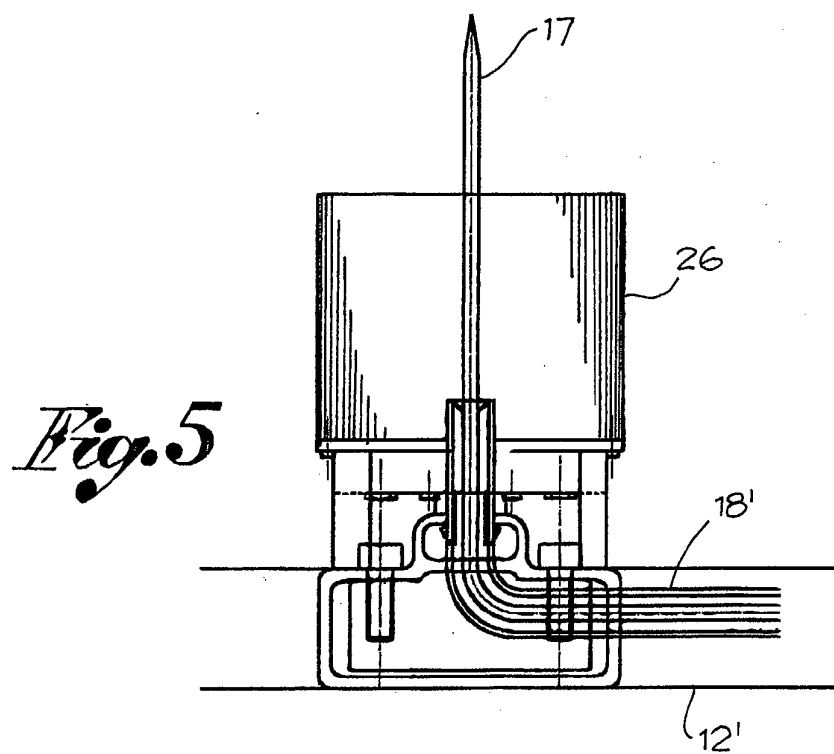


Fig. 5

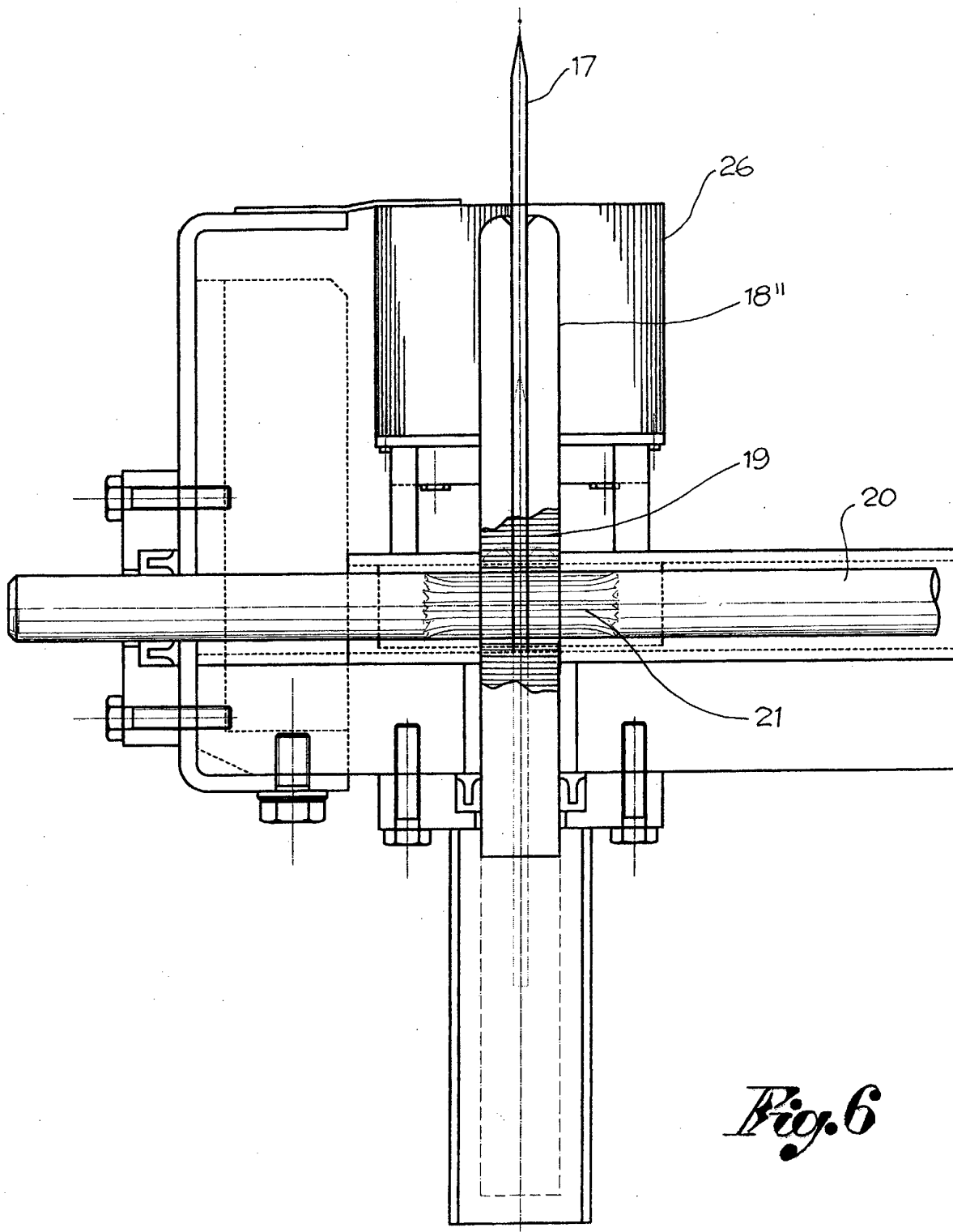


Fig. 6

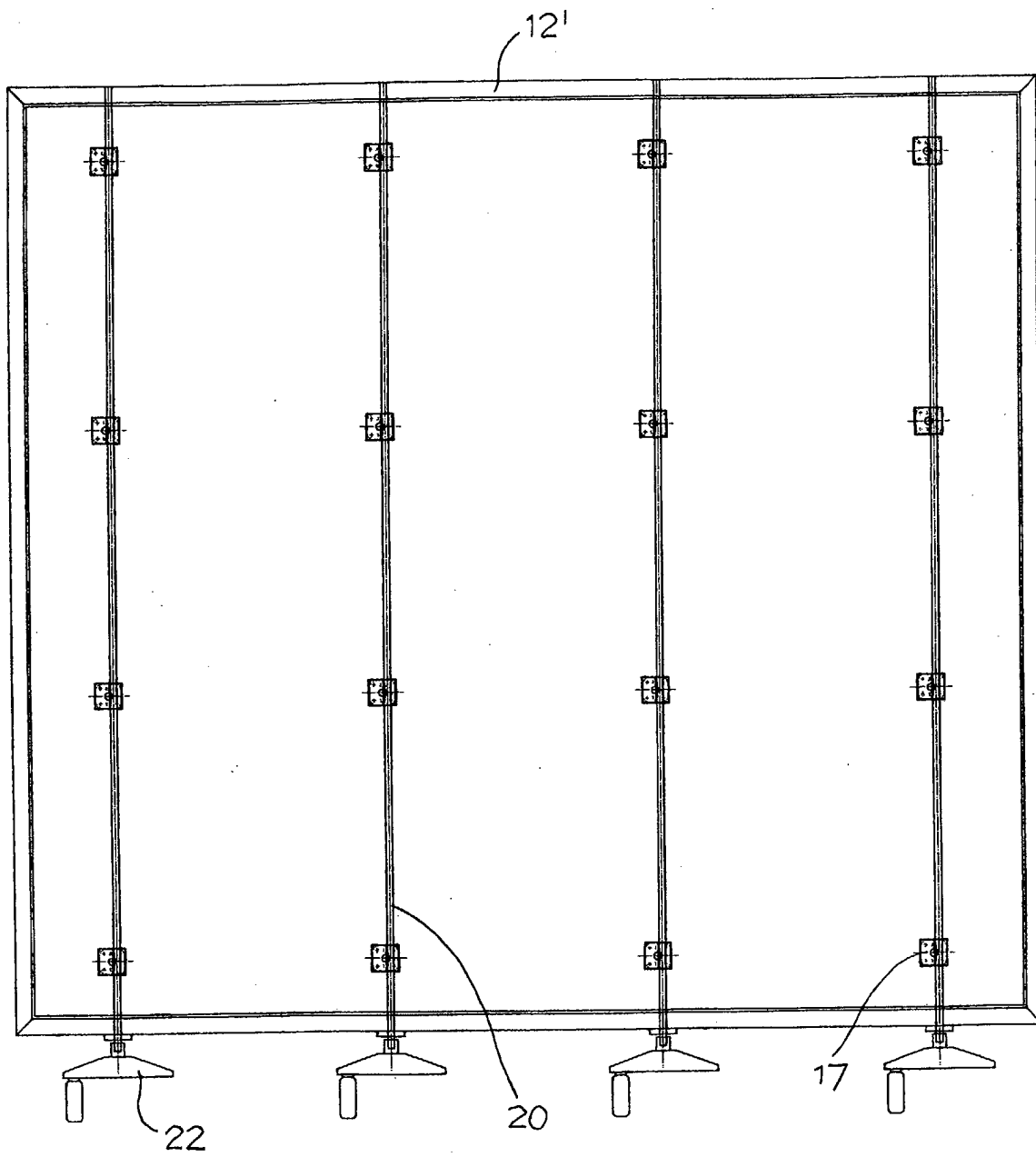


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5037

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 April 2003	Examiner Rabolini, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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