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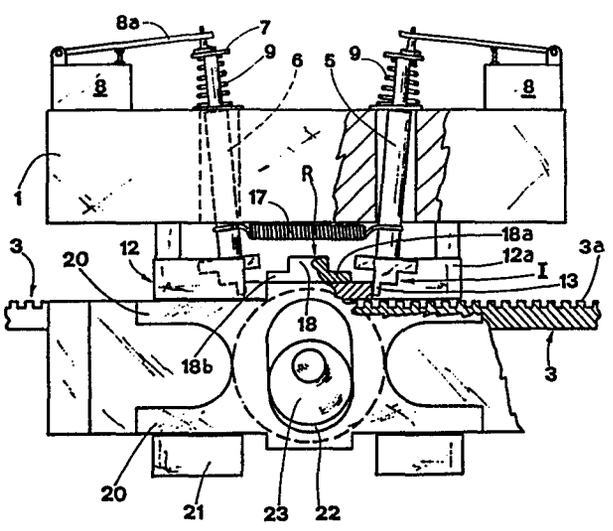
(54) Device for the bidirectional movement longitudinally of a bar in a succesion of displacement of predetermined constant amplitude.

(57) The device comprises a rack 3, integral with a bar 4 and in alignment therewith, two rods 5 and 6, respectively, side-by-side in a longitudinal plane, each provided at the lower extremity with a corresponding transverse tailpiece 13 able to move axially from a non-operative to an operative position and vice versa, as well as to oscillate longitudinally from an internal position I to an external position E and vice versa, transverse abutment means 16a and 16b, respectively, that define, in cooperation with elastic means 17, the said internal position I of the rods 5 and 6, and to conclude, a transverse slide 18 that is positioned in between the said rods and is able to move alternately, in a longitudinal direction, between two extreme positions M and K, respectively.

When one rod is in the operative position, the tailpiece 13 of this is inserted in a space 3b in between two teeth 3a of the rack 3. The displacement of the slide 18 in one direction causes the interception thereof with the rod that is in the operative position and, consequently, the rack 3 to be carried in the said direction.



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Device for the bidirectional movement longitudinally of a bar in a succession of displacements of predetermined constant amplitude

The invention relates to a device for the bidirectional movement longitudinally of a bar in a succession of displacements of predetermined constant amplitude, particularly suitable for moving the bars of straight knitting machines to which are locked the stops for the slide that carries the thread guide. In the said application what are known as "inalay" stitches are formed and it is necessary to displace the said stops by amounts equal to or multiples of the pitch of the needles installed in the needle beds of knitting machines.

Generally a number of bars are provided, each one of which equipped with corresponding means for the movement thereof in both directions that are actuated independently of the means belonging to the others bars.

Provisions has already been made for a solution with which to satisfy the technical problem outlined above, and this envisages the utilization of stepping type electric motors controlled by corresponding electronic equipment.

Known to everyone is the space taken up by the said motors and the considerable cost both of the electric motors themselves and of the electronic equipment associated thereto.

An additional problem with the above mentioned known solution that needs to the stressed is that any maintenance is entrusted solely to highly specialised personnel.

The object of the invention is to make available a device that solves the problem to which reference has been made above through a technical solution of electromechanical type that is extremely simple, functional, reliable, limited in volume, easy to maintain, and considerably cheaper than the methods known already that carry out an identical function.

The foregoing object is attained with the device according to the invention for the bidirectional movement longitudinally of a bar in a succession of displacements of predetermined constant amplitude, characterized by the fact of comprising : a rack locked to and in alignment with the said bar; means for guiding the longitudinal translation of the said rack; two rods side-by-side in a longitudinal plane and each positioned with the internal extremity thereof in front of the teeth of the said rack, it being possible for the said rods to traverse axially as well as to oscillate with respect to the axes thereof since the internal extremity of each rod is provided with a corresponding transverse tailpiece so dimensioned as to allow the insertion thereof in a space in between two of the said teeth; elastic means that exert an effect on the said rods and define for the longitudinal oscillation of each rod, in cooperation with corresponding transverse abutment means, the extreme internal position with the relevant tailpiece positioned at a point corresponding to, and in front of, a space in between two of the said teeth; independent means for operating the said rods, able to be actuated at different times, each destined to oblige the rod concerned to pass from the non-operative position, with the tailpiece outside the corresponding space in between two teeth, to the operative position with the said tailpiece inserted in the said space; and means for actuating the

one of the said rods that is in the operative position, with the oscillation of the rod concerned from the said extreme internal position to a predetermined extreme external position, and the consequent carrying of the rack, through the tailpiece of the said rod, in the same direction as the said oscillation.

Emphasis is given hereinafter to the characteristics of the device according to the invention, with particular reference to the accompanying tables of drawings, in which :

- Figure 1 shows in a front view, partly diagrammatic and partly sectional, the device in question with the rods thereof in the non-operative position;
- Figure 2 shows a part of the view in Figure 1, with one rod in the operative position;
- Figure 3 shows the device in the same view as in Figure 2 but with the rack displaced one step;
- Figure 4 shows the device in the same view as in Figure 3, with the rod that has effected the movement of the rack again in the non-operative position.

With reference to the said figures, at 1 is shown a support frame provided with a longitudinal slot 2 inside which slides, guided, a rack 3 whose teeth 3a and spaces 3b there in between are, in the example described herein, pointing upwards. The said rack is locked to a bar 4 aligned there with.

In the top part of the frame there are two through holes (vertical in the case described) inside each of which is freely inserted the centre part of a rod 5 and 6. In consequence of the said insertion, each rod is able to move

axially as well as to oscillate with respect to the axis thereof.

The upper extremity of each rod is provided with a plate 7 flush up agains the corresponding armature 8a of an electromagnet 8. The said abutment is permanently ensured by a spring 9 enshrouding the part of the rod that protrudes from the frame and interposed between this and the said plate.

Provided laterally in the lower extremity of each rod (that is to say in the internal extremity thereof) shown globally at 10, are two parallel flat parts 11 almost in contact with corresponding facing longitudinal surfaces 12a with which blocks 12 placed above and at the side of the groove 2, are provided. In this way, the rods 5 and 6 oscillate solely in a longitudinal direction with the corresponding internal extremity thereof positioned in front of the teeth of the rack.

Each extremity 10 has at the bottom, a transverse tailpiece 13 so dimensioned as to allow the insertion thereof in a space 3b in between two of the said teeth 3a, an internal transverse surface 14 commencing at the underneath inside edge of the tailpiece 13, and what can be defined a "heel" 15 positioned on the same side as the surface 14 and extending inwards.

Placed between the transverse surfaces 14 of the two rods is a transverse block 16 positioned above the rack. The external transverse surfaces 16a and 16b of the block 16 serve as means for the abutment there with of the said internal surfaces 14, the said abutment being ensured, in

the absence of external force being applied to the rods, by a spring 17 that connects one rod to the other.

With the internal extremity 10 of each rod flush up against the corresponding surface 16a or 16b of the block 16, the tailpiece 13 is positioned at a point corresponding to, and in front of, a space 3b in between two teeth 3a of the rack 3 (Figure 1).

When the electromagnet is de-energized, the tailpiece 13 is outside the corresponding space 3b (Figures 1 and 4: non operative position of the rod), while when the electromagnet is excited, the tailpiece is inserted in the said space (Figures 2 and 3: operative position of the rod). It should be noted that when the rod is in the non-operative position, the corresponding heel 15 is raised with respect to the block 16, while when the rod is in the operative position, the said heel is practically in contact with the said block.

Above the block 16 is provided a slide 18, the tranverse extremities of which are integral with corresponding guide elements 19. Laterally the lower part of the slide 18 has two transverse limbs 18a and 18b.

Each guide element 19 incorporates two pairs of forked parts 20 interposed between blocks 21 for guiding the longitudinal translation of the said element, and has a slot 22 in the centre with which engages a cam 23 carried in rotation by a shaft 24.

In thus ensues that with each revolution of the shaft 24 (driven in any way such as, for example, by a non-illustrated

electric motor that is controlled by a suitable, also non illustrated, unit), the slide 18 is moved with rectilinear reciprocating motion, longitudinally between two extreme characteristic positions M and K (Figures 3 and 4) that are equidistant with respect to the transverse centre line of the block 16 that also defines the inactive position R of the said slide. When both the rods 5 and 6 are in the non operative position (Figure 1), the limbs 18a and 18b of the slide 18 pass underneath the heels 15 without in any way intercepting the said rods.

To obtain the movement of the bar 4 in a predetermined direction, it is necessary that only the rod concerned be sent into the operative position. In other words, in the case of displacements towards the right, rod 5 is sent into the operative position, while for displacement towards the left, rod 6 is sent into the operative position.

Supposing it is wished to move the bar to the right: to achieve this the electromagnet 8 that operates the rod 5 has to be energized. Subsequently to the excitation of the said electromagnet, the means that drive the shaft 24 are set in operation in such a way as to cause the said shaft to undergo one complete revolution.

With the tailpiece 13 inserted in the space 3b in between two of the teeth 3a, the rack 3 (and obviously the bar 4 integral there with) are carried to the right, by means of the said tailpiece, at the time the limb 18a intercepts, while being displaced towards the right, the heel 15 of the rod 5; the actual displacement value of the rack 3 is equal to one predetermined step (Figure 3). The displace-

ment from the internal position I to the external position E that the extremity 10 undergoes is, in fact, constant because of the fact that the internal position I is univocally determined by the abutting surface 16a of the block 16, because of the fact that the displacement of the slide 18 between positions M and K is constant, and because of the fact that the said positions are equidistant from the inactive position R.

With the extremity 10 in the said external position E, the electromagnet 8 is de-energized, the spring 9 returns the rod to the non-operative position, and the spring 17 carries the surface 14 of the extremity 10 of the said rod, back flush up against the surface 16a of the block 16 (Figure 4).

The foregoing sequence is repeated until the required displacement, which is obviously a multiple of the said step, has been achieved. In the case of straight knitting machines on which the stops of the slide that carries the thread guide are locked to the bar, the said step coincides with the distance (pitch) between two consecutive needles in the needle bed.

For displacements of the bar to the left, it is necessary to use the other rod, namely rod 6.

The extreme simplicity of the technical solution according to the invention is manifest from what has been outlined above.

Use is, in fact, made of parts that are simple to construct, such as the rack, the electromagnets, the rods, the slides,

and the cams etcetera. Furthermore, when use is made of an electric motor to drive the shaft 24, it is sufficient to provide a unit that supplies the motor in such a way as to cause the shaft concerned (always carried in rotation in the same direction) to effect one complete revolution or a number of complete revolutions spaced temporally one with respect to the other. The simplicity of the electronic unit entrusted with operating the said motor is quite obvious to any expert.

In view of the extreme simplicity of the component parts of the device according to the invention, as well as of the original way in which one is combined with the other whereby the assembly thereof is rendered rapid and easy, it can clearly be seen that for the maintenance of the said device, it is not necessary to have to resort to highly specialized labour.

It is understood that the foregoing description has been given purely as an unlimited example and thus that any variants of a constructional nature (for example, the osclillation of the rods 5 and 6 can be achieved, instead of with the slide 18, with any other means such as electromagnets, just as the sending into the operative position of each rod can be effected, instead of whith the electromagnet 8, with any other mechanical or electrical means) in no way prejudice the framework of protection afforded to the invention as described above and claimed hereinafter.

Claims:

1. Device for the bidirectional movement longitudinally of a bar in a succession of displacements of predetermined constant amplitude, characterized by the fact of comprising: a rack 3 locked to and in alignment with the said bar 4; means 2 for guiding the longitudinal translation of the said rack 3; two rods 5 and 6, respectively, side-by-side in a longitudinal plane and each positioned with the internal extremity 10 thereof in front of the teeth 3a of the said rack 3, is being possible for the said rods to traverse axially as well as to oscillate with respect to the axes thereof since the internal extremity 10 of each rod is provided with a corresponding transverse tailpiece 13 so dimensioned as to allow the insertion thereof in a space 3b in between two of the said teeth 3a; means 12a for guiding the said rods to longitudinal oscillation; elastic means 17 that exert an effect on the said rods 5 and 6 and define for the longitudinal osillation of each rod, in cooperation with corresponding transverse abutment means 16, the extreme internal position I with the relevant tailpiece 13 positioned at a point corresponding to, and in front of, a space 3b in between two of the said teeth 3a; independent means 8 for operating the said rods 5 and 6, able to be actuated at different times, each destined to oblige the rod concerned to pass from the non-operative position with the tailpiece 13 outside the corresponding space 3b in between two teeth 3a, to the operative position with the said tailpiece inserted in the said space; and means for actuating the one of the said rods that is in the operative position, with the oscillation of the rod concerned from the said extreme internal position I to a predetermined extreme external position E,

and the consequent carrying of the rack 3, through the tail-piece 13 of the said rod, in the same direction as the said oscillation.

2. Device according to Claim 1, characterized by the fact that the said means for operating one or the other of the said rods 5 and 6 are constituted by transverse slide 18, positioned between the said rods and driven in a reciprocating fashion longitudinally between two extreme positions M and K, respectively, the alternation being complete and commencing at the inactive position R midway between the said positions M and K.

3. Device according to Claims 1 and 2, characterized by the fact that each of the said rods is provided with a "heel" 15 pointed towards the said transverse slide 18, and by the fact that the said slide has two transverse limbs 18a and 18b, respectively, each of which is either inserted in between the heel of the rod concerned and the rack 3, with the said rod in the non-operative position, or intercepts the said heel 15, with the said rod in the operative position.

4. Device according to Claim 1, characterized by the fact that each of the said means 8 for operating a corresponding rod is constituted by an electromagnet 8 whose armature 8a exerts an effect, in consequence of the excitation of the electromagnet, on the outer extremity of the rod concerned, in contrast with elastic means 9 connected to the said rod, in order to define the said operative position of the rod.

5. Device according to Claim 1, characterized by the fact that the said elastic means 17 are constituted by a spring

That is under tensione and has the extremities thereof connected to the said rods.

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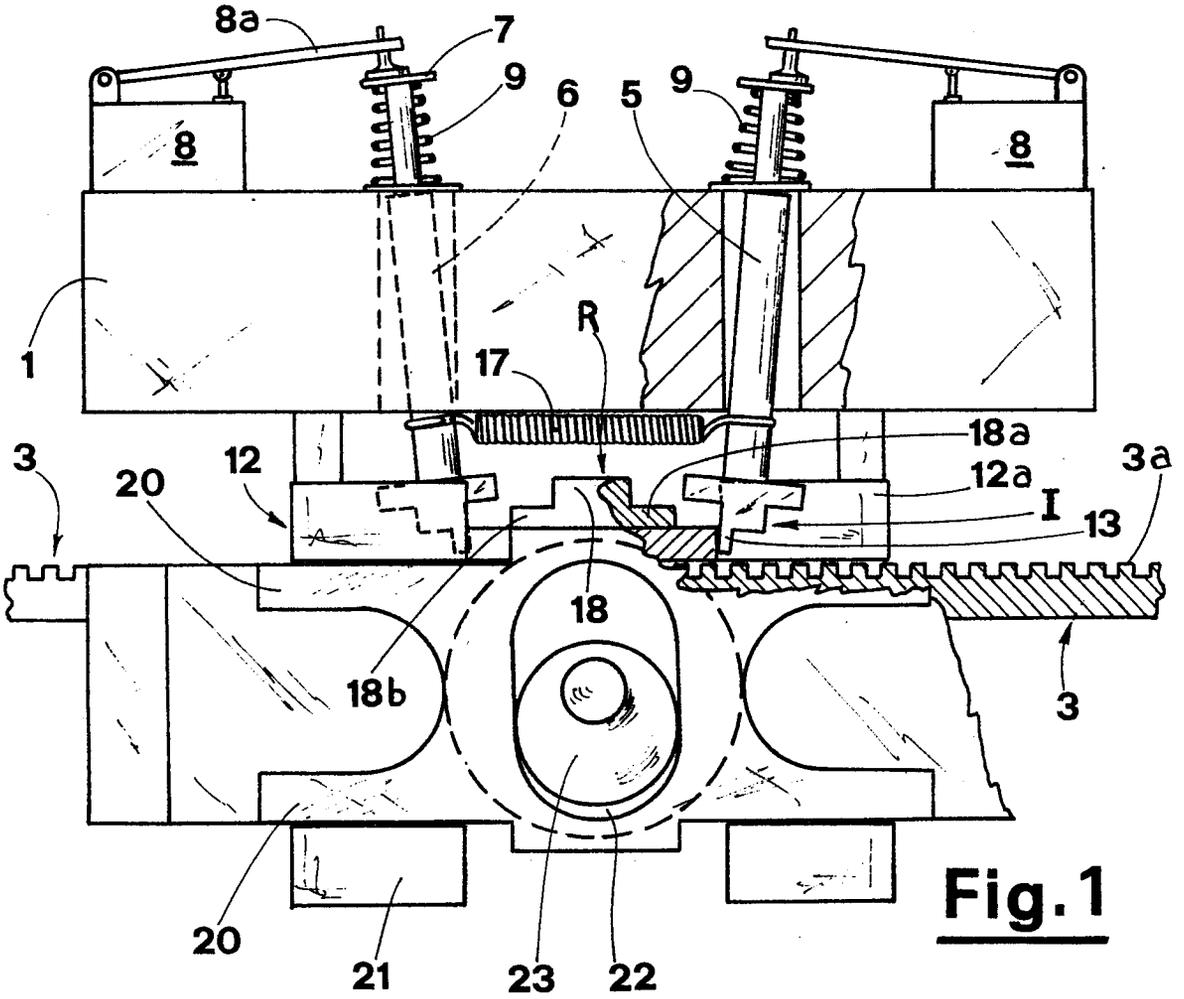

Fig. 1

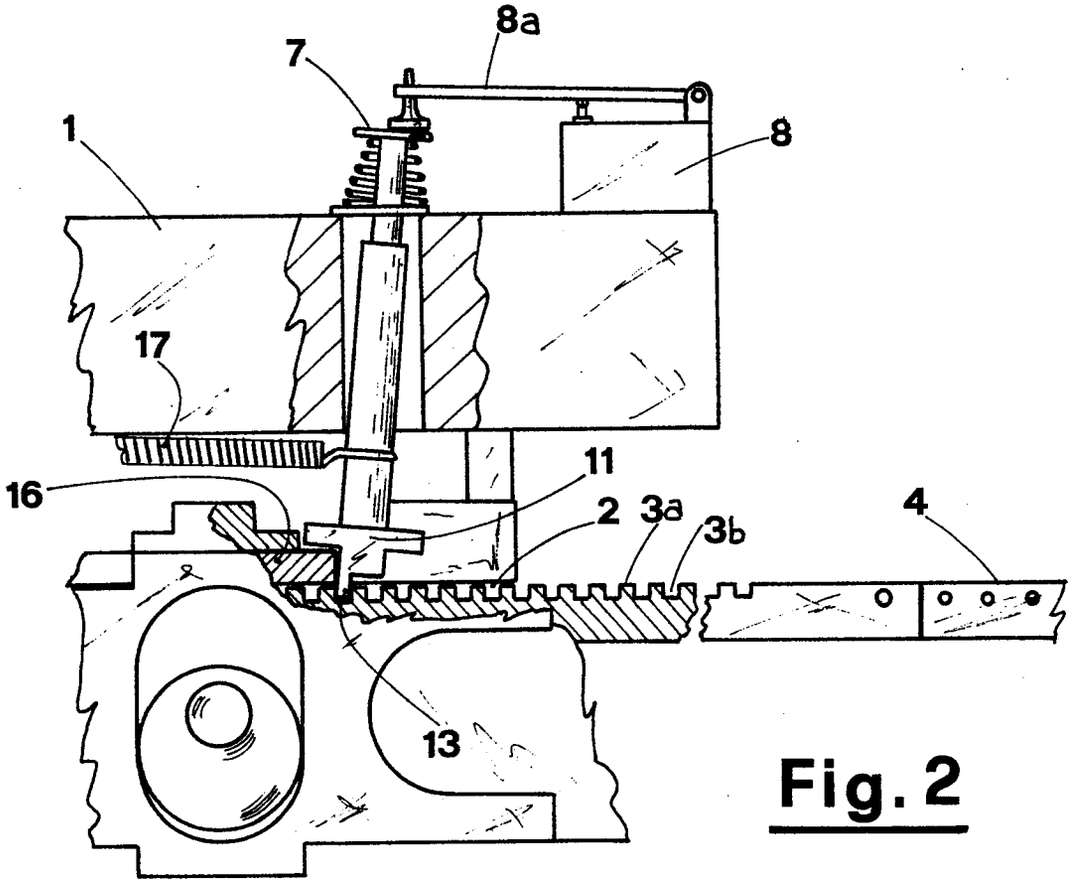

Fig. 2

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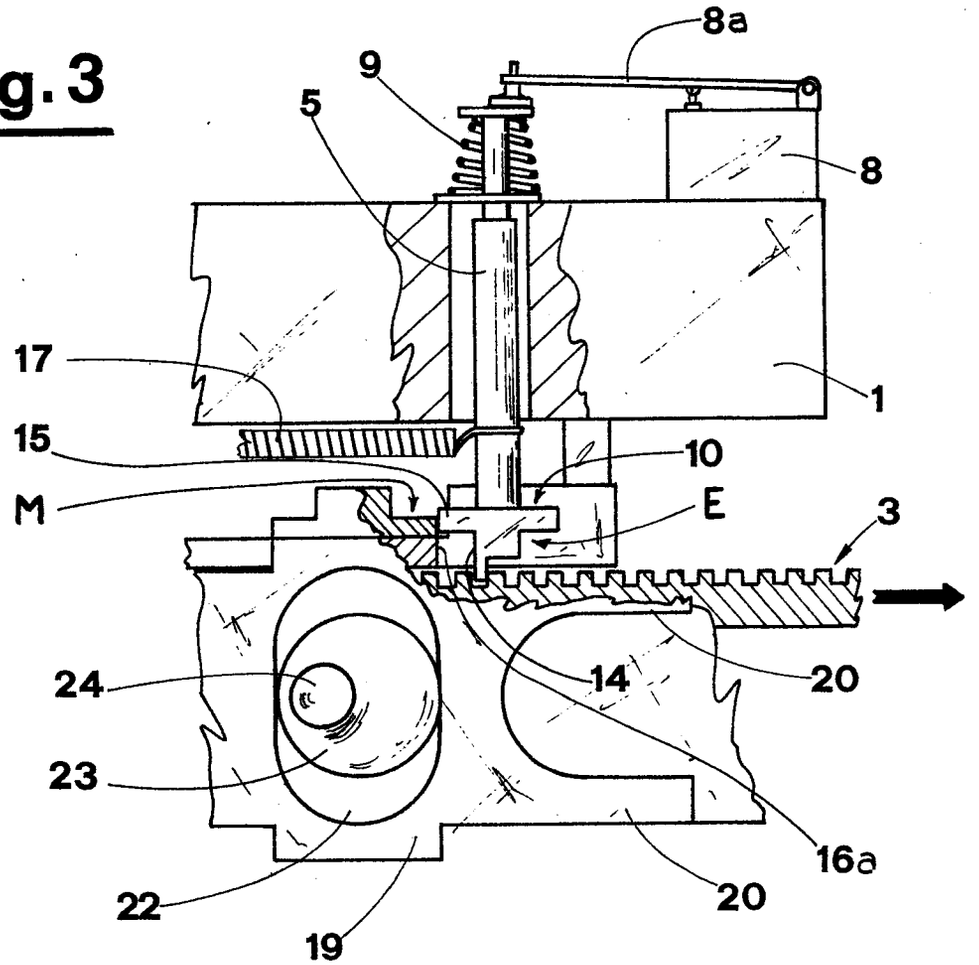
Fig.3



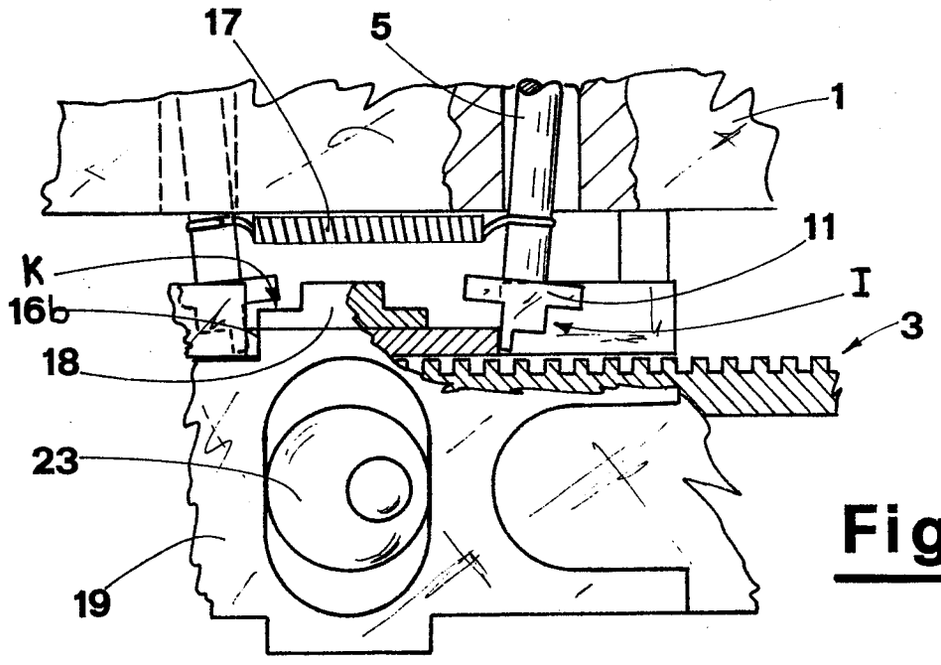


Fig.4

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EUROPEAN SEARCH REPORT

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Application number

EP 84 83 0264

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.4)
A	DE-A-2 026 463 (S.A. MONK) * Page 17, line 12 - page 18, line 12; figure 7 * ---	1	D 04 B 11/10
A	DE-A-1 809 654 (SCHUBERT & SALZER) ---		
A	FR-A-1 518 646 (FABRIQUE NATIONALE D'ARMES DE GUERRE) -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-01-1985	VAN GELDER P.A.

CATEGORY OF CITED DOCUMENTS

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