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## EUROPEAN PATENT APPLICATION

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⑰ Applicant: OFFICINE MECCANICHE MOLINA &  
BIANCHI S.p.A.  
Viale Industria, 213/5  
I-27029 Vigevano (Pavia)(IT)

⑱ Inventor: Zorzolo, Alessandro  
Via Stropeni, 24  
I-27029 Vigevano (Pavia)(IT)

⑲ Representative: Maggioni, Claudio et al  
Jacobacci-Casetta & Perani  
Via Visconti di Modrone, 7  
I-20122 Milano (IT)

⑳ Device for stretching uppers over a last using automatically adjusted grippers.

㉑ A device for stretching uppers over a last is disclosed which comprises a multiplicity of grippers (10) mounted on respective holders (12,20) around the last to clamp the uppers edges, means (14,17) for operating the grippers (10), means (28,30,33) for adjusting the grippers (10) in position relative to the last, and means for effecting a relative displacement of the last and the grippers along an uppers stretch-

ing direction over the last.

To have the grippers (10) readily and accurately adjusted in position and ensure automatic adaptation of the clamping points of the grippers to the contour of a footwear article to be assembled, the holders (12,20) of adjacent grippers (10) are connected pivotally together.

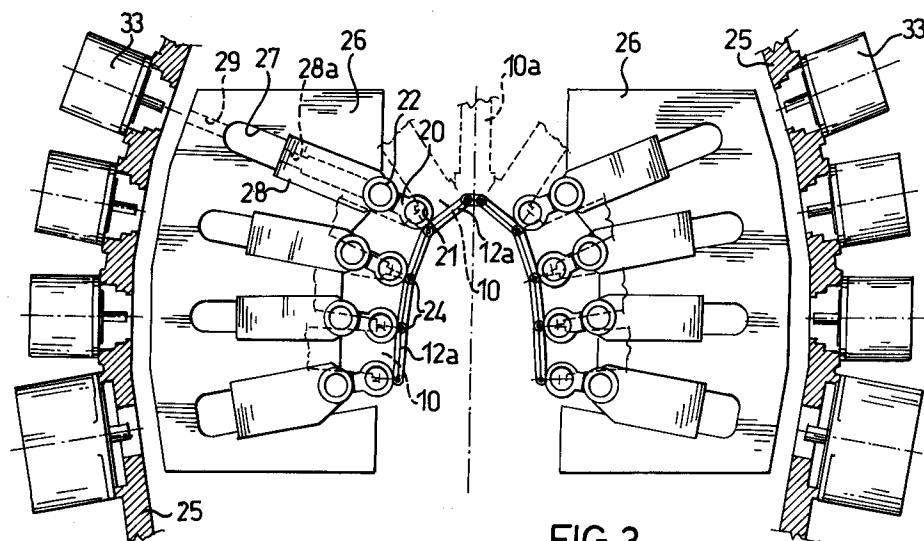


FIG.3

This invention relates to footwear-making equipment, and more particularly, to a device for stretching uppers over a last preparatory to gluing the edge of the uppers to a supporting insole which has been secured under the last.

Known are machines performing various operations for fitting the toe portion of a shoe over a last. A machine of this kind is described, along with an assembly method, in Italian Patent No. 912328, for example.

The basic steps involved in the process consists of placing the uppers onto a last under which a supporting insole has been secured, clamping the edges of the uppers in a multiplicity of grippers mounted all around the last, stretching the uppers over the last by a relative movement of the grippers and the last, locking the uppers to the last by means of a crescent-shaped member adapted to apply a pressure to the last edge, gradually releasing the grippers from the uppers, tucking the uppers edge under the last by means of two movable shaped plates, and adhering the uppers edge to the insole using a glue which has been coated over the two parts to be joined.

For the assembly process to be carried out correctly, the grippers should be arranged around the last such that their clamping points, specifically the sections which border the respective clamping points, are aligned to one another a predetermined distance away from the last to follow the contour of the latter, and such that their pull is applied evenly all around the edge of the uppers. Thus, for each gripper, adjusters are usually provided which enable a gripper to be moved toward and away from the last, sideways toward and away from adjacent grippers, and rotated about its axis to evenly merge with one another the clamping points of adjacent grippers.

These adjustments are fairly critical and must be performed by qualified personnel, are time-consuming, and adversely affect the production rate, and must be repeated on the occurrence of any change in the shoe design, which is disadvantageous especially where small volume productions are involved.

To reduce such adjusting operations, it has been proposed of mounting the grippers in two sets, each set to a plate pivoted in the proximities of the toe end of the last, so that the distance of each set from the respective side of the last can be controlled. However, this expedient has proved only partly successful because, while enabling the gripper positions to be adjusted within limits so as to accommodate the width of a footwear article being assembled, it disallows full adaptation of the gripper clamping pattern to the last.

It is the object of this invention to provide a device for stretching uppers over a last, which

enables adjustment of the gripper positions in a ready and accurate manner for automatically adapting the clamping points thereof to the contour of a footwear article being assembled while keeping the evenness of the clamping pattern unaltered.

This object is achieved by a device as generally defined and characterized in the first of the claims appended to this description.

The invention can be more clearly understood from the following detailed description of an exemplary and in no way limitative embodiment thereof, to be read in conjunction with the accompanying drawings, in which:

Figure 1 is a side view showing schematically a gripper of a device according to the invention;

Figure 2 is a view of the gripper shown in Figure 1, taken in the direction of arrow F;

Figures 3 and 4 are plan views showing schematically the most distinctive parts of a device according to the invention at two different stages of its operation; and

Figure 5 shows in perspective the supporting members for a gripper and the associated displacement means.

In Figures 1, 2 and 5, a gripper, generally designated 10, is shown with its supporting and driving members. In particular, the gripper has a box-type body 11 which is attached by two arms 13 to a rod 12 into a four-bar linkage. An electric motor 14 is mounted to the body 11 for oscillation about a pivot pin 15 and is coupled to the four-bar linkage by conventional means (not shown) for the purpose to shift the gripper 10 along a substantially parallel direction to the longitudinal axis of the rod 12, upwards as viewed in the drawing. The gripper has two jaws 16 connected to the body 11 for pivotal movement relatively to each other, and an air-operated cylinder 17 attached to the body 11. The cylinder 17 is coupled to the gripper jaws by conventional means for the purpose, of which only one tie rod 19 is partly shown in the drawing figure, to operate the gripper by opening or closing its jaws 16.

The rod 12 has an element 12a attached rigidly thereto which is constructed and functions as a chain link and is mounted to a linkage element or connecting rod 20 for pivotal movement about its longitudinal axis a-a within a cylindrical socket 21 (Figures 3 and 4) of the connecting rod 20. The latter has two lugs 20a laid opposite each other into a yoke configuration and being passed through by respective coaxial bores 22 through which a pin 23 extends.

Shown schematically in Figures 3 and 4 is a supporting and driving structure for a multiplicity of grippers 10. For convenience of illustration in these Figures, the grippers, nine in number, are only represented by their incomplete outlines. Shown in

the Figures are the connecting rods 20 and chain links 12a, the latter being connected pivotally together by pins 24. One of the grippers, the central or apical one shown at 10a, is made narrower than the others, carries no linkage element 20, and has its rod fastened rigidly to the bed by suitable means, not shown.

The structure comprises a rigid supporting part 25 in the form of a cylinder, with a portion of its surface removed and is fastened to the machine bed. In Figures 3 and 4, this cylindrical part 25 is represented by just two wall portions. It should be understood, however, that the two portions are joined together at the top of the Figure and extended into the bottom part thereof to leave a passage for accessing the center of the structure where the last is accommodated on which the uppers would be stretched. The last and respective supporting and driving means have not been shown because conventional.

The structure further comprises two thick supporting and guiding plates, shown at 26, which are also fastened rigidly to the machine bed by suitable means, not shown, and extend into the cylindrical part 25 in a common plane perpendicular to the cylinder axis, with a spacing therebetween. These plates 26 have notches 27 being open to the machine center and extending radially outwards. Through the thickness of the plates 26 there are provided bores 29 which extend from the bottoms of the notches 27 to the outward edges of the plates.

Each notch 27 provides a runway for a slide 28 connected pivotally to one of the connecting rods 20 by a respective pin 23, only shown in Figure 1. Each slide 28 has a longitudinal threaded bore 28a (Figure 1) into which an oppositely threaded shaft 30 engages correspondingly in helical fit relationship. The latter extends into the bore 29 between its respective slide 28 and a bearing coupling 31 mounted on the cylindrical part 25. The shafts 30 are each driven rotatively by a motor 33 secured on the cylindrical part 25.

For adjusting the gripper positions relative to the last, the motors 33 are operated in a co-ordinate fashion until the various grippers have been moved into a selected clamping pattern.

Conveniently, this setting would be performed by an electronic control unit, known per se, so programmed as to enable a series of adjustments for moving the grippers into the best clamping pattern for a given footwear article design to be assembled. In this case, as skilled persons in the art of automatic setting systems will readily recognize, the position of each gripper must be known each time. For this purpose, position sensors may be employed which can be coupled either to the slides 28 or the setting motors 33 and supply each

time acknowledge signals of the positions of the individual grippers to the electronic control unit, or step motors may be used whose angular settings would be known at all times.

As may be appreciated, the device of this invention enables optimum setting of the grippers for any design, shape, and size of a footwear article to be assembled. With the embodiment providing for an electronic program unit, the various patterns stored in the unit can be retrieved and changed as required, thereby the gripper positioning can be adjusted to fit any shapes, sizes, or sides (right or left) of footwear articles to be assembled, quite rapidly and accurately on all occasions, thus significantly expanding the machine versatility and production over prior art machines.

While only one embodiment of this invention has been described and illustrated hereinabove, it is understood that several variants and modifications are feasible within the scope of the same inventive concept.

### Claims

1. A device for stretching uppers over a last on a footwear-making machine, comprising:  
a multiplicity of grippers (10) mounted on respective holders (12,20) around the last for clamping the uppers edges;  
drive means (14,17) for the grippers (10);  
means (28,30,33) for adjusting the gripper (10) positions relative to the last; and  
means for effecting a relative movement of the last and the grippers along a stretching direction of the uppers over the last;  
characterized in that the holders (12,20) of adjacent grippers (10) are connected pivotally together.
2. A device according to Claim 1, characterized in that the holders (12,20) for the grippers (10) comprise each a rod (12) and means (13) for pivotally connecting a respective one of the grippers (10) to the rod (12), that the rods (12) of the holders lie substantially parallel to one another, and that the holders (12,20) for the grippers (10) comprise, for connecting them pivotally together, each a chain link (12a) fast with its respective rod (12) and means (24) of pivotal connection between that link (12a) and the chain link (12a) of an adjacent holder.
3. A device according to Claim 2, characterized in that the rods (12) of at least some of the holders (12,20) for the grippers (10) are mounted for free rotation about their longitudinal axes (a-a).

4. A device according to Claim 3, characterized in that the means for adjusting the grippers (10) in position comprise means (28,30,33) operative to shift at least some of the holders (12,20) for the grippers (10) along a transverse direction to the pivot axes of the chain links (12a). 5

5. A device according to Claim 4, characterized in that the means (28,30,33) for shifting the gripper (10) holders (12,20) comprise, for each gripper (10), a motor (33), a first helical coupling member (30) adapted to be rotated by the motor (33), a second helical coupling member (28) associated with the first helical coupling member, and a pivotal connection member (20) between that second helical coupling member (28) and the holder (12,20) of a respective gripper. 10

6. A device according to Claim 5, characterized in that the second helical coupling member is a slide (28) movable along a runway (27), and the pivotal connection member is a connecting rod (20) journalled, with one end, on the slide (28) and with the other end on the gripper (10) rod (12). 15

7. A device according to any of the preceding claims, characterized in that the position adjusting means comprise position sensors for the grippers (10) and an electronic program unit operative to adjust the gripper positions in accordance with a predetermined programmed clamping pattern. 20

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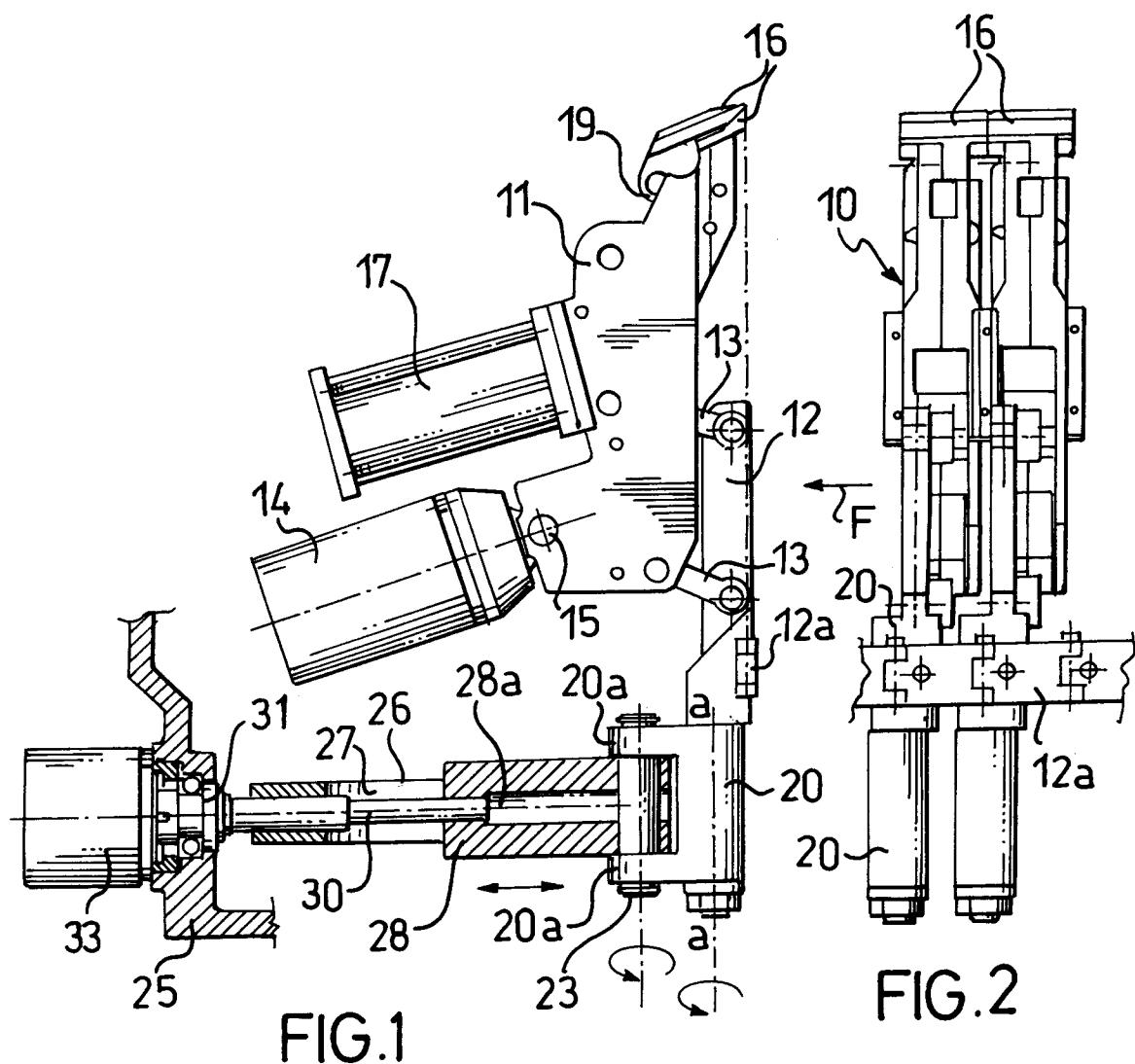
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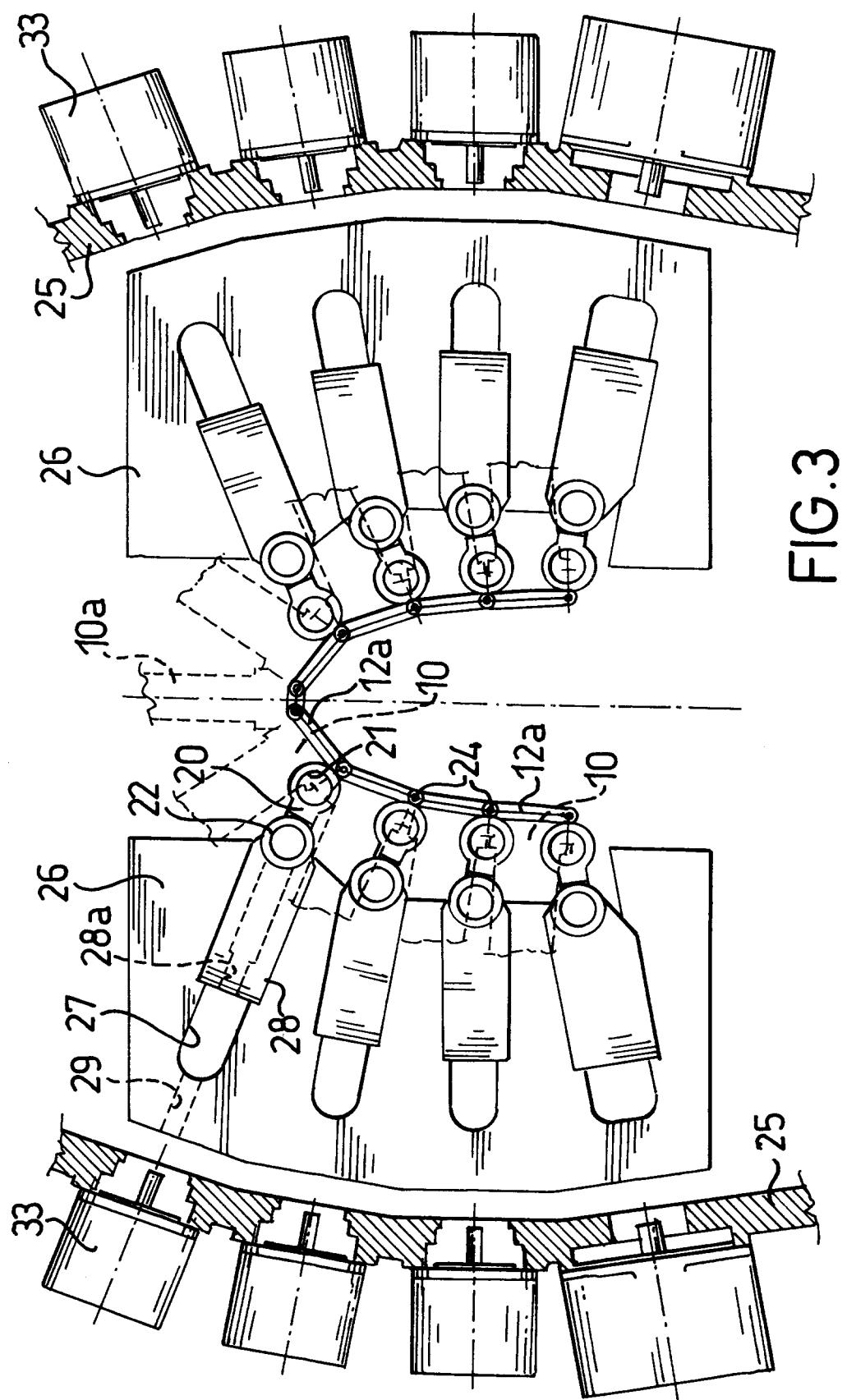
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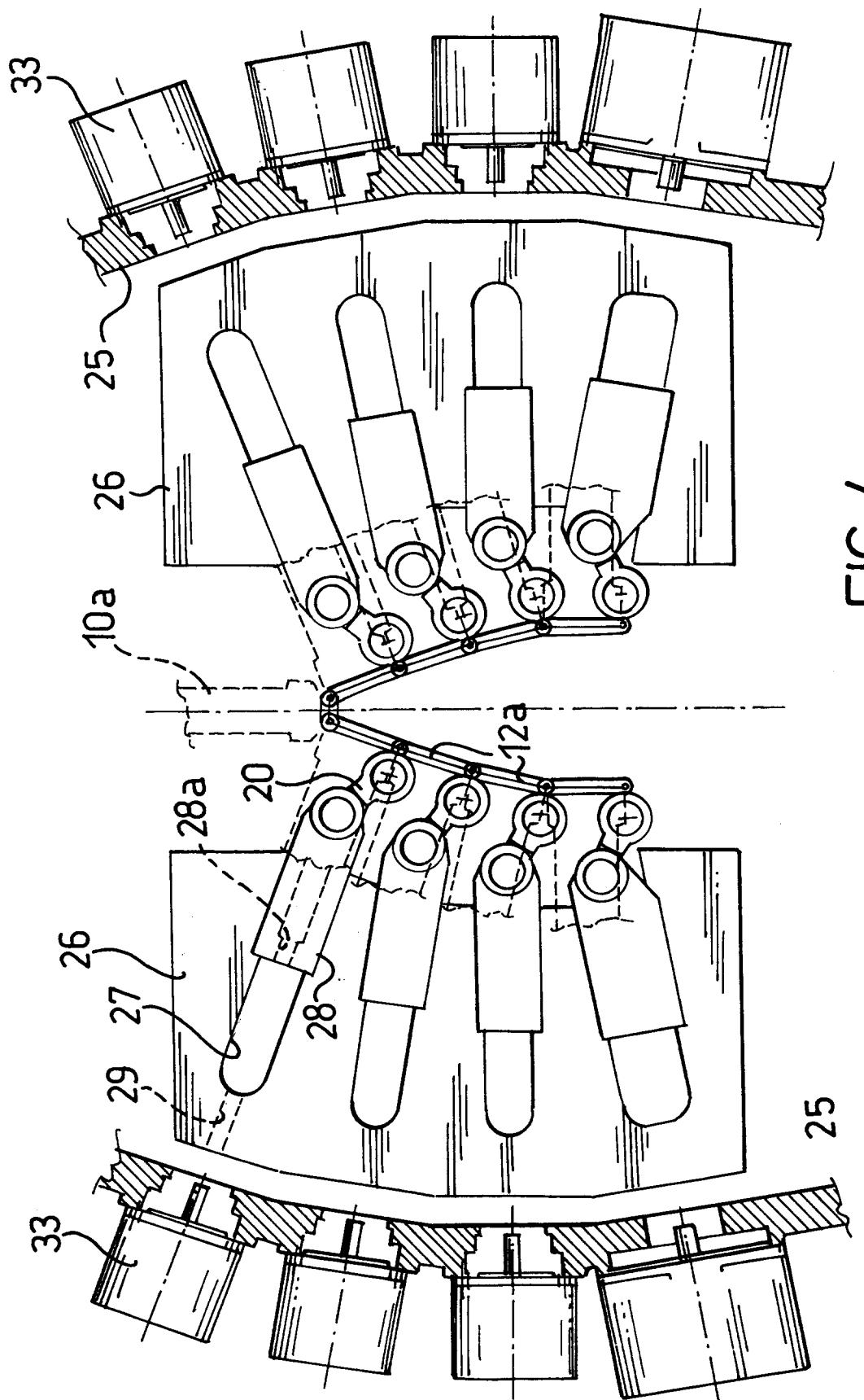
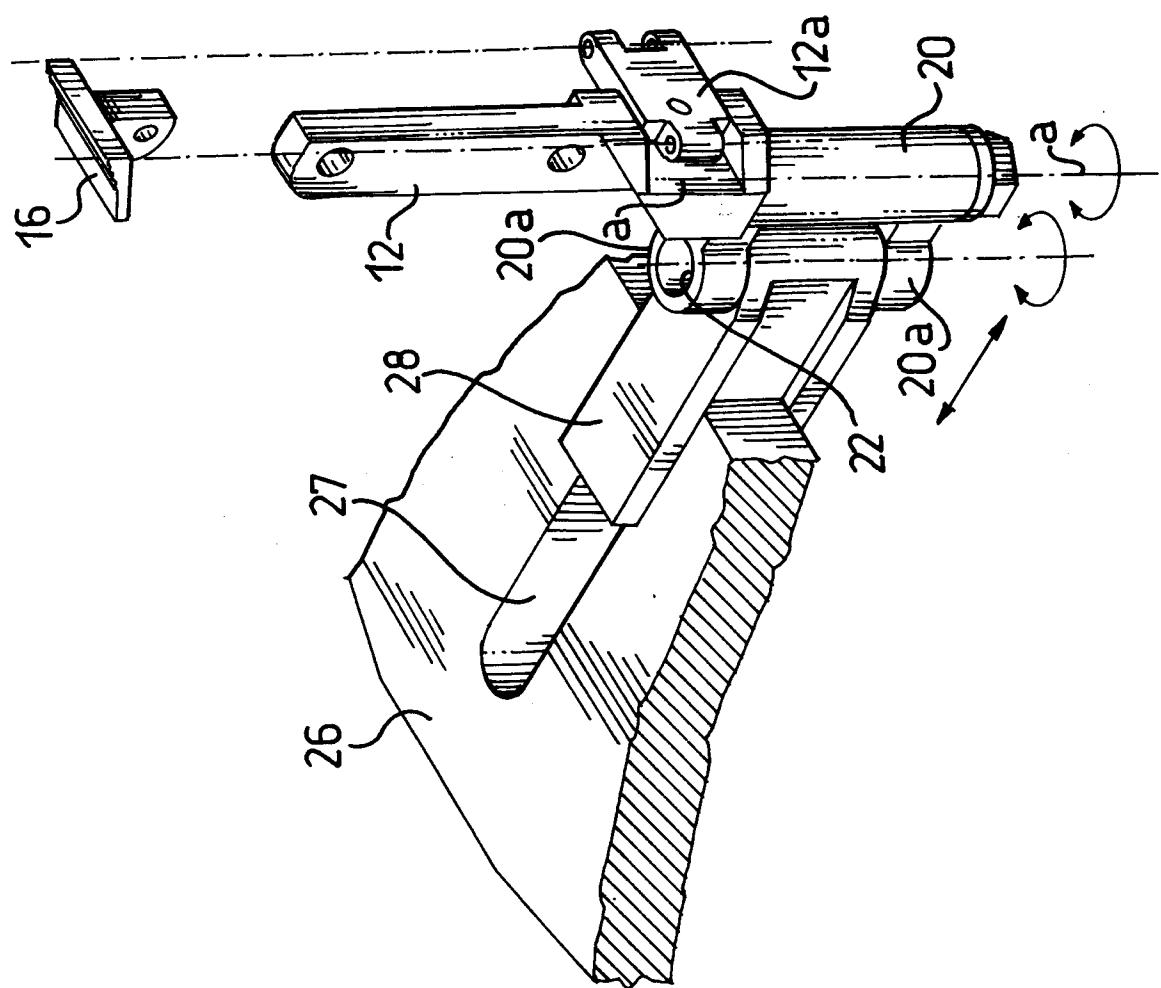


FIG.4

FIG. 5





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## EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0441

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	FR-A-2 389 345 (CERIM SPA) * claims; figures *	1-6	A43D21/16 A43D23/02 A43D119/00
A	WO-A-8 000 403 (INTERNATIONAL SHOE MACHINE CORP.) * claim; figures *	7	
A	GB-A-963 972 (W. G. HAWKINS)	-----	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A43D
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	26 FEBRUARY 1993	SOEDERBERG J.E.	
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