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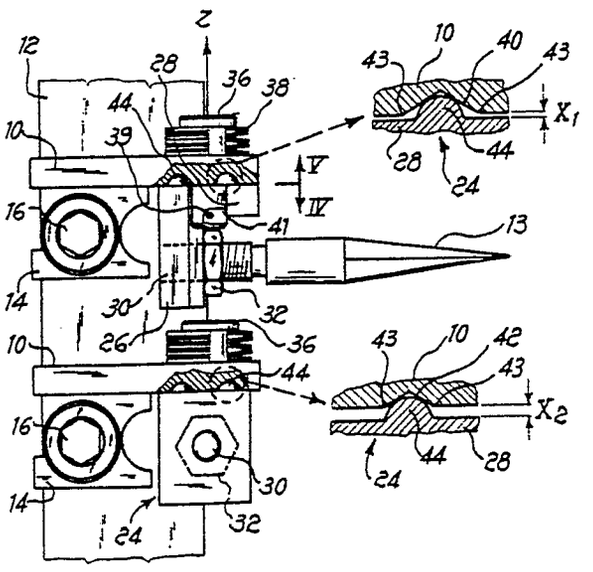
(54) Piercer enabling and disabling device in an embroidery machine, quilting machine or the like provided with a jointed coupling for the piercer.

(57) There is described herein a device for enabling and disabling a piercer (13) in an embroidery machine, quilting machine or the like.

The device includes a first support member (10) fastened to the means (12) controlling the piercer (13) forward and backward motion, and a second support member (24) kept into engagement with the first through resilient means (38), and which can take two operating positions relative thereto, i.e. an enabled and disabled position respectively wherein it is securely locked due to projecting portions (44) of a second member (24) engaging into corresponding recesses (40, 42) of the first member (10).

Fig. 3



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PIERCER ENABLING AND DISABLING DEVICE IN AN EMBROIDERY MACHINE, QUILTING MACHINE OR THE LIKE PROVIDED WITH A JOINTED COUPLING FOR THE PIERCER

This invention relates to a device adapted to enable or disable a piercer in an embroidery machine, quilting machine or the like, provided with a jointed coupling for the piercer.

The problems involved with piercers enabling and disabling are widely recognized in the specific field of the art, in that the above operations must be frequently performed when modifying the embroidery mode relative to sample size and shape and associated ratio, i.e. distance between two adjacent needles and piercers.

The major drawbacks in the known embroidery machines are substantially the long periods of time required for enabling a portion of the piercers and for disabling another portion, as well as the non disregardable precision loss due just to the frequent operations required to enable and disable the piercers.

A first type of known method for locking a piercer on to the bar which drives said piercer during the piercing stroke provides for a piercer back extension, having a hollow circular seat, to be inserted on a corresponding pin fastened to said bar. A small positioning spring is engaged in a seat of the piercer body and is hooked to a clamping means which keeps it in said position, whereby the piercer is in turn locked to the drive bar.

In the embroidery machines wherein this clamping arrangement is used, the plurality of piercers may be each individually disassembled or assembled in that each one of them has a pin and a small positioning spring associated therewith. In any case, the enabling and disabling operations are extremely time consuming both because of the high number of piercers and because, before the embroidery operations can be resumed, adjusting operations of each individual piercer are required.

This type of piercer, which is known as "automatic piercer", has a further drawback due to a lack of stability of the working position thereof, which moreover is fixed and does not allow the piercer to be moved in order to change the stroke length thereof relative to the fabric.

A further drawback stems for the fact that the plurality of the piercers taken off the embroidery machine are first sharpened and stored away in suitable containers wherein they are continuously in contact with each other. Moreover, the frequent replacements affect the spring constant of the positioning spring whereby said spring will definitely not be able to ensure a correct positioning of the piercer with time. As it should be apparent the above drawback jopardizes the quality of the embroidery performed.

A second type of known clamping arrangement between a piercer and the drive bar thereof provides for a threaded rear part of the piercers which can be threadably coupled to the bar. In this case, when a modification of the embroidery program is required, besides taking off or inserting an individual piercer, possibly the entire drive bar may be replaced with a new one having the required piercing ratio.

Also with this type of clamping arrangement, replacement times are extensive, and drive bar position adjusting operations are still required. Therefore, also for this solution, a considerable extent of time is required, and a worsening of the quality of the embroidery is unavoidable.

There has now been devised, and it is the subject of this invention, a device for fastening a piercer on to the drive bar, through which all the drawbacks of the conventional devices are overcome.

Therefore, a main object of this invention is to provide a device of the subject type, which requires neither disassembling a piercer nor replacing the entire drive bar, when a piercer has to be enabled and disabled.

Another object of this invention is to provide a device allowing the piercer to be rapidly brought from an enabled operating position to a disabled operating position and viceversa, substantially reducing the time required for preparing a new ratio of pierced embroidery.

A further remarkable object of this invention is to provide a piercer having associated therewith suitable means for clamping said piercer in the operating positions mentioned above, said means ensuring that both said positions are precisely defined and lasting in time.

The above and further objects and advantages, as well as the features of the device of the invention, will become apparent from the following detailed description of a preferred but not limiting embodiment thereof, made with reference to the attached drawings, wherein:

Figure 1 is a side view of the piercer in the working position thereof;

Figure 2 is a side view of the piercer of Figure 1, in the disabled position thereof, while the adjacent piercer is still enabled;

Figure 3 is a plan view of the two piercers of Figure 2;

Figure 4 shows a view of the device along line IV-IV of Figure 3;

Figure 5 is a view of the device along line V-V of Figure 4.

In the attached drawings there is shown a pair of adjacent piercers, the ratio being 4/4, each of them being provided with the device of the invention, it being of course understood that the number of piercers may be variable, depending upon the size of the embroidery machine. Independent of the number of piercers, each of them will be provided with an enabling and disabling device, as it will be described in the following.

Referring now to the attached drawings, the device includes a first support member 10 extending transverse and at right angles relative to a bar 12 carrying piercers 13 and provided with an extension 14 abutting against the top face of bar 12 and being fastened thereto by means of a screw 16 or any other suitable means.

Bar 12, which is substantially L-shaped, is supported by the upper end of a bracket 18, and it is fastened to said end by means of a screw 20 or other suitable means.

In an embroidery machine there is usually provided a plurality of brackets 18, whose number is increasingly higher as the number of piercer carrier bars or banks 12 increases.

In a way known per se, brackets 18 are fastened to, and supported by, shafts 22 slidably received within guides (not shown) of the embroidery machine.

The device according to the invention includes as well as a second substantially L-shaped support member 24, having a piercer 13 fastened to a side 26 thereof, while second side 28 of the support member is engaged against one of the side faces of first support member 10, as it will be explained in the following.

Clamping of piercer 13 to side 26 of second support member 24 is performed through a threaded engagement of shank 30 of piercer 13 within a corresponding threaded opening of side 26, and final locking means of a locknut 32.

A connecting shaft 34 is inserted through first support member 10 and through side 28 of second support member 24. Between enlarged head 36 of shaft 34 and support member 10 there is inserted a plurality of Belleville springs 38, whose function is to ensure that engagement between side 28 of second support member 24 and first support member 10 takes place with a high and predetermined pressure Level. For said purpose, a pin 39 is applied through the free end of shaft 34 and it engages in turn within a recess 41 of side 28 of second support member 24 just under the bias of Belleville springs 38.

According to one of the basic features of the device according to the invention, the opposite faces of first support member 10 and of side 28 of second support member 24 are not planar but they are suitably provided with projections and recesses adapted to generate a coupling type connection between said members, under the action of Belleville springs 38.

According to a further feature of the device, said coupling type connection, which will be described in the following, provides only two operating positions.

A first operating position of piercer 13 is the one shown in Figure 1, wherein support bar 12 thereof reciprocated from the position shown in full lines to the position shown in broken lines, and viceversa, whereby the piercer moves in the same way between the two positions shown in full lines and in broken lines respectively, piercing the fabric shown schematically and indicated by reference T.

Referring now to Figure 2, piercer 13 is shown therein in the idle position thereof, while the piercer adjacent thereto is shown in the working position.

In the idle position thereof, piercer 13 lies at an angle of substantially 90° relative to the working position, and it points downwards. In any case, the idle position is determined taking into account minimum disturbance for other moving members, and ease in performing the uncoupling and coupling operations.

The displacement from the working position to the idle position is simply obtained through the above mentioned coupling, which will be described in detail in the following referring in particular also to Figures 4 and 5.

As it is shown in Figure 4, on the face of support member 10 engaged with side 28 of second support member 24, there is provided two pluralities of substantially radial recesses 40 and 42, extending from a central bore wherein shaft 34 is received.

Still referring to Figure 5, there is also shown therein, in the exemplary embodiment considered here, that recesses 40 are in the number of three lying 120° apart from each other, one of them in addition being oriented horizontally. Recesses 42 as well lie 120° apart from each other, and one of them in particular is oriented vertically.

According to a feature of the device of the invention, in addition to recess 40 oriented horizontally and to recess 42 oriented vertically, the remaining ones as well are spaced 90° apart, just to obtain the 90° degree displacement from the enabled position to the disabled position of piercer 13.

Referring now to Figure 4, as it is shown therein, on the face of second support member 24 designed to lie in abutment with first support member 10 there is provided a plurality of shaped projections 44 which, in the subject exemplary embodiment, are three in number and are spaced 120° apart from each other.

When projections 44 are received within reces-

ses 40, piercer 13 lies in the working or enabled position, while if projections 44 are received within recesses 42, piercer 13 lies in the idle or disabled position. This particular feature is emphasized in the details shown in an enlarged scale on Figure 3, for the upper piercer of said figure and for the lower one of the same figure, respectively.

It should be apparent that transition from one of the above conditions to the other takes place due to the presence of Belleville springs 38, which allow projections 44 to temporarily disengage from recesses 40 or from recesses 42.

It should also be apparent that the action of springs 38 will be such as to securely hold piercer 13 in the two above positions and in particular, concerning the working position, this will always be the correct one, since the piercer has not been subjected to any displacement relative to support member 24.

A further advantageous aspect of the device of the invention derives from the fact that the displacement operation the operator has to perform to disable or to enable the piercer 13 is in no way complicated, as a matter of fact it is extremely simple in that he will be sure the piercer is in its correct position when feeling that projections 44 have snapped into recesses 40 and 42, without being required to pay any attention to the actual piercer position.

The easiness and rapidity of the above operation results of course in an easy and fast positioning of all the piercers whose position has to be modified, whereby, in conclusion, a modification of the embroidery program may be performed in an extremely short time.

It should be noted in particular, from Figure 5 and from the scaled up details of Figure 3, that recesses 40 have a larger width and depth compared to recesses 42, while projections 44 have always the same cross-section. In this way, distance X_1 between opposite faces of members 10 and 28 in the working position of piercer 13 will be shorter than distance X_2 between the same faces in the idle or disabled condition.

Recesses 42 have been provided with a shallower depth in order to make easier for projections 44 to snap therein, and in order to require a lower force to bring the piercer to the working position. In fact, when the piercer is in an idle or disabled position, he is subjected to no other forces except the force of inertia generated upon said piercer by the displacement of bar 12.

Still referring to the scaled up details of Figure 3, there is shown that inlet edges 43 of recesses 40 and 42 are chamfered, in order not to cause excessive friction forces and corresponding parts wear. From the same purpose projections 44 have a contoured cross section.

It should be understood that the arrangement described above, including a set of three projections 44 and two sets of three recesses 40 and 42, extending substantially in a radial direction, though it is preferred should not be considered in a limiting meaning. In fact, mutual locking of members 10 and 28 in three areas makes it possible to obtain a secure and repeatable positioning of piercer 13 along two axes, in particular axes X and Y of Figure 5, while the piercer is securely locked along the third axis, in particular the Z axis of Figure 3, by Belleville springs 38. The stability of the locking action does not depend upon the degree of manufacturing precision of the various components.

It is apparent, in any case, that the number of projections and recesses provided in the coupling arrangement of the device should not be taken as limiting, as well as the general arrangement and the mutual arrangement of the recesses and projections which, in the exemplary embodiment described above, have been chosen taking into account manufacturing simplicity and symmetry of the clamping forces.

In addition, the use of a coupling arrangement may be envisaged, which does not rely upon projections and recesses as locking members, but upon a friction coupling, a clutch coupling or the like, through which the same purpose can be met.

In a further embodiment, coupling means may be provided which include a plurality of suitably shaped matingly engageable shapes, spaced along outer surface 45, 46 of members 10 and 24.

Eventually, it should be understood that variations and/or modification may be made to the device for enabling and disabling a piercer in an embroidery machine, quilting machine or the like, according to this invention, without exceeding the scope of protection of the invention.

Claims

1. A device for enabling and disabling a piercer in an embroidery machine, a quilting machine or the like, characterized in that it includes a first and a second support member (10, 24), the second member bearing a piercer (13) fastened thereon, said members being connected to each other by means of a jointed coupling arrangement which, owing to the provision of resilient means (38), enables piercer (13) to be moved from a working position, wherein it lies substantially at right angles relative to fabric (T) to be embroidered, to a second position wherein it is substantially parallel to said fabric (T), and vice versa.

2. The device of claim 1, characterized in that first support member (10) is fastened to oscillating bar (12) which drives piercers (13) in their move-

ment, while second support member (24) is connected to the first by means of a shaft (34), said resilient means (38) being interposed between enlarged head (36) of said shaft and at least one of said support members (10, 24).

3. The device of claim 2, characterized in that to shaft (34) there is applied a pin (39) which engages into a seat (41) of one of said support members (10, 24) under the action of said resilient means (38).

4. The device of claim 2, characterized in that on the opposite faces of support members (10, 24), projections (44) are provided, and recesses (40, 42) are machined, adated to matingly engage with each other in order to temporarily lock the support member of piercer (13) in the desired positions.

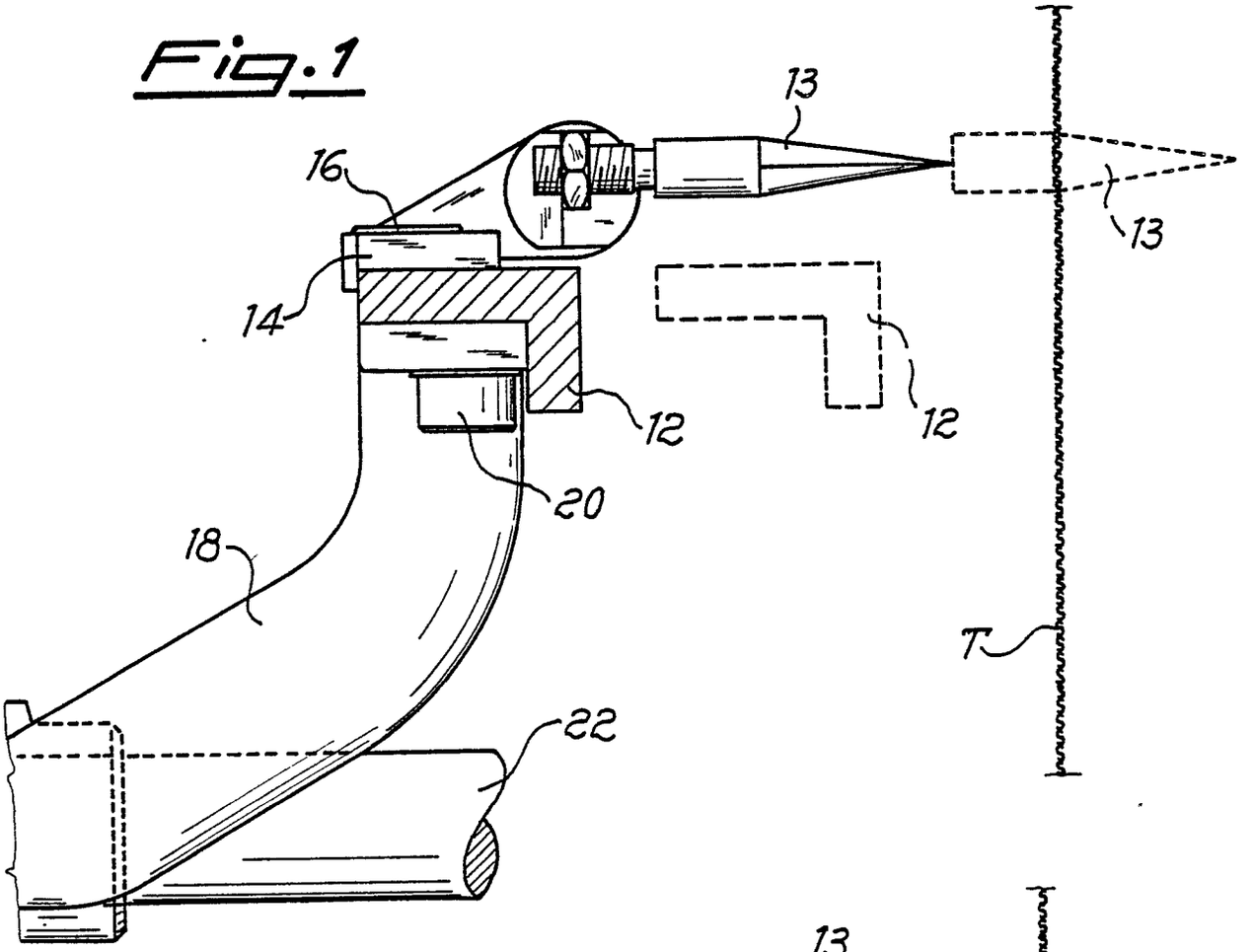
5. The device of claim 4, characterized in that, in the working position of piercer (13), projections (44) are engaged within recesses (40), the latter having a larger depth and width compared to the depth and width of recesses (42).

6. The device of claim 5, characterized in that recesses (40, 42) extend in a substantially radial direction around the opening wherein shaft (34) is inserted.

7. The device of claim 4, characterized in that projections (44) have a contoured cross-sectional shape.

8. The device of claim 4, characterized in that inlet edges (43) of recesses (40, 42) are chamfered.

Fig.1



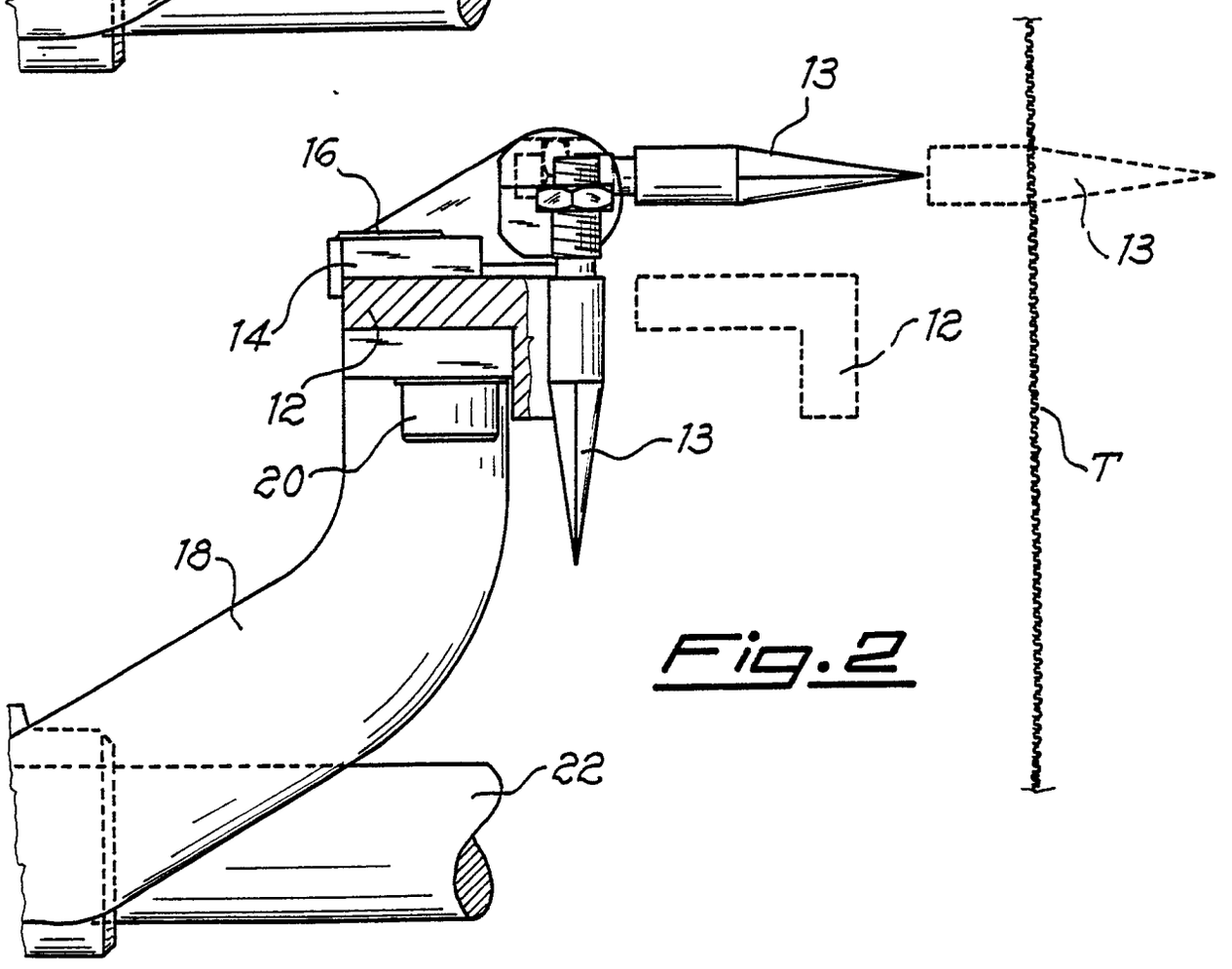


Fig.2

Fig.5

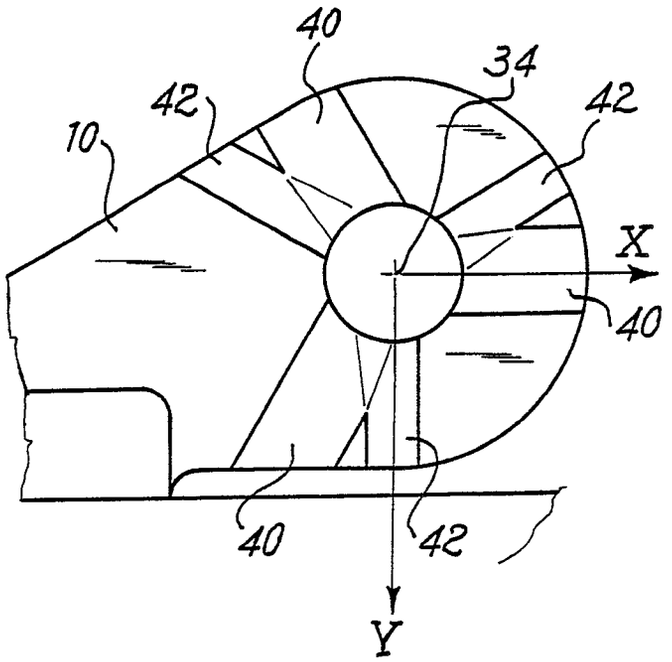


Fig.4

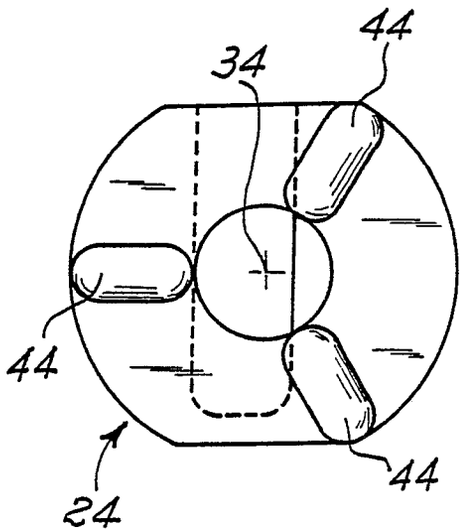
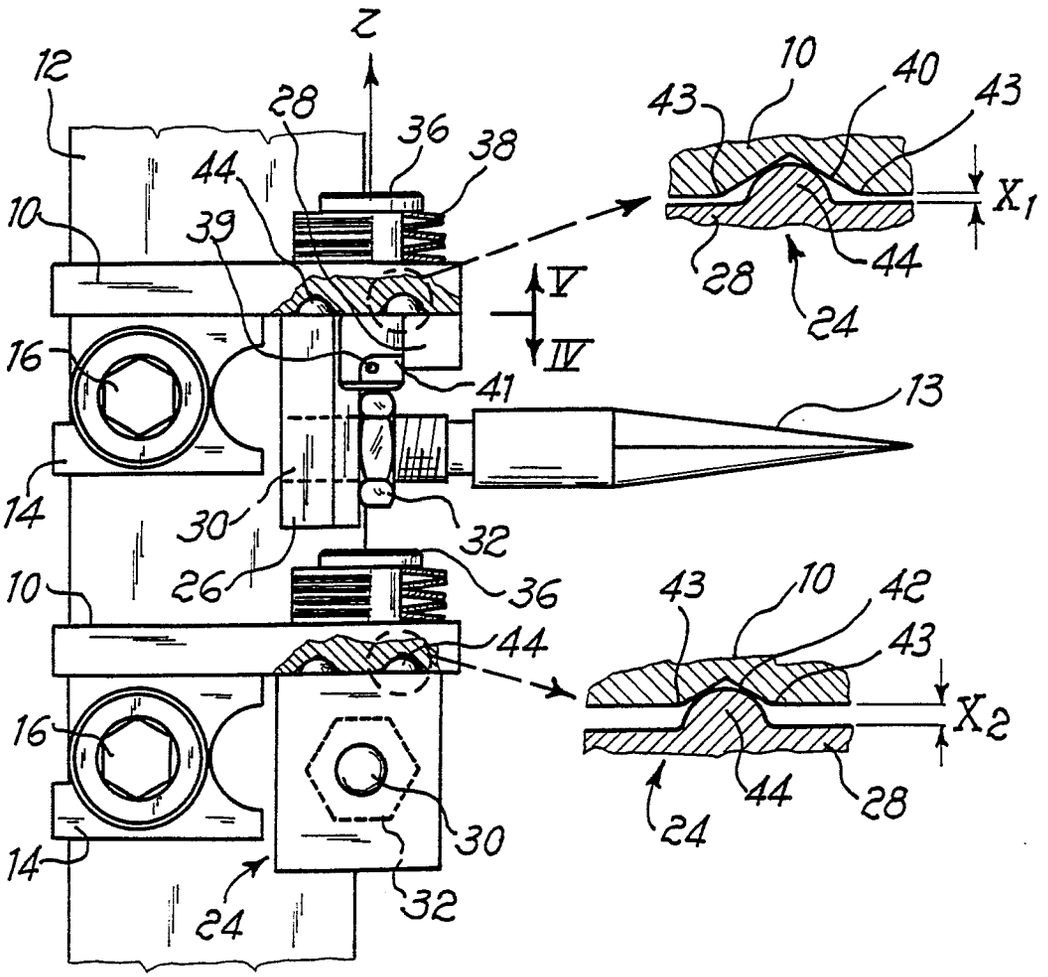


Fig.3



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EUROPEAN SEARCH REPORT

Application Number

EP 88 83 0409

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-B-1219781 (JACOB ROHNER) * column 3, line 64 - column 4, line 61; figures 2, 3 *	1	D05C11/04
Y	FR-A-381277 (BRAUN ET AL.) * the whole document *	1	
A	EP-A-0230211 (COMERIO ERCOLE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 SEPTEMBER 1989	RAYBOULD B.D.J.

CATEGORY OF CITED DOCUMENTS

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