

610389

FORM 1
REGULATION 9

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

We KLOCKNER FERROMATIK DESMA GmbH
of 7831 Malterdingen, Riegeler Str. 4, WEST GERMANY

hereby apply for the grant of a Patent for an invention entitled:

METHOD AND DEVICE FOR MOULDING SOLES WHICH MAY BE
MULTI-LAYERED ONTO SHOE UPPERS

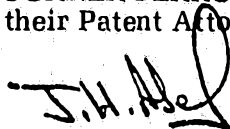
which is described in the accompanying complete specification. This
Application is a Convention Application and is based on the Application
numbered: P 38 15 013.1-26 for a Patent or similar protection made in West
Germany on 4 May 1988.

Our address for service is:

GRIFFITH HACK & CO.
71 YORK STREET
SYDNEY N.S.W. 2000
AUSTRALIA

DATED this 3rd day of May 1989

KLOCKNER FERROMATIK DESMA GmbH
By their Patent Attorneys



GRIFFITH HACK & CO.

007213 04/05/89

TO: THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA

0778A:rk

APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 21.2.91

DECLARATION FOR CONVENTION PATENT APPLICATION

(Note: (1) To be signed by the applicant(s), if individual(s). If applicant is a Company, to be signed by a person on its behalf. (2) This is a comprehensive form, and parts inappropriate to a particular application should be cancelled.)

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1960

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION
FOR A PATENT OR PATENT OF ADDITION

INSTRUCTIONS

Insert No. if
availableInsert full name(s)
of applicant(s)

In support of the Convention application No. (a) _____

made by (b) KLOCKNER FERROMATIK DESMA GMBH7831 Malterdingen, Riegeler Str. 4,West GermanyInsert title of
inventionfor a patent/~~patent of addition~~ for an invention entitled (c) METHOD AND DEVICE
FOR MOULDING SOLES WHICH MAY BE MULTI-LAYERED ONTO SHOE UPPERSInsert full name(s)
of declarant(s)~~I/We~~ (d) Hubert Zeug and Heiner Stobenerboth of (e) 7831 Malterdingen, Riegeler Str. 4, WEST GERMANYInsert address(es)
of declarant(s)~~of (e)~~ _____

do solemnly and sincerely declare as follows:—

1. ~~I am/We are the applicant(s) for the patent/patent of addition~~
(or, in the case of an application by a body corporate)1. ~~I am/We are authorized by the abovementioned applicant(s) for the patent/patent
of addition to make this declaration on its/their behalf.~~2. The basic application(s) as defined by Section 141 of the Act was/were made in the
following country or countries on the following date(s) by the following applicant(s)
namely:—Insert country in
which first basic
application was
filed.in (f) West Germany on (g) 4 May 1988by (h) Klockner Ferromatik Desma GmbHInsert date of first
basic application.

in (f) _____ on (g) _____ 19____

by (h) _____

Insert full name(s)
of basic
applicant(s)

in (f) _____ on (g) _____ 19____

by (h) _____

3. ~~I am/We are the actual inventor(s) of the invention~~
(or, where a person other than the inventor is the applicant)Insert full name(s)
of actual
inventor(s)3. (i) 1. Dipl. Ing. Fritz Gierschewski, Warthburgstr. 86,
2800 Bremen, West Germany.2. Dipl. Ing. Joachim Lühr, Bremer Str. 15, 2811 Schwarme,
West Germany.Insert address(es)
of actual
inventor(s)3. Dipl. Ing. Claus Dieter Köster, Fresenbergstr. 116,
2800 Bremen 71, West Germany.~~is/are the actual inventor(s) of the invention and the facts upon which the applicant(s)
is/are entitled to make the application are as follows:—~~(k) KLOCKNER FERROMATIK DESMA GMBH
are the assignees of the said invention from the
actual inventors.Recite manner in
which applicant(s)
derive(s) title from
actual inventor(s)4. The basic application(s) referred to in paragraph 2 of this Declaration was/were
the first application(s) made in a Convention country in respect of the invention the
subject of the application.Signature(s) of
declarant(s)Declared at Achimthis 10th day of February 19 89No attestation or
signature is re-
quired(b) KLOCKNER FERROMATIK DESMA GMBH

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i.A.

H. Stöbener

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(54) Title
COMPUTER AIDED SHOE MANUFACTURE

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(57) Claim

1. A method for moulding soles which may be multi-layered onto shoe uppers attached to a last, wherein the space coordinates (x,y,z) of the moulding region of the shoe upper are measured using a three-dimensional measuring apparatus and one or more machining tools are guided along the curve defined by these space coordinates during roughening and/or during the application of adhesive, and subsequently the sole is attached to the shoe upper, for which purpose the material for the formation of the layer(s) of the sole is injected, optionally in succession, into a mould having lateral mould parts, a last that can be placed thereon and a displaceable base die, the mould cavity of which, when receiving the material, is larger than the volume of the sole layer in each case and which, at the end of the or an injection operation, is reduced by displacing the base die to the volume corresponding to the sole layer, thus moulding the sole layer, and wherein injection burrs are subsequently removed from the edge of the sole, characterised in that the last and mould geometry in the

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region defined by the sealing edge of the lateral mould parts is determined with respect a predeterminable point of origin in the form of space coordinates (x,y,z) and respective tangential angles (u) , and stored and in each case, at the last having the attached shoe upper and the lateral mould parts, which are clamped in a device on a turntable having a plurality of injection-moulding devices, by scanning a few last and sealing edge points, the point of origin of coordinates at the lateral mould parts is determined or re-established, optionally the deviation of the last-measured point of origin of coordinates in the injection-moulding device is calculated with respect to the originally measured point of origin of coordinates and the space coordinates and tangential angle determined are changed, and one or more machining tool(s) for roughening, applying adhesive and/or, after the injection-moulding, for cutting is (are) guided tangentially along or parallel to the line determined by the changed space coordinates.

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PATENTS ACT 1952

Form 10

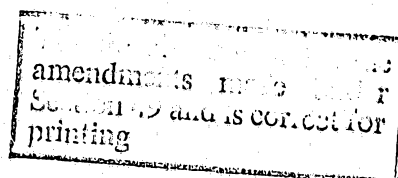
COMPLETE SPECIFICATION

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:
Lodged:



Complete Specification-Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

METHOD AND DEVICE FOR MOULDING SOLES
WHICH MAY BE MULTI-LAYERED ONTO SHOE
UPPERS

The following statement is a full description of this invention,
including the best method of performing it known to me/us:-

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METHOD AND DEVICE FOR MOULDING SOLES WHICH MAY BE
MULTI-LAYERED ONTO SHOE UPPERS

The invention relates to a method for moulding soles which may be multi-layered onto shoe uppers attached to a last, wherein the space coordinates (x,y,z) of the moulding region of the shoe upper are measured using a three-dimensional measuring apparatus and one or more machining tools are guided along the curve defined by these space coordinates during roughening and/or during the application of adhesive, and subsequently the sole, made from materials having low viscosity, especially polyurethane, or from materials such as thermoplastic or such as rubber, is attached to the shoe upper, for which purpose the material for the formation of the layer(s) of the sole is injected, optionally in succession, into a mould having lateral mould parts, a last that can be placed thereon and a displaceable base die, the mould cavity of which, when receiving the material, is larger than the volume of the sole layer in each case and which, at the end of the or an injection operation, is reduced by displacing the base die to the volume corresponding to the sole layer, thus moulding the sole layer, and wherein injection burrs are subsequently removed from the edge of the sole.

The invention relates also to a device for carrying out this method, said device having a last for accommodating the upper, a displaceable base die, lateral mould parts which can be moved away from one another and enclose the base die and the last, and optionally a counter-die which can be inserted into the mould in place of the last and which is provided laterally with an encircling seal of resilient material, optionally on a turntable or feed system.

In a method of injection moulding a shoe sole directly onto a shoe upper, it has been previously proposed to improve the adhesion between the sole and the upper to roughen the leather of the upper in the region of the sole and optionally provide an adhesive. In that case, only a small proportion of inadequate sole connections are to be attributed to the sole adhesives used, such as polychloroprene or polyurethane adhesives; on the contrary the major proportion of inadequate sole connections are attributed to insufficiently careful processing. There are used as roughening tools, for example, wire brushes, abrasive discs and abrasive rollers having steel wires, grindstones and abrasive belts embedded in a retaining substance, such as, for example, rubber. Both mechanical and manual roughening require exact tool guidance in order to avoid damage to the material of the upper. Another important factor for the roughening operation is the contact pressure of the tool. The roughening should always be carried out so that the surface is cleaned of foreign matter, the weak surface layers are removed, and the more solid, cleaner layer of material lying thereunder is exposed with which the sole, optionally with an intermediate layer of adhesive, can form a durable connection. It has also already been proposed to guide abrasive brushes using a template corresponding to the last used in order to be able to automate the roughening. It is a disadvantage in such cases that a separate template is required for each last resulting in a considerable expense on material. In addition, in the case of such guiding of the abrasive tool, it is not possible to take into account any possible unevenness in the material of the upper or in the last.

The main factor when gluing is that the adhesive layer is accurately positioned on the upper material of the last and has a thickness that is as uniform as

possible and measures from 20 to 30 microns. If the adhesive layer is thicker, there is a danger of cracks appearing in the adhesive which could result in the detachment of the glued layers; in contrast, an adhesive layer which is too thin may result in an adhesive connection which is not continuous, reliable or durable. For the reasons already mentioned in connection with roughening, automation of the application of adhesive is thus not readily possible.

Finally, with regard to the injection of polyurethane, problems occur owing to its low viscosity. In order to ensure a satisfactory sealing of the mould tools, the polyurethane is first injected into a larger mould cavity than the volume of the sole to be injected, the polyurethane being expanded. Only subsequently is it compressed to form the sole. Suitable designs of injection-moulds which to a large extent prevent a specific extrusion of material are described in DE-PS 20 22 118 and in DE-AS 20 48 596. It is not possible, however, completely to prevent the formation of burrs at the sole edge which have to be removed after the sole material has hardened. This applies also to shoes having multi-layer soles which, together with their manufacturing process and the device necessary for this purpose, are described in DE-PS 22 41 493. In that case, in a first working stage the walking sole is injected into a mould cavity formed by the lateral mould parts, the base die and the counter-die, the mould cavity being reduced to the size of the intermediate sole only after foaming of the polyurethane. Subsequently, the counter-die is replaced by a last having an attached upper and in a corresponding manner the intermediate sole is injected and pressed by reduction of the mould cavity formed.

The aim of the present invention is to provide a method and a device with which it is possible to carry

out, in an automated process, the roughening of the surface of the upper in the region of soling, the application of adhesive in that area and/or the subsequent removal of burrs while avoiding the above-mentioned disadvantages and without great costs with regard to construction and apparatus. In that case, individual faults in the last, mould and/or upper material and also sealing edge faults are especially to be taken into consideration.

According to the present invention, there is provided a method for moulding soles, which may be multi-layered, onto shoe uppers attached to a last, wherein the space coordinates (x,y,z) of the moulding region of the shoe upper are measured using a three-dimensional measuring apparatus and one or more machining tools are guided along the curve defined by these space coordinates during roughening and/or during the application of adhesive, and subsequently the sole, made from materials having low viscosity, especially polyurethane, or from materials such as thermoplastic or such as rubber, is attached to the shoe upper, for which purpose the material for the formation of the layer(s) of the sole is injected, optionally in succession, into a mould having lateral mould parts, a last that can be placed thereon and a displaceable base die, the mould cavity of which, when receiving the material, is larger than the volume of the sole layer in each case and which, at the end of the or an injection operation, is reduced by displacing the base die to the volume corresponding to the sole layer, thus moulding the sole layer, and wherein injection burrs are subsequently removed from the edge of the sole, characterised in that the last and mould geometry in the region defined by the sealing edge of the lateral mould parts is determined with respect to a predeterminable point of origin in the form of space coordinates (x,y,z) and tangential angles (u) in each case, and stored and in

each case, at the last having the attached upper and the lateral mould parts, which are clamped in a device on a turntable having a plurality of injection-moulding devices, by scanning a few last and sealing edge points, the point of origin of coordinates at the lateral mould parts is determined or re-established, optionally the deviation of the last-measured point of origin of coordinates in the injection-moulding device is calculated with respect to the originally measured point of origin of coordinates and the space coordinates and tangential angle determined are changed, and one or more machining tool(s) for roughening, applying adhesive and/or, after the injection-moulding, for cutting is (are) guided tangentially along or parallel to the line determined by the changed space coordinates.

Advantageously, as a result, production inaccuracies in the moulds and the lasts, and positioning faults of the latter and changes in position can be taken into account so that the machining tools used cannot damage the upper material or the injected sole. As a result of increased production accuracy, the quality of the manufactured shoe is improved.

According to a development of the invention, the waste produced by the roughening and the removal of burrs are taken away directly by suction. This has the advantage that they cannot contaminate materials subsequently to be processed, which could prevent especially a clean gluing.

If the geometric data of a combination of last and the other mould parts have been exactly determined, it is readily possible to determine for one and the same last type, by multiplication with pre-set values (graduating rules), the corresponding dimensions of the other lasts that are substantially the same shape but a different

size, in order thereby to determine a new desired line comprising the space coordinates and relevant curvature. Accordingly, it is adequate, in principle, to measure a last or a mould pair once in order then to be able to manufacture a complete series of shoes of different sizes.

If a turntable is used having a plurality of moulding stations, the uppers guided on individual lasts should be guided, preferably in succession, into the working range of a fixed, computer-controlled robot machining tool, the arm of which carrying the tool is guided in each case around the upper in the region of moulding. If it is desired to carry out the roughening, application of adhesive and removal of burrs, three such robot tools should be provided in corresponding positions. In principle, however, it is also possible to work with only one robot, the tools of which can each be exchanged for the next processing operation. In that case, the knowledge according to the invention is used that the roughening, the application of adhesive and the removal of burrs are, with regard to the guiding of the tool, corresponding working operations, the course of which can be based, in each case, on the same three space coordinates and the associated curvature values. The tools are guided on corresponding parallel paths in the area.

Also according to the present invention, there is provided for carrying out the method, said device having a last for accommodating the upper, a displaceable base die, lateral mould parts which can be moved away from one another and enclose the base die and the last, and optionally a counter-die which can be inserted into the mould in place of the last and which is provided laterally with an encircling seal of resilient material, optionally on a turntable or feed system, characterised

by a measuring apparatus provided with measuring sensors and/or contact-less optical sensors, for measuring the last and mould geometry and for determining a point of origin of coordinates, set for the last or mould type, at the mould frame, the measuring apparatus being connected to a memory for the measured values and this memory being connected to a computer-controlled robot machining tool, the arm of which carrying the tool is so hinged that the tool can be guided round tangentially to the curvature of the upper over the region of soling.

This device need only have a few constructional elements.

The measuring apparatus serves to measure a last or the associated moulds of a series. If such a last has been measured once, it can, by scanning a few points, be identified not only with regard to its type and its size, but also with regard to its actual position which it may assume at the turntable. For this purpose it is necessary to provide, in addition to the measuring apparatus having contact or contact-less measuring sensors, a measured data memory. This memory contains, in each case, the space coordinates and the associated angle of curvature of the upper or sole geometry to be covered, which are to be set in relation to a point of origin of coordinates in each case. If the above-mentioned values are made available to the computer-controlled robot, it can so guide the tool attached to one arm that it is moved tangentially to the curvature of the upper over the region of soling. In that case, as already claimed above, the tool is exchangeable so that one and the same robot can, if desired, carry out the roughening, application of adhesive and/or the removal of burrs. Advantageous tools are a milling cutter, an adhesive gun and/or a heatable knife.

An embodiment of the invention is shown in the drawing which shows a last having an attached shoe upper during roughening.

The device used for injection-moulding is described in detail in DE PS 22 41 493 to which reference is drawn. Obviously, devices suitable for so-called direct soling can be used in conjunction with the invention.

The upper 11 attached to a last 10 is roughened in the region of sole moulding by means of a milling cutter 15 which is secured to an arm 14 of the computer-aided robot 13. The arm 14 or milling cutter 15 is so attached that the milling cutter 15 can be guided right round in the region of the later sole moulding in all cases of attachable lasts 10. The waste pieces falling off during milling are removed by means of suction device of which only a suction pipe 12 is shown here. The method according to the invention operates in such a manner that the data determined by the measuring apparatus about the mould sealing edge, which seals, with respect to the upper or the last, the halves of the mould which can be pivoted towards one another, together with its curvature are detected and, together with the last values in this region, are stored. The relevant memory has, in addition, so-called graduating rules, that is to say multipliers, with which the dimensions of a last of a determined size must be multiplied in order to obtain the corresponding dimensions of a last of the same type but a different size. The memory is connected to a computer which is equipped for the receipt of any control command for the robot 13.

If a moulding station comes into the robot working range, then the above-mentioned measuring sensor determines what relative position or spatial angle

inclination the last has. If desired, a centring pin (not shown) may be used for that purpose, via which the point of origin of coordinates can be calibrated. If the point of origin of coordinates has been established, it is possible, using the stored values, to determine or calculate the desired curve which the machining tool 15 must follow, optionally taking into account the smaller or larger size of the last 11. Relevant control commands are given directly to the robot 13 or the arm 14. In this manner, the roughening, the possible application of adhesive and the subsequent removal of burrs can be carried out with an accuracy which could not hitherto be realised according to the prior art.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for moulding soles which may be multi-layered onto shoe uppers attached to a last, wherein the space coordinates (x,y,z) of the moulding region of the shoe upper are measured using a three-dimensional measuring apparatus and one or more machining tools are guided along the curve defined by these space coordinates during roughening and/or during the application of adhesive, and subsequently the sole is attached to the shoe upper, for which purpose the material for the formation of the layer(s) of the sole is injected, optionally in succession, into a mould having lateral mould parts, a last that can be placed thereon and a displaceable base die, the mould cavity of which, when receiving the material, is larger than the volume of the sole layer in each case and which, at the end of the or an injection operation, is reduced by displacing the base die to the volume corresponding to the sole layer, thus moulding the sole layer, and wherein injection burrs are subsequently removed from the edge of the sole, characterised in that the last and mould geometry in the region defined by the sealing edge of the lateral mould parts is determined with respect a predeterminable point of origin in the form of space coordinates (x,y,z) and respective tangential angles (u) , and stored and in each case, at the last having the attached shoe upper and the lateral mould parts, which are clamped in a device on a turntable having a plurality of injection-moulding devices, by scanning a few last and sealing edge points, the point of origin of coordinates at the lateral mould parts is determined or re-established, optionally the deviation of the last-measured point of origin of coordinates in the injection-moulding device is calculated with respect to the originally measured point of origin of coordinates and the space coordinates and



tangential angle determined are changed, and one or more machining tool(s) for roughening, applying adhesive and/or, after the injection-moulding, for cutting is (are) guided tangentially along or parallel to the line determined by the changed space coordinates.

2. A method according to claim 1, characterised in that waste produced by the roughening and/or burr removal is taken away by suction directly at the machining tool.

3. A method according to claim 1 or 2, characterised in that the values measured, in the case of a mould comprising a last, at the sealing edge of the lateral mould parts are determined by multiplication with pre-set values (graduating rules) to the dimensions of the other lasts and lateral mould parts that are substantially the same shape but different in size to calculate a suitable desired line.

4. A method according to any one of claims 1 to 3, characterised in that the individual lasts of the injection-moulding devices of a turntable or feed system having a plurality of moulding stations are guided in succession by stepwise transport into the working range of a fixed, computer-controlled robot machining tool having an arm and wrist which guides the tool in each case about the upper in the moulding region.

5. A device for carrying out the method according to any one of claims 1 to 4 having a last for accommodating the upper, a displaceable base die, lateral mould parts which can be moved away from one another and enclose the base die and the last, and optionally a counter-die which can be inserted into the mould in place of the last and which is provided laterally with an encircling seal of resilient material, optionally on a turntable or feed system, characterised by a measuring apparatus provided

with measuring sensors and/or contact-less optical sensors, for measuring the last and mould geometry and for determining a point of origin of coordinates, set for the last or mould type, at the mould frame, the measuring apparatus being connected to a memory for the measured values and this memory being connected to a computer-controlled robot machining tool, the arm of which carrying the tool is so hinged that the tool can be guided round tangentially to the curvature of the upper over the region of soling.

6. A device according to claim 5, characterised in that the tool is detachably secured and is thus exchangeable.

7. A device according to claim 5 or 6, characterised in that the tool is a milling cutter, a glue gun or a heatable knife.

8. A device according to claim 5 substantially as hereinbefore described with reference to the accompanying drawing.

9. A method according to claim 1 substantially as hereinbefore described with reference to the accompanying drawing.

Dated this 3rd day of May 1989

KLOCKNER FERROMATIK DESMA GmbH
By their Patent Attorney
GRIFFITH HACK & CO.



Fig. 1

