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(54) Automatic machine for the controlled roughening of the edge of an upper.

(57) A machine for roughening the bottom of a shoe along its peripheral edge comprises a shoe support (20) and a working head (17) with a disc-shaped roughening tool (29) which rotates in one plane and has a peripheral rim for working the bottom of the shoe. The shoe support (20) and the working head (17) are movable relative to one another so as to cause the tool (29) to follow a predetermined trajectory along said edge. The tool is supported by orienting means (27) so as to be arranged with the plane of rotation perpendicular to or inclined at a predetermined angle with respect to the lateral profile of the bottom during the movement along said trajectory.

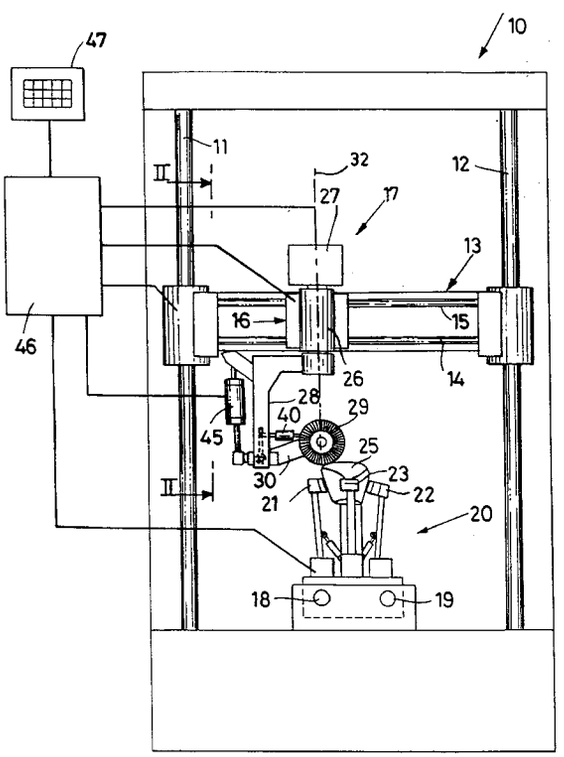

Fig.1

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In shoe manufacturing technology automatic machines are known in which the shoe bottoms are scraped along their perimeter after the upper has been applied in order to eliminate the shoulder formed as a result of folding over of the hems of the upper onto the bottom and in order to roughen the upper and the bottom, with the aim of improving gripping during the subsequent sole-gluing operation.

These machines generally consist of one or two rotating circular tools with an abrasive peripheral edge. The tools are guided so as to travel along the lateral edge of the bottom in order to perform the required roughening operation.

Generally the relative movement of tool and shoe occurs along orthogonal Cartesian axes. The tool therefore always moves parallel to itself in a plane which is usually transverse with respect to the direction in which the bottom of the shoe extends. In view of the winding pattern of the profile of the shoe bottom, the plane of rotation of the tool therefore forms an extremely variable angle with said profile during its movement.

It has been found that such an action of the tool on the edge of the upper causes stressing and distortion of the part of the edge glued to the bottom of the shoe, thus impairing both the final appearance of the upper and the subsequent operation involving fixing of the sole.

The general aim of the present invention is to overcome the abovementioned drawbacks, providing an automatic machine for scraping and roughening shoe bottoms, which does not give rise to abnormal stressing or distortion of the edge of an upper being worked on.

In order to achieve this aim, according to the present invention, it has been thought to provide a machine for roughening the bottom of a shoe along its peripheral edge, comprising a shoe support and a working head with a disc-shaped roughening tool which rotates in one plane and has a peripheral rim for working the bottom of the shoe, the shoe support and the working head being movable relative to one another so as to cause the tool to follow a predetermined trajectory along said edge, characterized in that the tool is supported by orienting means so as to be arranged with the plane of rotation inclined at a predetermined angle with respect to the lateral profile of the bottom during the movement of the tool along said trajectory.

In order to explain more clearly the innovative principles of the present invention and its advantages with respect to the known art, a description is provided below, with the aid of the accompanying drawings, of a possible non-limiting example of embodiment applying said principles. In the drawings:

Figure 1 is a diagrammatic view, in front elevation, of a machine according to the invention;

Figure 2 is a view, along the line II-II of Figure 1, showing a detail of the working head of the machine;

Figure 3 is a diagrammatic view of successive positions of a working tool along the edge of a shoe to be worked upon, with the plane of rotation perpendicular to the profile of the bottom; and

Figure 4 is a view similar to Figure 3, in which the plane of rotation of the tool is inclined at a predetermined variable angle with respect to the profile of the bottom.

With reference to the Figures, a machine according to the invention is diagrammatically indicated by 10 in Figure 1. This machine comprises a first pair of vertical guides 11 and 12 for vertical travel of a motor-driven slide 13 which supports in turn a second pair of guides 14 and 15, along which a second motor-driven slide 16 supporting a working group or head 17 travels horizontally.

At the bottom of the group 17 there are located further horizontal guides 18, 19 extending perpendicularly with respect to the plane of the drawing and hence perpendicular to the guides 11, 12 and 13, 14. On these bottom guides 18, 19 there travels a motor-driven carriage 20 with lateral grippers 21 and 22 and end grippers 23 for supporting and locking in position a shoe 25, as is known to a person skilled in the art.

The three pairs of guides thus form a system of orthogonal Cartesian axes by means of which it is possible to perform any relative translatory movement of the shoe 25 and working group 17.

The working group 17 comprises a vertical sleeve 26, rigid with the slide 16, inside which a support arm 28 is rotatable about a vertical axis 32 substantially perpendicular to the plane in which the shoe bottom extends. Rotation of the arm 28 about the the axis 32 is effected by an adjustable-position motor unit 27, for example a stepper motor or a d.c. motor with a position encoder.

The support arm 28 pivotably supports at one of its ends an arm 30 which supports at its free end a rotating tool 29 with an abrasive peripheral edge, for example a metal brush or the like.

As can be seen in Figure 2, the end 38 of the arm 30 which supports the brush 29 is hinged with the arm 28 by means of an articulated joint 36, such that the arm 30 is able to move about an axis 31 in a plane parallel to the plane of the brush and about an axis 34, perpendicular to the axis 31 and substantially tangential with the bottom edge of the brush, so as to allow lateral inclination of the brush plane. The vertical axis 32 intersects the axis 34 in the vicinity of the point of tangency of the brush with the axis 34. The movement of the lever 30 about the axis 34 is effected by a linear actuator 45 arranged between an extension of the support 28 and the free end of the articulated joint 36. A resilient element 40 (for example an air spring) is located between the arm 30 and articulated joint 36 in order to maintain the lever 30 resiliently in a predeter-

mined angular position with respect to the axis 34.

As a result of the moving mechanisms described above, the working surface of the tool 29 can be moved along a predetermined path following the pattern of the bottom of the shoe in both a horizontal and vertical plane. The plane of the tool can in fact be kept inclined at a predetermined angle with respect to the lateral profile of the bottom, viewed in the horizontal plane, by means of operation of the motor 27. The plane of the tool can moreover be kept inclined laterally by means of the actuator 45, so as to remain correctly oriented with respect to the bottom of the shoe, viewed in a vertical plane, even along the sloping sections.

As diagrammatically shown in Figure 1, the machine described above comprises a unit 46 for controlling and managing operation, said unit being connected to the driving systems of the slides 13, 16 and the carriage 20, to the motor 27 for vertical rotation of the support 28, to the linear actuator 45 and to the grippers for holding and positioning a shoe in the carriage 20. The control unit 46 may be, for example, a programmable electronic processing unit, such as a microprocessor for example. This electronic unit is of a well-known type and hence can be easily imagined by a person skilled in the art, especially in the light of the operating description which follows. Consequently, it will not be described or illustrated further herein.

The path and angles which the tool must follow or assume during the working operation may be entered into the unit 46, for example by means of a keyboard 47 or other known instructing means.

Advantageously, the control unit may be programmed so as to calculate directly rotation of the tool about the axes 32 and 34 on the basis of the movement data relating to the front and rear end of the shoe. In other words, for the sake of simplicity of use, it is advantageous to enter into the device 46 the trajectory which the tool must follow, while the inclinations of tool are calculated directly for each point along the trajectory as a fixed - for example perpendicular - angle, with respect to the tangent of the trajectory along a vertical plane and a horizontal plane, or as an angle which is variable in a predetermined manner depending on the position of the tool along the trajectory.

Figure 3 shows, by way of example, the inclination of the tool about the vertical axis 32 along various points of a trajectory 24 representing the edge of a hypothetical shoe, so as to keep the action of the tool directed towards the inside of the edge of the upper and in a direction perpendicular thereto.

Figure 4 shows an example of a working operation in which the working plane of the tool is inclined at predetermined variable angles depending on the position of the tool along the edge of the bottom. In the particular embodiment shown in this Figure, the tool forms an angle α of about 90° in the region of the central, toe and heel zones of the bottom, while it forms an angle β less than 90° in the intermediate connecting zones. In this way it is possible to obtain a more precise working profile as well as more regular wear of the brush. Finally an advantage is also achieved in terms of working time, since the choice of the aforementioned angles results in more rapid rotational movement of the brush support in the heel and toe zones of the bottom.

Obviously, the tool is rotated so as to push the upper towards the centre of the bottom, i.e. in an anticlockwise direction as viewed in Figure 1.

During operation, the brush is resiliently supported by means of the spring 40, so as to exert an adequate pushing force on the bottom of the shoe.

At this point it is clear how the machine according to the invention is able to follow the entire perimeter of the edge of the shoe, performing a complete revolution thereof, without causing abnormal stressing of the edge of the upper resulting in the possibility of detachment or distortion.

The automatic roughening machine according to the present invention has been described with reference to particular embodiments of the same, but its protective scope also comprises all the possible variants within the competence of a person skilled in the art, as defined in the following claims.

For example, the articulated joint 36 may be different from that shown. In particular, it may be dispensed with if inclination of the tool in a vertical plane about the axis 34 is not required.

The carriage supporting the shoe may be provided with sensors which measure the dimensional characteristics of the shoe so as to indicate to the unit 46 the model and/or the size of the shoe, such that this unit is able to choose between several preset trajectories (one for each model to be handled) or can calculate a scale factor of a preset trajectory so as to adapt it to a different shoe size. Similarly, the sensors may indicate the presence of a right-hand or left-hand shoe or mirror-reverse the trajectory to be followed. These sensors may be simply inserted into the shoe positioning grippers in order to measure displacement of the grippers themselves prior to gripping as can be easily imagined by a person skilled in the art.

Claims

1. Machine for roughening the bottom of a shoe along its peripheral edge, comprising a shoe support (20) and a working head (17) with a disc-shaped roughening tool (29) which rotates in one plane and has a peripheral rim for working the bottom of the shoe, the shoe support (20) and the working head (17) being movable relative to one another so as to cause the tool (29) to follow a predetermined trajectory along said edge, char-

acterized in that the tool is supported by orienting means designed to keep the plane of rotation inclined at a predetermined angle with respect to the lateral profile of the bottom during the movement of the tool along said trajectory.

2. Machine according to Claim 1, in which said predetermined angle between the plane of rotation of the tool and the lateral profile of the bottom is substantially equivalent to 90°.

3. Machine according to Claim 1, in which said predetermined angle between the plane of rotation of the tool and the lateral profile of the bottom, viewed in a horizontal plane, is substantially equivalent to 90° in the region of the central, toe and heel zone of the bottom and is less than 90° in the front and rear end zones connecting the aforementioned zones.

4. Machine according to Claim 1, characterized in that said orienting means comprise a support (28) driven by an adjustable-position motor unit (27) and fixed to the head (17) rotatably about a first axis (32) substantially perpendicular to the surface of the bottom of the shoe.

5. Machine according to Claim 4, characterized in that said first axis (32) passes substantially through the point of contact of the tool (29) with the bottom of the shoe.

6. Machine according to Claim 1, characterized in that the tool (29) is supported with its own plane of rotation rotatable about a second axis (34) perpendicular to the first axis (32) and substantially tangential with the tool in the region of the point of contact of the tool with the bottom of the shoe.

7. Machine according to Claim 1, characterized in that the tool (29) is movable in its plane of rotation against the action of resilient means (40) pushing with a controlled force the tool against the bottom of the shoe.

8. Machine according to Claim 1, characterized in that it comprises a carriage (20) supporting the shoe support, which is movable along guides (18, 19) in a first horizontal direction substantially coinciding with the longitudinal direction of the bottom of the supported shoe, and slides (13, 16) supporting the working head (17), which are movable along respective guides (11, 12 and 14, 15) in a vertical direction and in a second horizontal direction perpendicular to said first horizontal direction, so as to achieve relative translatory movements of the tool (29) and support (20) along three Cartesian axes.

9. Machine according to Claim 6, characterized in that the tool (29) is supported at the end of an arm (30), the other end of which is hinged on articulated means (36) in turn hinged with the support (28) of the working head (17) so as to allow rotation of the tool in its own plane of rotation against the action of resilient means (40), about a third axis (31) perpendicular to said first axis (32) and second axis (34).

10. Machine according to Claims 6 and 9, in which said rotation about the second axis (34) is effected by a linear actuator (45) fixed at one end to an extension of the support (28) of the working head and at the other end to said articulated means (36).

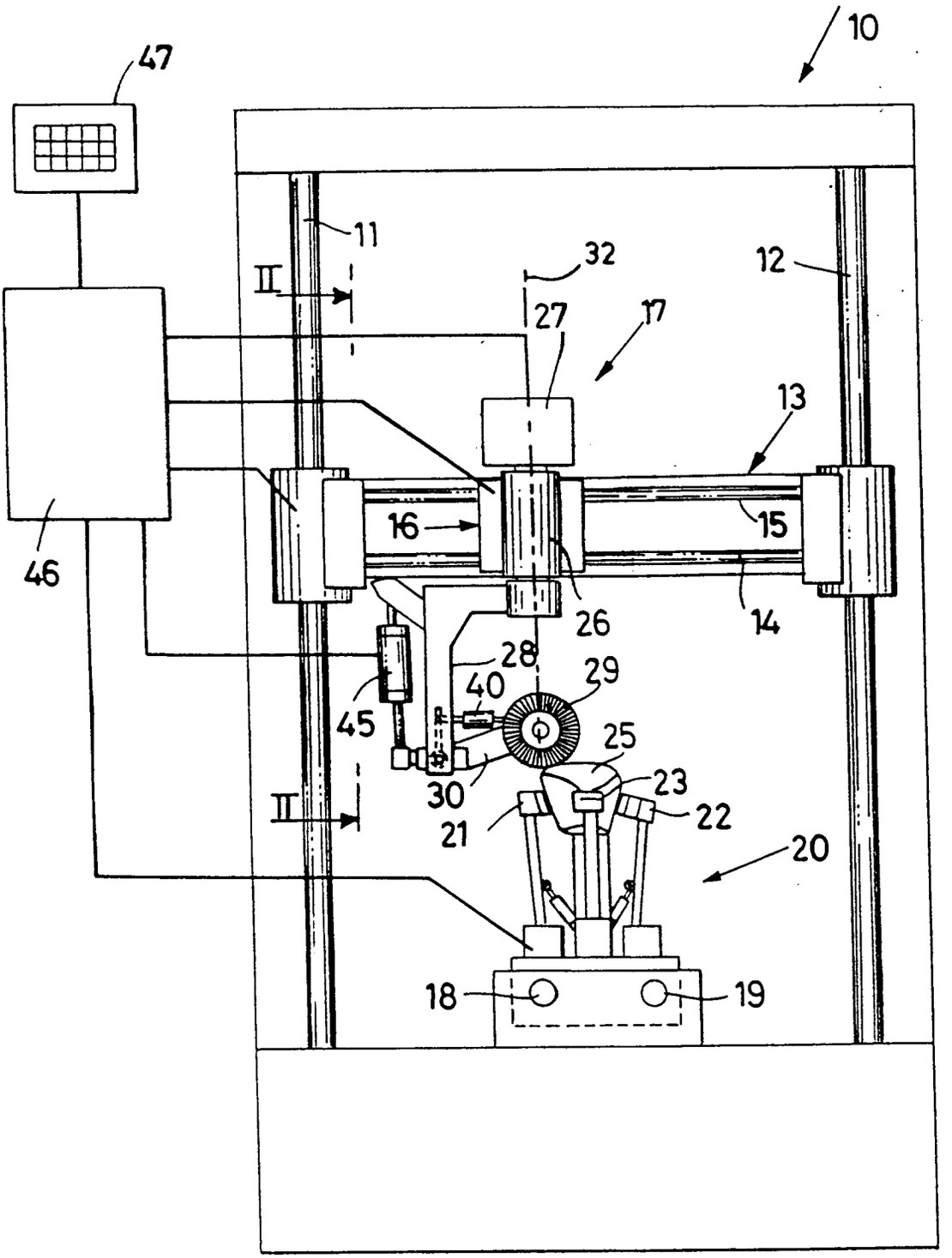
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Fig.1

Fig.3

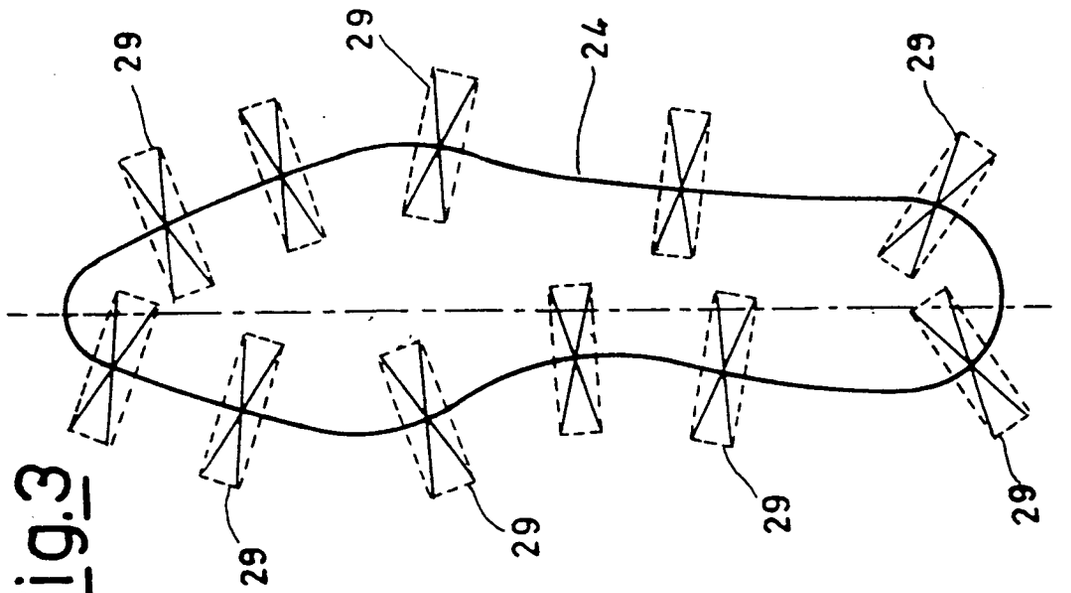


Fig.2

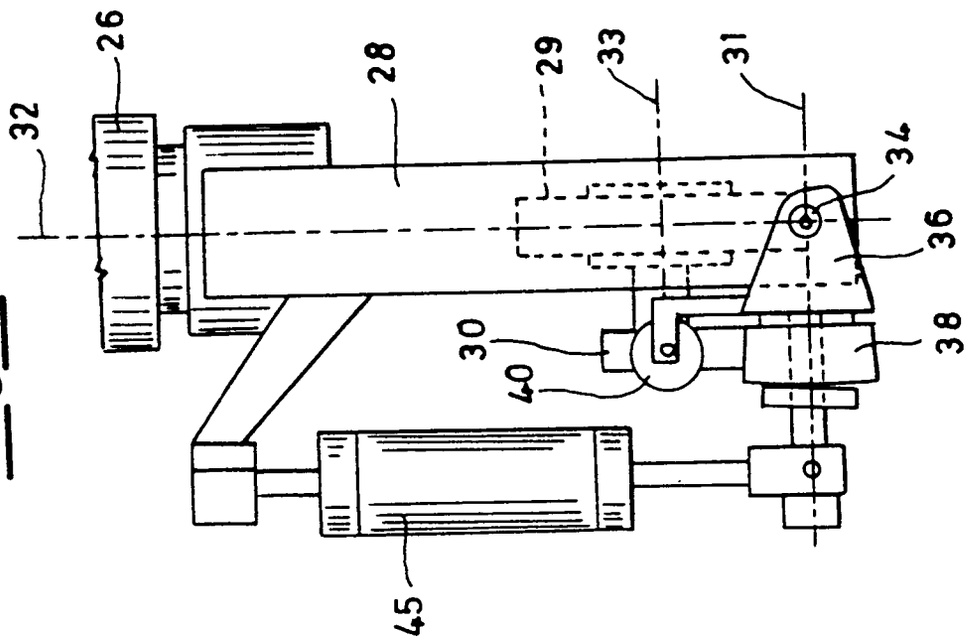
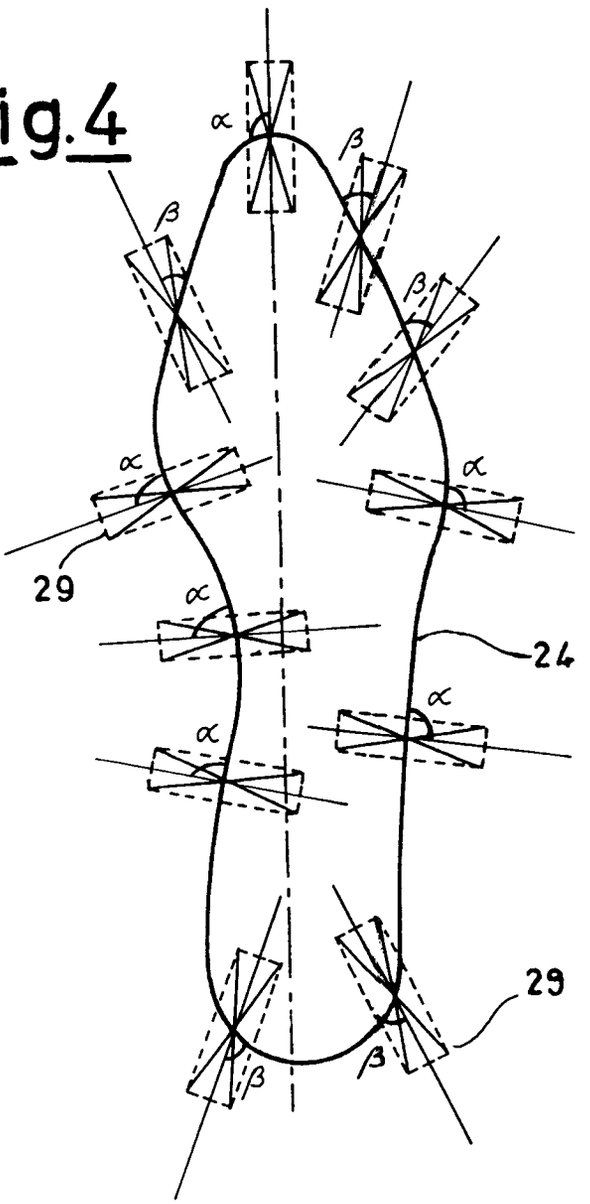


Fig.4



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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 7125

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.6)
X A	EP-A-0 135 201 (LEADER COMPANY LTD) * page 7, paragraph 1; figure 31 * * page 41 - page 51, paragraph 2 * * figures 19,25-28,30 *	1,2,6 8-10	A43D37/00 A43D119/00
X	FR-A-2 489 110 (ANVER SA) * page 2, line 6 - line 17 * * page 6, line 24 - line 35 * * claim 1; figures *	1,2,4,5, 7,8	
X	FR-A-2 529 763 (ANVER SA) * page 2, line 17 - line 26 * * page 4, line 16 - line 28 * * figures, in particular figure 1 and 4 *	1,2,4,5, 7,8	
A	DE-A-42 11 634 (WINTER ET AL) * column 2, line 46 - line 49 * * column 2, line 62 - line 63; figure 4 *	1-10	
X A	EP-A-0 042 672 (THE BRITISH UNITED SHOE MACHINERY COMPANY LTD. ET AL) * page 13, line 7 - line 12; figures 8,1 *	1,4,7,8 2,3	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A43D
P,X	EP-A-0 596 570 (OFFICINA MECCANICA B.D.F.) 11 May 1994 * column 3, line 44 - column 4, line 5; figures *	1-10	
A	EP-A-0 336 632 (INTERNATIONAL SHOE MACHINE CORPORATION) * column 5, line 51 - column 6, line 34; figures *	1,2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 February 1995	Scholvinck, T

CATEGORY OF CITED DOCUMENTS

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