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(54) **System for detecting and compensating the lateral rotation of a shoe last in respect of the predetermined blocking position in an automatic shoe processing machine**

Verfahren zur Feststellung und Kompensation der seitlichen Drehung von einem Schuhleisten im Vergleich mit einer vorbestimmten Position in einer automatischen Schuhbearbeitungsvorrichtung

Système de détection et compensation de la rotation latérale d'une forme de chaussure par rapport à une position de blocage prédéterminée utilisé dans une machine de réalisation de chaussures automatique

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(73) Proprietor: **OFFICINA MECCANICA B.D.F. S.P.A.**
27023 Cassolnovo (IT)

(72) Inventor: **Ceriani, Davide**
27023 Cassolnovo,
Pavia (IT)

(74) Representative: **Faggioni, Marco et al**
Fumero Studio Consulenza Brevetti Snc
Pettenkoferstrasse 20-22
80336 München (DE)

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Description

[0001] The present description concerns a system to automatically detect and compensate the slight rotations to which a shoe-tree may be subjected during the locking operation which precedes the automatic shoe manufacturing step - for instance, a carding operation on the shoe bottom - in respect of the position taken up by said shoe-tree during the initial learning operation on a sample shoe-tree.

[0002] It is well known to the skilled in the art that one of the shoe manufacturing steps involves a carding of the shoe bottom in order to suitably roughen its surface and allow to correctly carry out the subsequent step of sticking the sole. For this purpose, the bottom and the vamp of the shoe are mounted onto a support having the desired shape of the shoe being manufactured and called, in this sector, a "shoe-tree".

[0003] To carry out the carding operation, the shoe-trees - on which the shoe bottoms and vamps have been previously mounted - are locked in position between the clamps of a carding machine and are then automatically machined by a carding tool, normally a brush with steel bristles. The carding tool follows a very specific path along the bottom and on the vamp, which path has been previously detected on a sample shoe-tree and memorised in a storage area of the carding machine. The detection on the sample shoe-tree is normally carried out by locking said shoe-tree in the normal working position and by passing, over the area to be carded, an appropriate feeler, the movement of which is detected and memorised by the carding machine, so as to be then exactly reproduced in the movement of the carding tool over the different shoe-trees being inserted, time after time, on the machine. An automatic shoe manufacturing machine of this type is for example disclosed in EP-A-655207.

[0004] To make sure that the movement of the carding tool reproduces in a fully identical way the machining path which has been detected on the sample shoe-tree, it is obviously necessary for the single shoe-trees, mounted in succession on the carding machine, to be all locked exactly in the same initial position of the sample shoe-tree. This result is fairly easy to obtain and reproduce in the case of the linear positioning of the shoe-tree in respect of a longitudinal axis of the shoe, as well as of an axis perpendicular thereto and to the shoe sole. It is instead more difficult to reproduce an exact position in the case of the angular setting of the shoe-tree in respect of said longitudinal axis of the shoe. It is in fact possible and it besides.frequently happens that, during the locking operation, the shoe-tree takes up a slightly inclined position on either sides - for example, an inclination varying between a few tenths of a degree and some degrees - in respect of the position originally taken up by the sample shoe-tree when detecting the machining path.

[0005] In the manufacture of traditional footwear, the aforedescribed phenomenon has given rise to no appreciable drawbacks. In fact, when the sole is of a substantially flat type, the carding concerns merely the bottom part of the shoe, whereby the slight misalignments in the positioning of the sample shoe-tree - determined by a slight lateral rotation of said shoe-tree - are easily and widely compensated. In fact, the carding tool is normally caused to operate on the shoe with a constant pressure, thanks to the use of elastic or hydraulic means; thus, if the bottom surface of the shoe were to undergo a slight rotation along the longitudinal axis of the shoe, in respect of the ideal working plane - that is, if one side of the bottom surface of the shoe were to be higher than the opposite side - such a difference in height would actually be compensated by a shorter or longer stroke of the carding tool, pressed against the shoe by said elastic or hydraulic means, so that it always works substantially in the same conditions.

[0006] The same phenomenon has instead quite different consequences when the machining operation on the shoe - whether it be a carding or sticking operation - must concern also the lateral portion of the vamp, as it typically happens in the case of shoes with a box-type sole. In this type of footwear - which has been having an exceptional development in the last years, particularly in the sector of sports footwear - the outer edge of the sole extends in fact upwards, up to covering the vamp to an extent which may vary between a few millimeters and some centimeters. Moreover, said outer edge may have a uniform configuration, and thus a substantially constant height throughout the perimeter of the sole, or else - as it happens more frequently - it can be variously shaped in the different parts of the sole, so as to give to the shoe special aesthetic features, as well as characteristics of stoutness, foot protection, and so on.

[0007] The lateral machining operation on this type of soles is thus particularly delicate. Considering for example the carding operation, it is evident that an insufficient carding does not allow a proper sticking of the sole edge, while an excessive carding prejudices the final quality of the shoe which, in this case, would in fact show a remarkable strip of carded vamp above the edge of the shoe sole.

[0008] Taking into account the above, it is thus evident that, when carrying out a machining operation on shoes with a box-type sole, as described heretofore, an angular displacement of the shoe-tree - even only of a few tenths of a degree - in respect of the theoretical position, involves a corresponding positive displacement of the machining limit of the carded area, and precisely a lifting of said limit on one side of the shoe and a lowering thereof on the other side. This would hence simultaneously produce a fault of excessive carding - and thus visible - on one side of the shoe, and a fault of reduced carding - and thus of insufficient sticking of the sole - on the opposite side of the shoe, thereby giving rise to a high depreciation in the quality of the product.

[0009] The object of the present invention is to thus supply an automatic shoe manufacturing machine apt to eliminate the above drawback and prevent faulty machin-

ing and, in particular, faulty carding operations, i.e. insufficient or excessive carding, caused by a final positioning of the shoe-tree at the end of the locking operation in the carding machine - in relation to the angular setting in respect of the longitudinal axis - differing from that taken up by the sample shoe-tree used for the initial learning of the machining path.

[0010] According to the present invention, said object is reached by means of an automatic shoe manufacturing machine and, in particular, in a carding machine, as claimed in claims 1-6 and the method of claim 7.

[0011] Other characteristics and advantages of the system according to the present invention will anyhow be more evident from the following detailed description of a preferred embodiment thereof, given with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic plan view of a carding machine including the system according to the present invention;

Fig. 2 is a side elevation view of the machine of fig. 1, in a rest position; and

Fig. 3 is a view similar to that of fig. 2, with the carding tool in operation.

[0012] The carding machine illustrated on the drawings consists of a guide arm 1, onto which an oscillating arm 2 is hinged in A. On the free end of said arm 2 there is finally fixed a carding tool 3, normally a brush with metal bristles, and the respective driving motor M. The arm 1 is then connected, in known manner, to control and driving means (not shown) which allow to automatically shift the tool 3 according to a desired working path, along a shoe-tree F which is locked in position under the carding tool 3 and on which there are mounted the bottom and the vamp of a shoe being manufactured.

[0013] When starting to manufacture a new series of shoes of the same type, a sample shoe-tree is first of all locked in position on the shoe manufacturing machine, and a learning operation is carried out on said sample shoe-tree to learn the machining path which the tool 3 will have to perform over the whole series of shoe-trees F of the same type. However, when said shoe-trees F - mounted in succession - are locked in position in the carding machine, it easily happens - as already mentioned in the introductory part of the present description - that the angular setting of the shoe-tree F in respect of the longitudinal axis Y of the shoe, once said shoe-tree has been locked in position, is rotated by an angle α (fig. 3) in respect of the initial position taken up by the sample shoe-tree during the learning step.

[0014] According to the present invention, an encoder 4, coaxial to the hinge A, is set between the arm 1 and the arm 2 and is fixedly connected to one of said arms, so as to be apt to detect the respective angular displacements thereof, then transmitting the data concerning such displacements to the above control means. By processing this new data and comparing them to those previously detected during the learning step on the sample shoe-tree, the system is thus apt to detect the lateral rotation actually undegone by each single shoe-tree F being manufactured, in respect of the position taken up by the sample shoe-tree, and is apt to accordingly modify the machining path of the carding tool 3 in the subsequent working steps, that is, in particular, in the steps which concern the lateral surface of the vamp.

[0015] In fact, according to an important characteristic of the present invention, by associating the encoder 4 to the arms 1 and 2 carrying the carding tool 3, it is possible to detect the final angular setting of the shoe-tree F just during the carding operation on the shoe bottom, thereby avoiding to dedicate a specific working step to this detection operation.

[0016] It is however evident that if, for any special models of footwear, one should wish to carry out also the bottom carding step according to a "modified" working path, this working step can be preceded by a step exclusively meant to detect the lateral rotation of the shoe-tree, by using a device fully similar to that described heretofore in which the carding tool has been replaced by a common feeler. This last device can also be of the retractable or foldable type and it can be permanently associated to the carding tool, so that it may be possible to use one or the other, according to uses or preferences, with a simple and practical operation.

[0017] In the previous description reference has mainly been made to the carding operation on the shoe bottom as a basic shoe manufacturing step, during which it is preferably convenient to detect the lateral rotation of said shoe. This is due, on one hand, to the fact that said operation is normally the first automatic operation carried out on the shoe and, on the other hand, to the fact that - as said above - said operation can normally be carried out correctly also in the presence of a small angular rotation.

[0018] The present invention has been described with reference to a particular embodiment thereof, but it is evident that its protection scope is not limited to said embodiment, but extends to any possible variants within reach of a person skilled in the art, provided that they fall within the definitions of the invention given in the accompanying claims.

Claims

1. Automatic shoe manufacturing machine of the type comprising means to lock the shoe-tree (F) in position, a working tool (3) movable along said shoe-tree, and control and driving means to shift said tool along the shoe-tree according to a machining path pre-set on the basis of data previously memorised in a storage area of said control means, **characterised in that** said automatic shoe manufacturing machine also comprises a system to detect and compensate the lateral rotation of a shoe-tree, in respect of the

initial locking position of a sample shoe-tree, said system comprising a feeler apt to detect, after locking of the shoe-tree (F), the lateral rotation of said shoe-tree in respect of said initial locking position of the sample shoe-trees and control means apt to modify the machining path of the working tool on the basis of the data on the lateral rotation of said shoe-tree, detected by said feeler.

2. Automatic shoe manufacturing machine as in claim 1), wherein said feeler is associated to said working tool (3) and is apt to detect the lateral rotation of the shoe-tree (F) during the operation carried out on the shoe by said tool.

3. Automatic shoe manufacturing machine as in claim 2), wherein said feeler consists of the actual working tool (3).

4. Automatic shoe manufacturing machine as in claim 3) which is a carding machine, and the operation during which the lateral rotation of the shoe-tree (F) is detected is a carding operation on the shoe bottom.

5. Automatic shoe manufacturing machine as in claim 4), wherein the working tool (3) of said carding machine consists of a rotating brush with metallic bristles.

6. Automatic shoe manufacturing machine as in claim 4) or 5), wherein a support arm (2) of said carding tool (3) is hinged (in A) onto a guide arm (1), an encoder (4) being positioned in correspondence of said hinge (A) and being apt to detect the angular displacements between said arms (1, 2) and to transmit said information to said control means.

7. Method for manufacturing a shoe with an automatic shoe manufacturing machine as claimed in claim 6), comprising a system to detect and compensate the lateral rotation of a shoe-tree (F) in respect of the initial locking position of a sample shoe-tree, comprising the following steps:

a)carding of the bottom surface of the shoe, and
b)detecting the lateral rotation of the shoe-tree in respect of said initial locking position of the sample shoe-tree;

carried out simultaneously by said carding tool (3), and the following further steps in succession:

c)reprocessing, by said control means, of the stored data concerning the machining path of the carding tool (3), on the basis of the data on the lateral rotation detected during step b);
d)carrying out one or more successive operations on the shoe on the basis of the machining path reprocessed in step c).

8. Method for manufacturing a shoe as in claim 7), wherein the successive operations carried out in step d) can be selected among the following: lateral carding of the shoe, application of an adhesive on the bottom carded surface of the shoe, application of an adhesive on the lateral carded surface of the shoe.

Revendications

1. Machine de fabrication automatique de chaussure du type comprenant un moyen pour verrouiller l'embauchoir (F) en position, un outil de travail (3) mobile le long dudit embauchoir, et un moyen de commande et d'entraînement pour déplacer ledit outil le long de l'embauchoir suivant un chemin d'usinage prédéterminé sur la base de données mémorisées au préalable dans une zone de stockage dudit moyen de commande, **caractérisée en ce que** ladite machine de fabrication automatique de chaussure comprend également un système pour détecter et compenser la rotation latérale d'un embauchoir, par rapport à la position de verrouillage initiale d'un embauchoir échantillon, ledit système comprenant un palpeur apte à détecter, après verrouillage de l'embauchoir (F), la rotation latérale dudit embauchoir par rapport à ladite position de verrouillage initiale des embauchoirs échantillons et un moyen de commande apte à modifier le chemin d'usinage de l'outil de travail sur la base des données sur la rotation latérale dudit embauchoir, détectée par ledit palpeur.

2. Machine de fabrication automatique de chaussure selon la revendication 1, dans laquelle ledit palpeur est associé audit outil de travail (3) et est apte à détecter la rotation latérale de l'embauchoir (F) pendant l'opération effectuée sur la chaussure par ledit outil.

3. Machine de fabrication automatique de chaussure selon la revendication 2, dans laquelle ledit palpeur se compose de l'outil de travail même (3).

4. Machine de fabrication automatique de chaussure selon la revendication 3, qui est une machine à carder, et l'opération pendant laquelle la rotation latérale de l'embauchoir (F) est détectée est une opération de cardage sur le fond de la chaussure.

5. Machine de fabrication automatique de chaussure selon la revendication 4, dans laquelle l'outil de travail (3) de ladite machine à carder se compose d'une brosse rotative avec des poils métalliques.

6. Machine de fabrication automatique de chaussure selon la revendication 4 ou 5, dans laquelle un bras

de support (2) dudit outil de cardage (3) s'articule (en A) sur un bras de guidage (1), un encodeur (4) étant positionné en correspondance de ladite articulation (A) et étant apte à détecter les déplacements angulaires entre lesdits bras (1, 2) et à transmettre lesdites informations audit moyen de commande.

7. Procédé de fabrication d'une chaussure avec une machine de fabrication automatique de chaussure selon la revendication 6, comprenant un système pour détecter et compenser la rotation latérale d'un embauchoir (F) par rapport à la position de verrouillage initiale d'un embauchoir échantillon, comprenant les étapes suivantes consistant à :

a) carder la surface inférieure de la chaussure, et
b) détecter la rotation latérale de l'embauchoir par rapport à ladite position de verrouillage initiale de l'embauchoir échantillon ;

étapes effectuées simultanément par ledit outil de cardage (3), et les autres étapes suivantes en série consistant à :

c) retraiter, par ledit moyen de commande, les données stockées concernant le chemin d'usinage de l'outil de cardage (3), sur la base des données sur la rotation latérale détectée pendant l'étape b) ;
d) effectuer une ou plusieurs opérations successives sur la chaussure sur la base du chemin d'usinage retraité à l'étape c).

8. Procédé de fabrication d'une chaussure selon la revendication 7, dans lequel les opérations successives effectuées à l'étape d) peuvent être sélectionnées parmi les suivantes : le cardage latéral de la chaussure, l'application d'un adhésif sur la surface cardée inférieure de la chaussure, l'application d'un adhésif sur la surface cardée latérale de la chaussure.

Patentansprüche

1. Automatische Maschine zum Herstellen von Schuhen, der Bauart mit einem Mittel zum Verriegeln des Schuhspanners (F) in seiner Position, mit einem Bearbeitswerkzeug (3), das entlang des genannten Schuhspanners bewegbar ist, und mit einer Steuer- und Antriebseinrichtung zum Verlagern des genannten Werkzeugs entlang des Schuhspanners gemäß eines Bearbeitungswegs, der auf der Basis von Daten, die vorab in einem Speicherbereich der genannten Steuereinrichtung gespeichert worden sind, voreingestellt ist, **dadurch gekennzeichnet, daß** die genannte automatische Maschine zum Herstellen von Schuhen weiterhin ein System zum Erfassen und Kompensieren der lateralen Rotation eines Schuhspanners umfaßt, in bezug auf die ursprüngliche Verriegelungsposition eines Musterschuhspanners, wobei das System einen Fühler aufweist, um nach dem Verriegeln des Schuhspanners (F) die laterale Rotation des genannten Schuhspanners in bezug auf die genannte ursprüngliche Verriegelungsposition der Probeschuhspanner zu erfassen, und eine Steuereinrichtung, die geeignet ist, den Bearbeitungsweg des Bearbeitswerkzeugs auf der Basis der Daten über die laterale Rotation des genannten Schuhspanners, die durch den genannten Fühler erfaßt worden ist, zu modifizieren.

2. Automatische Maschine zum Herstellen von Schuhen nach Anspruch 1, **dadurch gekennzeichnet, daß** der genannte Fühler dem genannten Bearbeitungswerkzeug (3) zugeordnet ist und sich dazu eignet, die laterale Rotation des Schuhspanners (F) während der Bearbeitung, die an dem Schuh durch das genannte Werkzeug ausgeführt wird, zu erfassen.

3. Automatische Maschine zum Herstellen von Schuhen nach Anspruch 2, **dadurch gekennzeichnet, daß** der genannte Fühler aus dem eigentlichen Bearbeitungswerkzeug (3) besteht.

4. Automatische Maschine zum Herstellen von Schuhen nach Anspruch 3, bei der es sich um eine Kardiermaschine handelt, und wobei die Bearbeitung, bei der die laterale Rotation des Schuhspanners (F) erfaßt wird, eine Kardierbearbeitung an der Unterseite des Schuhs ist.

5. Automatische Maschine zum Herstellen von Schuhen nach Anspruch 4, **dadurch gekennzeichnet, daß** das Bearbeitswerkzeug (3) der genannten Kardiermaschine aus einer rotierenden Bürste mit metallischen Borsten besteht.

6. Automatische Maschine zum Herstellen von Schuhen nach Anspruch 4 oder 5, **dadurch gekennzeichnet, daß** ein Tragarm (2) des genannten Kardierwerkzeugs (3) bei A auf einem Führungsarm (1) angelenkt ist, wobei ein Kodierer (4) entsprechend der genannten Aufhängung (A) angeordnet ist und dazu geeignet ist, die Winkelverlagerungen zwischen den genannten Armen (1, 2) zu erfassen und die Information an die Steuereinrichtung zu übertragen.

7. Verfahren zum Herstellen eines Schuhs mit einer automatischen Maschine zum Herstellen von Schuhen nach Anspruch 6, mit einem System zum Erfassen und Kompensieren der lateralen Rotation eines Schuhspanners (F) in bezug auf die ursprüngliche

Verriegelungsposition eines Musterschuhspanners, mit den folgenden Schritten:

a) Kardieren der unteren Oberfläche des Schuhs, und
b) Erfassen der lateralen Rotation des Schuhspanners in bezug auf die genannte ursprüngliche Verriegelungsposition des Musterschuhspanners;

die gleichzeitig durch das genannte Kardierwerkzeug (3) ausgeführt werden, und wobei anschließend die folgenden weiteren Schritte ausgeführt werden:

c) erneutes Bearbeiten, durch das genannte Steuermittel, der gespeicherten Daten, die den Bearbeitungsweg des Kardierwerkzeugs (3) betreffen, auf der Basis der Daten über die laterale Rotation, die während des Schritts b) erfaßt worden sind;
d) Ausführen von einem oder mehreren aufeinanderfolgenden Bearbeitungsvorgängen an dem Schuh auf der Basis des Bearbeitungswegs, der in Schritt c) erneut verarbeitet worden ist.

8. Verfahren zum Herstellen eines Schuhs nach Anspruch 7, **dadurch gekennzeichnet, daß** die aufeinanderfolgenden Bearbeitungsvorgänge, die in Schritt d) ausgeführt werden, unter dem folgenden ausgewählt sind: laterales Kardieren des Schuhs, Aufbringen eines Klebstoffs auf die kardierte untere Oberfläche des Schuhs, Aufbringen eines Klebestoffs auf die kardierte laterale Oberfläche des Schuhs.

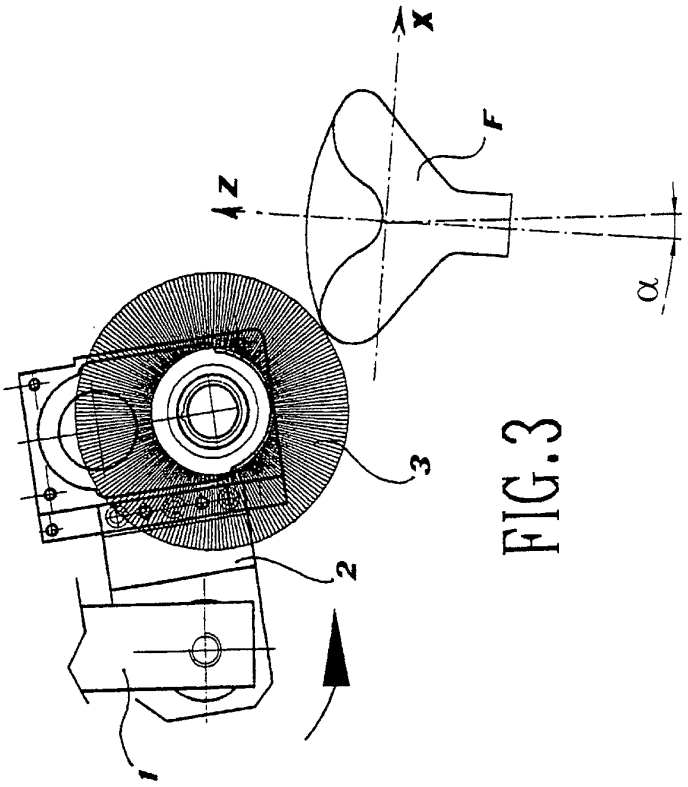

FIG.3

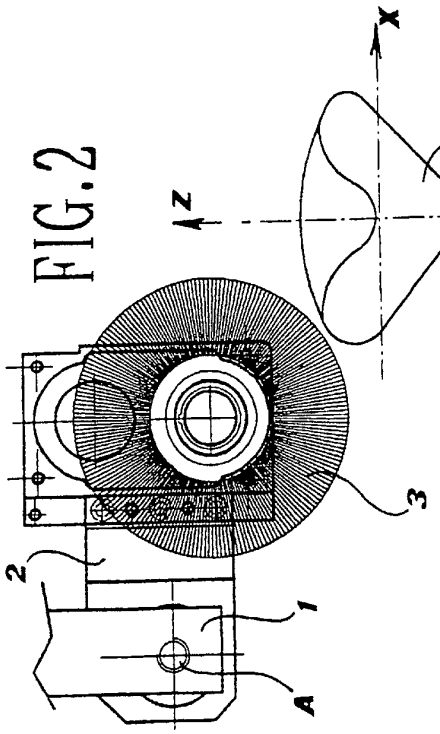

FIG.2

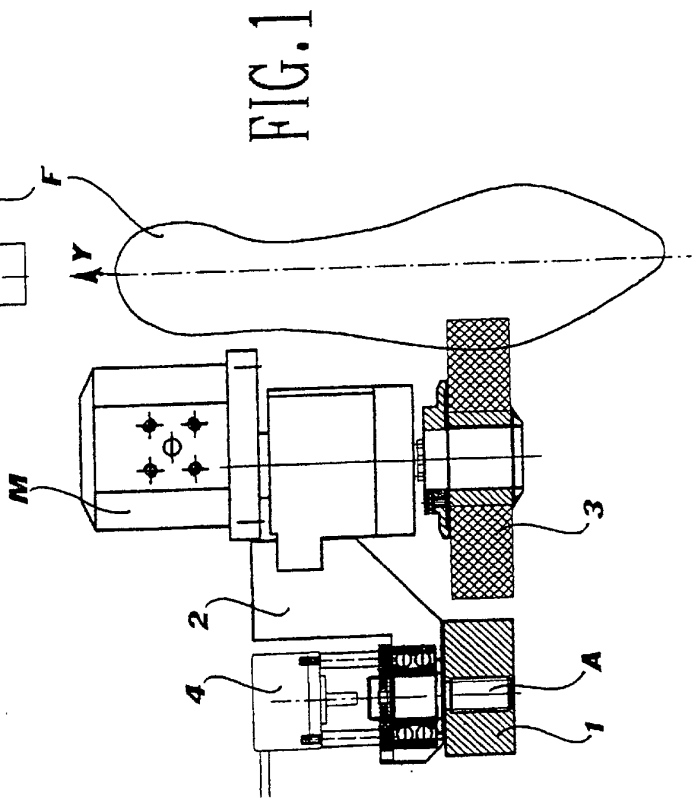

FIG.1