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(54) **Footwear assembly machine with programmable visible reference means**

Vorrichtung zum Zusammenbau eines Schuhes mit sichtbaren programmierbaren Referenzmarken

Machine d'assemblage d'une chaussure à points de repère visuels programmables

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Description

[0001] The present invention relates to a footwear assembly machine equipped with means for supplying programmable visual reference marks useful for correct positioning of the upper in the work station.

[0002] In particular the reference marks are used for correctly forming the throat of the shoe so as to have production uniformity especially of the right and left shoes of the same pair.

[0003] In the prior art there are known assembly machines which receive a shoe last on which is arranged an upper which the machine draws by means of grasping clamps. An operator positions the upper and commands tension of the clamps to cause the upper to take on the correct shape.

[0004] Wrong positioning of the upper involves differences between the original model and the shoe produced and dissymetry of the right and left shoes of the same pair which is more serious.

[0005] To aid the operator there have been proposed machines in which on the upper are projected fixed lines of light parallel to one another and directed along the longitudinal axis of the footwear so as to supply a sort of reference ruler for the operator. With this system much is left to the operator's eye and experience and he must decide which lines of the multitude to take as reference and maintain this reference steady with each change of footwear. A machine having the features as set forth in the preamble of claim 1 is known from EP-A-0 797 938.

[0006] It has also been proposed to replace the lines with points of light projected on the upper in predetermined positions. The projectors are fixed and can only be regulated manually and occasionally by means of regulation screws. It is thus impossible to change rapidly and indifferently from the processing of one shoe size to another or from a right to a left shoe. The system is therefore not usable e.g. for ensuring symmetry to the two shoes of a pair. In addition if positioning errors of the entire shoe-tree occur in the machine the effectiveness of the luminous reference marks is completely annulled.

[0007] The general purpose of the present invention is to overcome the above shortcomings by making available an assembly machine which would permit accurate and rapid configuration of the throat of shoes of different size and whether right or left.

[0008] In view of this purpose it is sought to provide in accordance with the present invention a footwear assembly machine comprising a work station receiving a shoe-tree on which is positioned an upper and light projectors projecting luminous reference marks on the upper in the work station characterized in that the projectors are powered to move on command the luminous reference marks projected with control means commanding movement of the projectors to direct each luminous reference mark towards a predetermined posi-

tion upon reception of a preparation signal.

[0009] To clarify the explanation of the innovative principles of the present invention and its advantages compared with the prior art there is described below with the aid of the annexed drawings a possible embodiment thereof by way of non-limiting example applying said principles. In the drawings:

- Fig. 1 shows a diagrammatic view of the machine in accordance with the present invention,
- Fig. 2 shows a plan view of an upper arranged in the machine,
- Fig. 3 shows a partially cross sectioned side elevation view of part of the machine of Fig. 1,
- Fig. 4 shows a diagrammatic view along plane of cut IV-IV of Fig. 1 of a part of the machine in accordance with the present invention,
- Fig. 5 shows a diagrammatic side elevation view of a variant embodiment of the machine in accordance with the present invention,
- Fig. 6 show a plan view of the variant of Fig. 5, and
- Fig. 7 shows a side elevation view of the variant of Fig. 5.

[0010] With reference to the figures a footwear assembly machine indicated as a whole by reference number 10 comprises a work station 11 receiving a shoe last 12 on which an upper is positioned. Above the work station is arranged a unit 13 for controlled projection of luminous reference marks on the upper in the work station. The unit can be made up of a plurality of projectors 34.

[0011] In accordance with the present invention each projector 34 is powered to move the projected luminous reference mark on command. Control means 14 control the machine functions. The control means comprise command means 21 which upon reception of a preparation signal 16 command movement of the projectors to direct each luminous reference mark towards a predetermined position. For this purpose the control means comprise memory means 15 to memorize a plurality of predetermined positions which can be selected by means of the selection control 16. To generate the selection command the machine can comprise means 17 for input of the shoe size of the upper received in the work station so that the selection command input is dependent upon on the shoe size input. Input of the number can be manual and performed by the operator by means of a keyboard 18 when he loads another shoe-tree in the machine or advantageously automatic. In the latter case the machine comprises known means 19 for direct measuring of the shoe size of the upper on the shoe-tree. The manual selection means 18 can be provided e.g. by a keyboard.

[0012] Selection of the positions which the projectors must take also depends on the type of shoe, right or left, of the upper mounted in the machine. There are thus advantageously present shoe type input means 17

which in turn emit the selection command according to the shoe type input. Advantageously the shoe type input means comprise a known sensor 20 for automatic detection of the right or left shoe arranged in the work station. The type input means can also be manual 18.

[0013] In this manner when the machine is in its normal operational setup the operator sets a shoe last with its upper in the work station. Upon automatic or manual input of a predetermined position from among those memorized the control device 21 recovers from the memory 15 the positions requested for the projectors and commands movement of the projectors to reach those positions. The projectors thus project in the predetermined positions on the shoe last in the station the luminous reference marks which the operator can follow to command pulling of the grasping clamps 22 of the machine by means of known controls 33 so as to provide correct shaping of the shoe throat.

[0014] Fig. 2 shows diagrammatically a plan view of the shoe last 12 in the work station with a mounted upper 23 grasped by the clamps 22 and with reference marks 24 projected. The luminous reference marks are advantageously three in number with each in the form of a cross and two in opposite side zones of the upper and one in a front zone of the upper. This has been found useful for rapid and correct stretching and positioning of the upper by supplying to the operator a side and front references during the operation. By way of example Fig. 2 shows in broken lines the configuration the upper is to reach.

[0015] In addition to the normal operational setup the machine can be placed through a control 25 in learning condition during which it is possible to program the various luminous reference mark positions selectable.

[0016] Advantageously for programming there are provided manual projector movement means 26 for bringing the reference marks into position on a reference shoe last which is mounted in the work station. After reaching the correct positions memorization control means 28 handling permits memorization of these positions in the memory 15. This can be repeated for all the possible desired positions which will be selected by the selection means 17 during normal machine operation.

[0017] To avoid having to set the reference positions manually for all the possible right and left shoe sizes there can advantageously be provided calculation means 29 which calculate the plurality of predetermined positions starting from a few sample positions e.g. a smallest and a largest position input for each projector and corresponding to the smallest and largest shoe sizes which will be mounted on the machine.

[0018] When the positions for a right or left shoe have been programmed the system automatically calculates the specular positions for a corresponding left or right shoe by means of overturning. To signal to the calculation means to store a smallest or largest position reached there are controls 30, 31 for signaling the small-

est and largest positions respectively. Another control 32 commands the calculation means to calculate the intermediate values.

[0019] Advantageously the various controls 18, 25, 28 and 30 to 33 can be grouped on a single keyboard.

[0020] The machine 10 comprises means 49, 50, 51 for detecting the real position of the shoe in the work station. The detection means produce a position signal for the corresponding correction of the luminous reference mark positions so that they always fall in the right position in relation to the shoe. Advantageously the detection means comprise a rear presser 49 movable by means of a powered carriage 50 to rest against the rear part of the footwear in the work stations. A sensor 51 detects the absolute position of the presser in its movement towards the footwear and sends to the control device 14 a correction signal 52. On the basis of the information on the shoe size mounted in the machine and the position of the presser the control system calculates the exact position of the footwear in the station and corrects the absolute position of the luminous reference marks to arrange itself in the exact reference positions in relation to the footwear.

[0021] In other words for a certain shoe size the system expects to find the rear presser in a predetermined position. If it does not it corrects the position of the projectors or the tip projector for the difference between the theoretical and the real positions. In practice if the presser detects that the footwear is arranged e.g. 5mm behind the projector position memorized in the memory 15 the control device corrects the real projector position or only the tip projector position.

[0022] Fig. 3 shows an embodiment of a projector 34 which has been found particularly advantageous.

[0023] The projector comprises a projection member 35 for projection of the luminous reference mark along a projection axis 36. The projection member is supported on a base 37 to be rotatable around an axis 38 transversal to the projection axis upon command of a gear motor 39 so as to move the projected luminous reference mark along a straight line.

[0024] The gear motor 39 commands movement of the projection member 35 against the thrust of a spring 40 through a thrust screw 41 rotated by the gear motor 39 to screw into the fixed support 37 and project therefrom to rest on the projection member 35 with its free thrust end 42.

[0025] Coupling between the screw 41 and the gear motor 39 is secured with a running joint 43 made up of pins 44 rotated by the gear motor and engaged in an axial running manner in a gear 45 supported axially on the screw 41.

[0026] Advantageously the gear 45 engages an encoder 46 which supplies a measurement which is a function of the position of the projected luminous reference mark. The encoder supplies feedback to the control means 21 which control the gear motor 39.

[0027] Fig. 4 shows the arrangement of the three pro-

jectors 34 in the projection unit 13 to have the movement of the side reference marks in a direction 47 transverse to the longitudinal axis of the footwear and the front reference movement in direction 48 parallel to the longitudinal axis of the footwear.

[0028] Figures 5 to 7 show a particularly advantageous variant embodiment indicated with reference number 113.

[0029] In this variant the central projector is provided virtually as already explained for embodiment 13. In particular the central projection member 135a is supported and hinged at 138a to a plate 137. An actuator made up of a motor 139 and a transmission with running joint 143 pushes with a thrust screw setscrew 141 on an intermediate movable plate 160 on which is constrained the projection member for execution of the inclination of the projected beam.

[0030] The side projectors are also made up of projection members 135b pivoted at 138b to incline the motors 139 upon command by means of transmissions 143.

[0031] Differently from the first embodiment 13 the side projectors are supported on the intermediate plate 160 of the central projector.

[0032] This way the longitudinal distance of the central projector grid from the side projector grids does not vary with the movement of the central projector because the side projectors incline therewith. The transverse position of the side grids is adjustable by means of respective motors 139 as described for the previous embodiment. For the sake of drawing simplicity in the second embodiment the retraction encoders 46 are not shown.

[0033] For an initial calibration of the position of the central projection member 135a it is supported on the movable plate 160 pivoted at 161. Two dowels 162 permit manual regulation of the inclination of the member 135 with respect to the plate 160.

[0034] It is now clear that the preset purposes have been achieved by supplying a footwear assembly machine permitting rapid and accurate positioning of the upper to have product uniformity.

[0035] Naturally the above description of an embodiment applying the innovative principles of the present invention is given by way of non-limiting example of said principles within the scope of the exclusive right claimed here.

[0036] For example the projector handling means could be different from those shown just as the known structure of the assembly machine could be different in accordance with specific practical needs. In addition although the side-projector movement only in the direction transverse to the axis of the footwear was found sufficient, if preferred the projectors could be provided to move with other trajectories e.g. along two orthogonal axes. The machine control means could comprise an electronic system virtually provided in accordance with the prior art either with hard-wired logic or advantageously by a microprocessor.

[0037] To ensure that the shoe is in the correct position with respect to the projectors especially as to height a sensor 53 (Fig. 1) could be provided to detect the positioning of the shoe in the machine and command movement of the projectors to correct the relative positioning differences. This sensor 53 could comprise e.g. an adjustable shoe-support foot.

10 Claims

1. Footwear assembly machine comprising a work station (11) receiving a shoe last (12) on which is positioned an upper (23) and light projectors (13) projecting luminous reference marks (24) on the upper in the work station **characterized in that** the projectors are powered to move on command the luminous reference marks projected with control means (14) controlling movement of the projectors to direct each luminous reference mark towards a predetermined position on reception of a preparation signal (16).
2. Machine in accordance with claim 1 **characterized in that** it comprises means of detection (49-51) of the footwear position in the station to generate a correction signal for the predetermined projector positions relative to the footwear.
3. Machine in accordance with claim 2 **characterized in that** the detection means comprise a moving presser (49) resting against the rear part of the footwear in the station and a sensor (51) for detection of the presser position.
4. Machine in accordance with claim 1 **characterized in that** the control means (14) comprise memory means (15) for memorizing a plurality of predetermined positions which are selectable by means of a selection command.
5. Machine in accordance with claim 4 **characterized in that** it comprises means (17, 18, 19) for inputting the shoe size of the upper on the shoe last received in the work station with the input means emitting said selection command (16) dependent upon the size input.
6. Machine in accordance with claim 5 **characterized in that** the input means comprise means (19) of direct measurement of the shoe size of the upper on the shoe last.
7. Machine in accordance with claim 4 **characterized in that** it comprises means (17, 18, 20) of input of the shoe type, right or left, of the upper received in the work station with the shoe type input means emitting the selection command (16) dependent up-

on the shoe type input.

8. Machine in accordance with claim 7 **characterized in that** the shoe type input means comprise a sensor (20) arranged in the work station for automatic detection of right and left shoe.

9. Machine in accordance with claim 4 **characterized in that** it comprises calculation means (29) calculating the plurality of predetermined positions starting from sample positions.

10. Machine in accordance with claim 9 **characterized in that** the sample positions are a smallest position corresponding to a shoe with smallest size and a largest position corresponding to a shoe with largest size.

11. Machine in accordance with claim 10 **characterized in that** the largest and smallest positions are input by setup means comprising means (26) of manual control of projector movement and means (30-32) of manual control upon the memorization of positions reached in such a manner as to permit an operator to take the luminous reference marks into predetermined positions on a sample upper and command memorization of the positions reached as largest or smallest position.

12. Machine in accordance with claim 1 **characterized in that** each projector comprises a member (35) for projection of the luminous reference mark along a projection axis with the projection member being supported to be rotatable around an axis (38) transverse to the controlled projection axis of a gear motor (39) to move along a projected luminous reference line.

13. Machine in accordance with claim 12 **characterized in that** the gear motor (39) controls the movement of the projection member against the thrust of a spring (40) through a thrust screw (41) rotated by the gear motor to screw into a fixed support (37) and rest with one free thrust end on the projection member.

14. Machine in accordance with claim 1 **characterized in that** the projector comprises an encoder (46) for detection of the projected luminous reference mark position to supply feedback to the control means.

15. Machine in accordance with claim 1 **characterized in that** the luminous reference marks are in cross shape.

16. Machine in accordance with claim 1 **characterized in that** it comprises at least two side projectors to project two luminous reference marks in opposite

side zones of the upper and a central projector to project a luminous reference mark in a front zone of the upper.

17. Machine in accordance with claim 16 **characterized in that** the side reference marks are movable along lines transverse to the footwear axis and the front reference mark is movable parallel to the footwear axis.

18. Machine in accordance with claim 16 **characterized in that** the side projectors are supported on a plate (160) movable with the projection member (135a) of the central projector.

Patentansprüche

1. Vorrichtung zum Zusammenbau eines Schuhs, bestehend aus einem Arbeitsplatz (11) zur Aufnahme eines Schuhleists (12), auf dem ein Schaft (23) und Lichtprojektoren (13) positioniert sind, um am Arbeitsplatz Licht-Referenzmarken (24) auf den Schaft zu projizieren, **dadurch gekennzeichnet, dass** die Projektoren so betrieben werden, dass sie auf Befehl die projizierten Licht-Referenzmarken durch eine Steuerungseinrichtung (14) zur Steuerung der Bewegung der Projektoren verschieben, um bei Empfang eines Vorbereitungssignals (16) jede Licht-Referenzmarke in eine vorgegebene Position zu richten.

2. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** sie eine Erkennungseinrichtung (49-51) für die Position des Schuhwerks am Arbeitsplatz aufweist, um ein Korrektursignal für die vorgegebenen Projektorpositionen im Verhältnis zum Schuhwerk zu erzeugen.

3. Vorrichtung entsprechend Anspruch 2, **dadurch gekennzeichnet, dass** die Erkennungseinrichtung einen beweglichen Presser (49) aufweist, der am hinteren Teil des Schuhwerks am Arbeitsplatz anliegt, sowie einen Sensor (51) zur Erkennung der Presserposition.

4. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** die Steuerungseinrichtung (14) eine Speichereinrichtung (15) zum Speichern einer Vielzahl von vorgegebenen Positionen aufweist, die mit Hilfe eines Auswahlbefehls auswählbar sind.

5. Vorrichtung entsprechend Anspruch 4, **dadurch gekennzeichnet, dass** sie eine Einrichtung (17, 18, 19) zur Eingabe der Schuhgröße des Schafes enthält, der sich auf dem am Arbeitsplatz aufgenommenen Schuhleiste befindet, wobei die Eingabe

beeinrichtung in Abhängigkeit von der Größeneingabe den erwähnten Auswahlbefehl (16) ausgibt.

6. Vorrichtung entsprechend Anspruch 5, **dadurch gekennzeichnet, dass** die Eingabeeinrichtung eine Einrichtung (19) zur direkten Messung der Schuhgröße des auf dem Schuhleisten befindlichen Schaftes aufweist. 5
7. Vorrichtung entsprechend Anspruch 4, **dadurch gekennzeichnet, dass** sie eine Einrichtung (17, 18, 20) zur Eingabe des Schuhtyps - d.h. rechter oder linker Schuh - des am Arbeitsplatz aufgenommenen Schaftes aufweist, wobei die Schuhtyp-Eingabeeinrichtung in Abhängigkeit der erfolgten Schuhtypeingabe den Auswahlbefehl (16) ausgibt. 10 15
8. Vorrichtung entsprechend Anspruch 7, **dadurch gekennzeichnet, dass** die Schuhtyp-Eingabeeinrichtung einen am Arbeitsplatz angeordneten Sensor (20) zur automatischen Erkennung des linken oder rechten Schuhs aufweist. 20
9. Vorrichtung entsprechend Anspruch 4, **dadurch gekennzeichnet, dass** sie eine Berechnungseinrichtung (29) zur Berechnung der Vielzahl der vorgegebenen Positionen ausgehend von Musterpositionen aufweist. 25
10. Vorrichtung entsprechend Anspruch 9, **dadurch gekennzeichnet, dass** die Musterpositionen eine Minimalposition entsprechend einem Schuh der kleinsten Größe und eine Maximalposition entsprechend einem Schuh der größten Größe sind. 30 35
11. Vorrichtung entsprechend Anspruch 10, **dadurch gekennzeichnet, dass** die Eingabe der Minimal- und Maximalpositionen durch eine Einstellungseinrichtung erfolgt, die aus einer Einrichtung (26) zur manuellen Steuerung der Projektorbewegung und einer Einrichtung (30-32) zur manuellen Steuerung der Speicherung der erreichten Positionen besteht, und zwar in einer solchen Weise, dass es einer Bedienungsperson ermöglicht wird, die Licht-Referenzmarken in vorgegebenen Positionen auf einem Musterschaft zu bringen und die erreichten Positionen als Maximal- oder Minimalposition zu speichern. 40 45
12. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** jeder Projektor ein Element (35) zur Projektion der Licht-Referenzmarken entlang einer Projektionsachse aufweist, wobei das Projektionselement so befestigt ist, dass es um eine Achse (38) drehbar ist, die quer zur gesteuerten Projektionsachse eines Getriebemotors (39) verläuft, um eine Bewegung entlang einer projizierten Licht-Referenzlinie zu ermöglichen. 50 55

13. Vorrichtung entsprechend Anspruch 12, **dadurch gekennzeichnet, dass** der Getriebemotor (39) die Bewegung des Projektionselements gegen die Schubkraft einer Feder (40) und über eine Druckschraube (41) steuert, welche durch den Getriebemotor in Rotation versetzt wird, um sich in eine feststehende Stütze (37) einzuschrauben und mit einer freien Schubseite auf dem Projektionselement zu ruhen.

14. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** der Projektor eine Codiereinrichtung (46) zur Positionserkennung der projizierten Licht-Referenzmarken aufweist, um ein Feedback für die Steuerungseinrichtung zu liefern.

15. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** die Licht-Referenzmarken kreuzförmig sind.

16. Vorrichtung entsprechend Anspruch 1, **dadurch gekennzeichnet, dass** sie mindestens zwei seitliche Projektoren zur Projizierung von zwei Licht-Referenzmarken in gegenüberliegenden seitlichen Zonen sowie einen zentralen Projektor zur Projizierung einer Licht-Referenzmarke in einer frontalen Zone des Schaftes aufweist.

17. Vorrichtung entsprechend Anspruch 16, **dadurch gekennzeichnet, dass** die seitlichen Referenzmarken entlang von Linien verschoben werden können, die quer zur Achse des Schuhwerks verlaufen, und dass die frontale Referenzmarke parallel zur Achse des Schuhwerks verschoben werden kann.

18. Vorrichtung entsprechend Anspruch 16, **dadurch gekennzeichnet, dass** die seitlichen Projektoren auf einer Platte (160) montiert sind, die gemeinsam mit dem Projektionselement (135a) des zentralen Projektors verschoben werden kann.

Revendications

1. Machine d'assemblage d'une chaussure comprenant un poste de travail (11) recevant une forme pour chaussure (12) sur laquelle est positionnée une empeigne (23) et des projecteurs lumineux (13) projetant des points de repère lumineux (24) sur l'empeigne dans le poste de travail, **caractérisée en ce que** les projecteurs sont alimentés pour déplacer sur commande les points de repère lumineux projetés, avec des moyens de contrôle (14) contrôlant le mouvement des projecteurs pour diriger chaque point de repère lumineux vers une position prédéterminée à la réception d'un signal de préparation (16).

2. Machine selon la revendication 1, **caractérisée en ce qu'elle** comporte des moyens de détection (49-51) de la position de la chaussure dans le poste pour engendrer un signal de correction pour les positions prédéterminées des projecteurs par rapport à la chaussure. 5
3. Machine selon la revendication 2, **caractérisée en ce que** les moyens de détection comportent un élément presseur mobile (49) prenant appui contre la partie arrière de la chaussure dans le poste et un capteur (51) pour la détection de la position de l'élément presseur. 10
4. Machine selon la revendication 1, **caractérisée en ce que** les moyens de commande (14) comportent des moyens de mémoire (15) pour mémoriser une pluralité de positions prédéterminées qui sont susceptibles de sélection par l'intermédiaire d'une commande de sélection. 15
5. Machine selon la revendication 4, **caractérisée en ce qu'elle** comporte des moyens (17, 18, 19) pour introduire la dimension ou pointure de la chaussure se référant à l'empeigne sur la forme pour chaussure reçue dans le poste de travail, avec les moyens d'entrée émettant ladite commande de sélection (16) en fonction des données en entrée relatives à la dimension. 20
6. Machine selon la revendication 5, **caractérisée en ce que** les moyens d'entrée comportent des moyens (19) de mesure directe de la dimension de la chaussure se référant à l'empeigne sur la forme pour chaussure. 25
7. Machine selon la revendication 4, **caractérisée en ce qu'elle** comporte des moyens (17, 18, 20) d'entrée du type de chaussure, gauche ou droite, se référant à l'empeigne reçue dans le poste de travail, avec les moyens d'entrée du type de chaussure émettant la commande de sélection (16) en fonction de l'entrée du type de chaussure. 30
8. Machine selon la revendication 7, **caractérisée en ce que** les moyens d'entrée du type de chaussure comportent un capteur (20) disposé dans le poste de travail pour la détection automatique de la chaussure droite ou gauche. 35
9. Machine selon la revendication 4, **caractérisée en ce qu'elle** comporte des moyens de calcul (29) calculant la pluralité de positions prédéterminées à partir des positions d'échantillonnage. 40
10. Machine selon la revendication 9, **caractérisée en ce que** les positions d'échantillonnage sont la position la plus petite correspondant à une chaussure ayant la dimension la plus petite et la position la plus large correspondant à une chaussure ayant la dimension la plus large. 45
11. Machine selon la revendication 10, **caractérisée en ce que** les positions la plus large et la plus petite sont introduites par des moyens de mise au point comprenant des moyens (26) de contrôle manuel de mouvement des projecteurs et des moyens (30-32) de contrôle manuel lors de la mémorisation de positions atteintes de manière à permettre à un opérateur d'amener les points de repère lumineux à des positions prédéterminées sur une empeigne d'échantillonnage et commander la mémorisation des positions atteintes en tant que positions la plus large et la plus petite. 50
12. Machine selon la revendication 1, **caractérisée en ce que** chaque projecteur comporte un élément (35) pour la projection du point de repère lumineux le long d'un axe de projection, avec l'élément de projection qui est supporté pour être en mesure de tourner autour d'un axe (38) transversal à l'axe de projection contrôlé d'un motoréducteur (39) pour le déplacement le long d'une ligne de repère lumineuse projetée. 55
13. Machine selon la revendication 12, **caractérisée en ce que** le motoréducteur (39) contrôle le mouvement de l'élément de projection contre la poussée d'un ressort (40) à travers une vis de poussée (41) tournée par le motoréducteur pour le vissage dans un support fixe (37) et l'appui sur l'élément de projection par une extrémité de poussée libre.
14. Machine selon la revendication 1, **caractérisée en ce que** le projecteur comporte un codeur (46) pour la détection de la position des points de repère lumineux projetés pour fournir un retour d'asservissement aux moyens de contrôle.
15. Machine selon la revendication 1, **caractérisée en ce que** les points de repère lumineux sont en forme de croix.
16. Machine selon la revendication 1, **caractérisée en ce qu'elle** comporte au moins deux projecteurs latéraux pour projeter deux points de repère lumineux dans des zones latérales opposées de l'empeigne et un projecteur central pour projeter un point de repère lumineux dans une zone avant de l'empeigne.
17. Machine selon la revendication 16, **caractérisée en ce que** les points de repère latéraux sont mobiles le long de lignes transversales à l'axe de la chaussure et le point de repère avant est mobile parallèle à l'axe de la chaussure.

18. Machine selon la revendication 16, **caractérisée en ce que** les projecteurs latéraux sont supportés par une plaque (160) mobile avec l'élément de projection (135a) du projecteur central.

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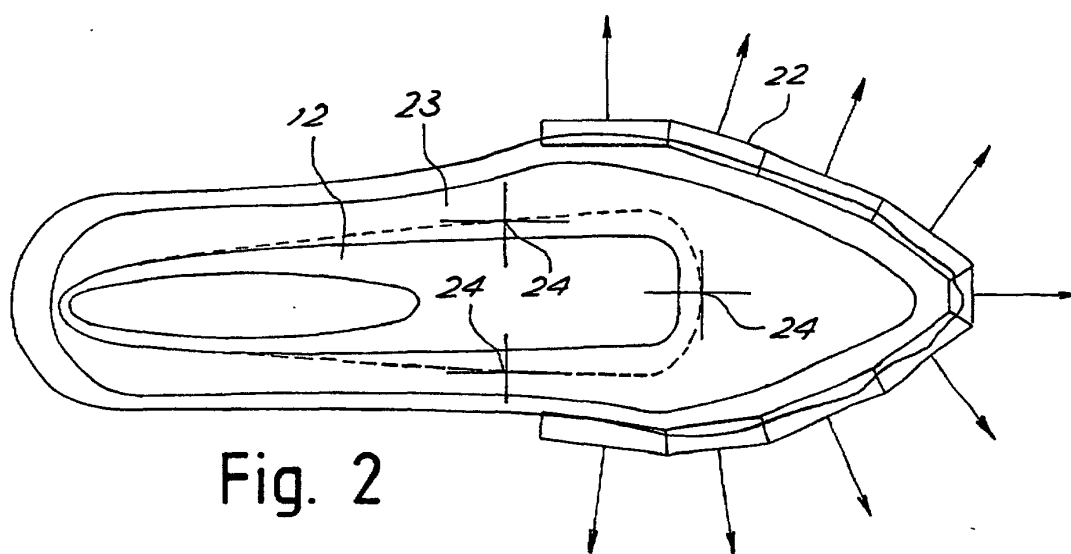
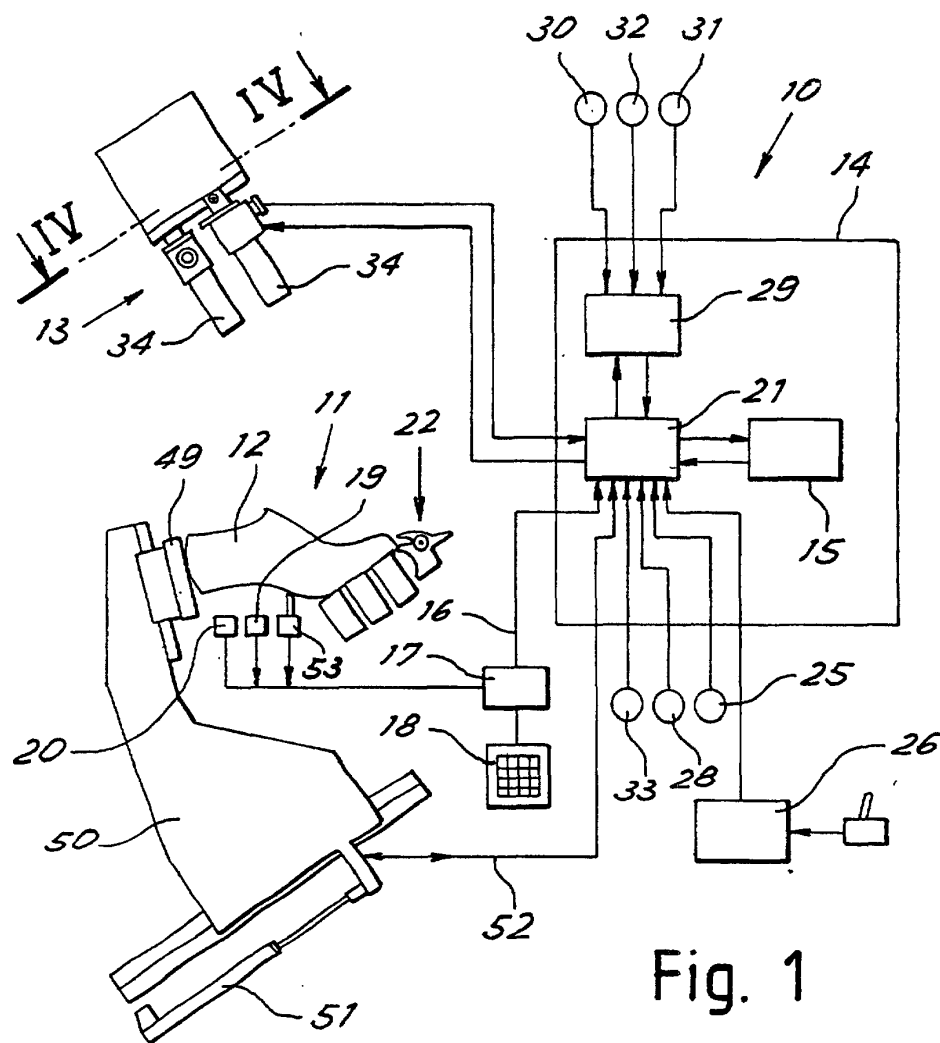
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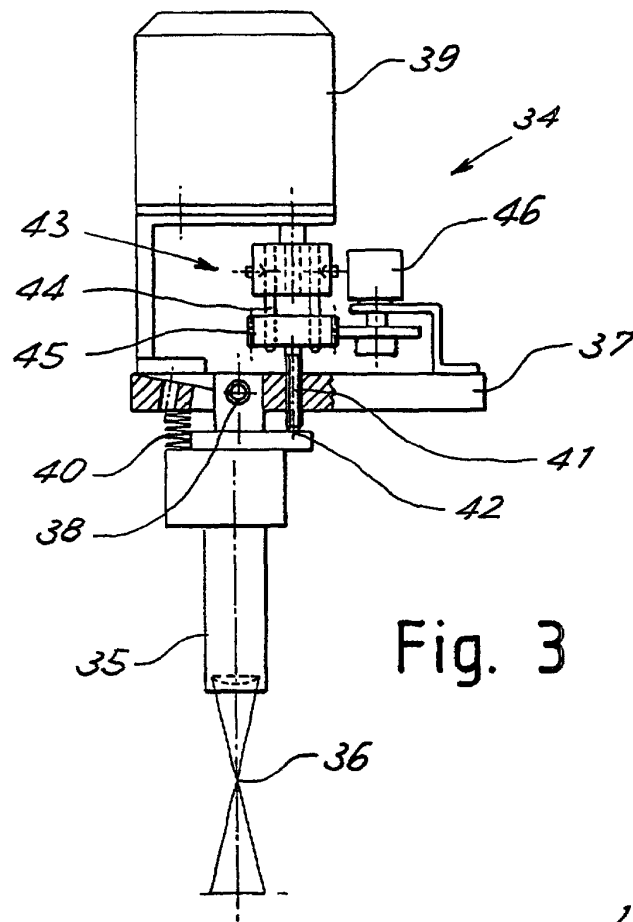


Fig. 3

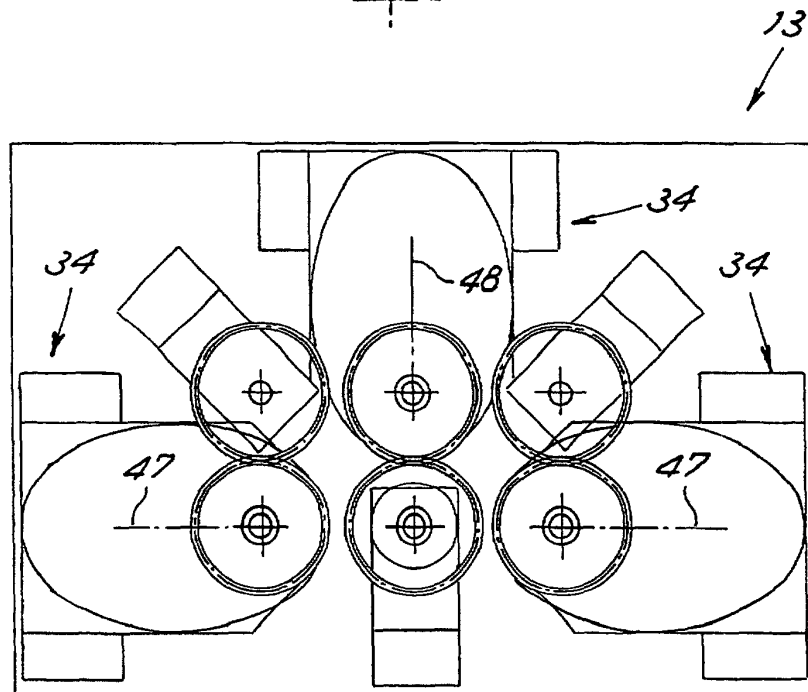


Fig. 4

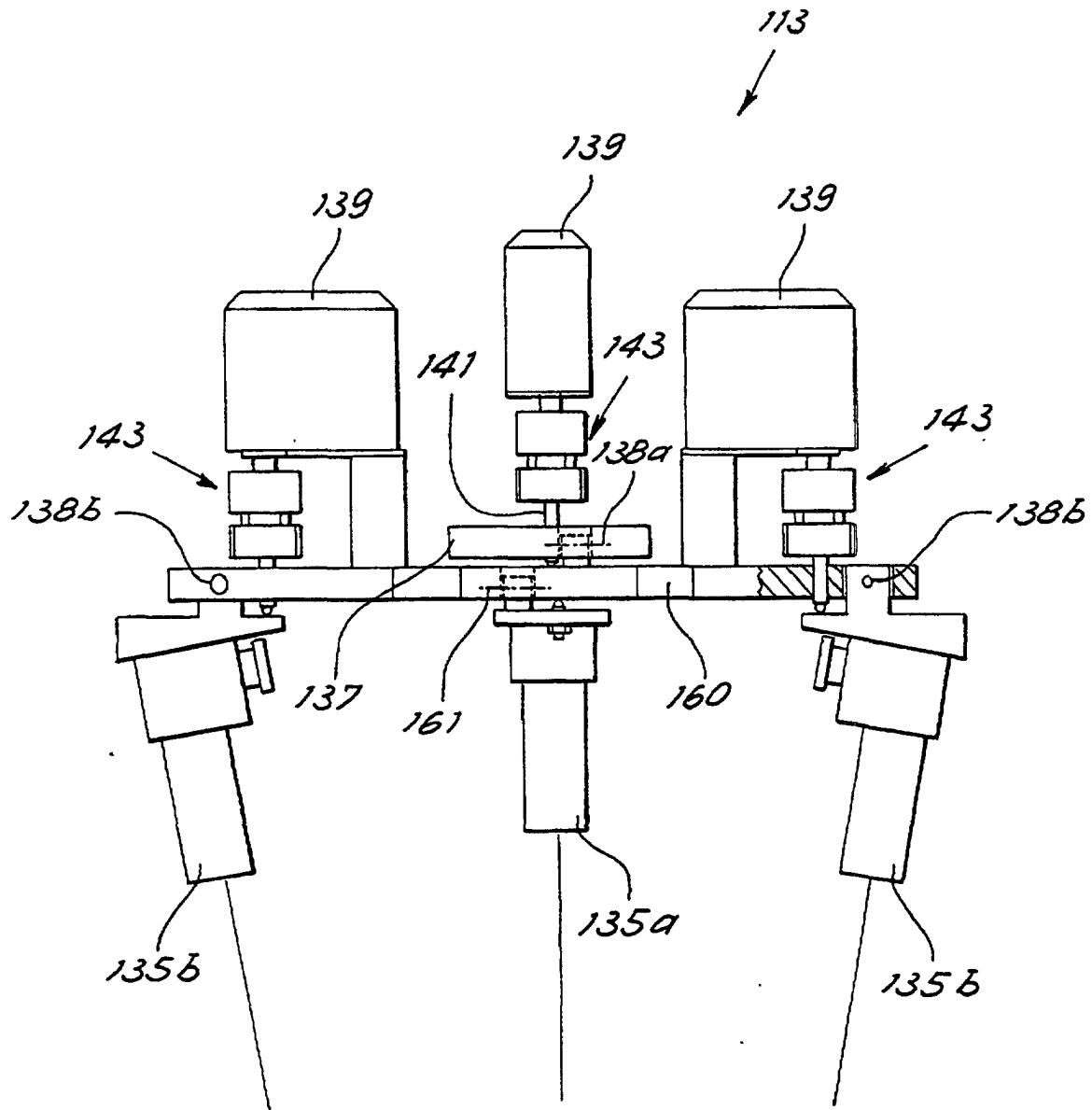


Fig. 5

