(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 591 596 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92830152.2**

(51) Int. Cl.5: **A43D 111/00**, A43D 119/00

(22) Date of filing: **27.03.92**

(43) Date of publication of application:
13.04.94 Bulletin 94/15

(84) Designated Contracting States:
DE ES FR GB IT PT

(71) Applicant: **COMELZ S.p.A.**
Viale Indipendenza 55
I-27029 Vigevano (Pavia)(IT)

(72) Inventor: **Zorzolo, Allessandro**
Via stropeni, 24
I-27029 Vigevano - Pavia(IT)

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

(54) Automatic shoe manufacturing system, particularly for roughening and gluing of uppers.

(57) A system is disclosed which is specially suited to edge card uppers (19) attached to an insole (20) and apply an adhesive thereto for subsequent gluing of a sole member thereon. It comprises:

shuttle holders (5) for holding the semimanufactured article,

track means (10,11,12) for the shuttle holders arranged to define at least two travel paths having a section (11) in common,

at least one processing station (B,C,D,E) in each of the two paths at sections (10,12) thereof other than the common one,

driving means (M) for the shuttle holders (5),

means of detecting (P) the shuttle holder positions, and

a central control unit (UC) receiving signals from the stations and the position detecting means and issuing signals to drive the shuttle holders (5) and have the processing steps carried out according to a predetermined program.

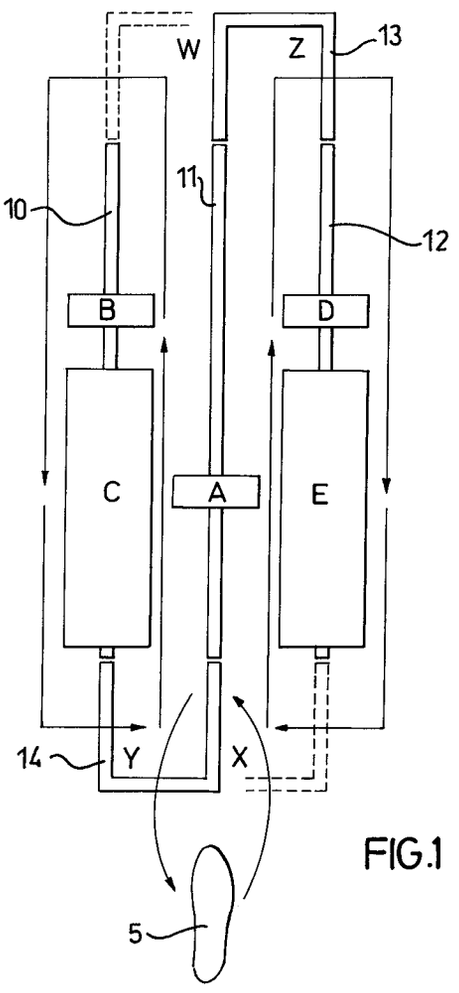

FIG.1

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This invention relates to footwear making plants, and more particularly, concerns a system for mass processing semimanufactured articles, specifically for edge "carding" uppers and coating them with an adhesive preparatory to adhering a sole member thereto.

An industry-level footwear making cycle involves sequential operations to be performed on one and the same region of a semimanufactured article and each requiring approximately the same machine time. Two operations of this kind are the "carding" of the uppers edge, as folded over and glued onto an inner supporting sole known as the insole, and the application of an adhesive over the carded region for subsequent attachment of an outer sole member thereto. In the footwear making industry, a process step whereby the leather surface of the uppers is roughened preparatory to gluing is commonly referred to as "carding".

For such carding, a semimanufactured article, as fitted on a former attached to a movable fixture, is taken under a carding machine and processed by driving a carding tool across the folded over and glued edge of the uppers, all around the footwear peripheral contour. The operation can be automated using program equipment including, for instance, template and feeler means, whereby the carding tool can be made to travel a definite processing path. For subsequent processing, the semimanufactured article, while still held in its fixture, is brought under an adhesive applicator machine having a moving injector operated to travel substantially the same path as the carding tool and to coat the surface to be glued with an adhesive layer. The carding step is usually preceded by a preparatory or pre-carding step, to remove residual matter from the previous step (gluing of the uppers to the insole), and the adhesive application is preceded by a brushing step to remove dust and particulate left over from the carding step. After carding, it is advisable that the semimanufactured article be inspected visually for processing faults, so as to have them corrected by the operator, where necessary.

The above-discussed operations are carried out in the prior art on an individual basis by moving the semimanufactured article between the machines either manually, or over belt or rotating table conveyors, or the like. This denies, however, optimum utilization of the equipment potential, or alternatively requires that more than one operator be detached to simultaneously oversee the machines, or may disallow proper checking between processing steps, thereby the overall throughput of the plant system is bound to be a low one.

It is the object of this invention to provide a system as defined in the beginning which is fully automated and enables the main process steps to be monitored by a single operator without this affecting optimum utilization of the machines which compose the system.

This object is achieved by the provision of a system as defined and characterized in the appended claims to this specification.

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

Figure 1 is a diagramatic representation of the inventive system;

Figure 2 is a perspective view showing schematically a structure for holding and moving a semimanufactured article through the system in Figure 1; and

Figure 3 is a block diagram useful to explain the operation of the inventive system.

Figure 1 shows schematically a shuttle-type of workpiece holder 5, shuttle track means defining two travel paths for the shuttle holder, and processing stations where the semimanufactured articles carried on the shuttle holder are variously processed or treated. The largest number of said shuttle holders that can fit in the path at any one time will depend essentially on the processing time allowances at the individual stations. In actual practice, it would be selected to minimize downtime between process steps at one and the same station.

The shuttle track means comprise in this embodiment three parallel rails 10, 11, 12, and two parallel translation members 13 and 14 laid in the form of two juxtaposed letters "U" with the legs of the U's defining junction rails. Each of these translation members can be moved in a crosswise direction to the parallel rails, such that the two legs of each "U", when in one position, merge with the center rail 11 and one of the side rails, and in another position, merge with the center rail 11 and the other of the side rails.

A shuttle holder 5, as shown in Figure 2, consists of a car 16 having a mounting block 17 and a former holding post 18. As shown in said Figure, the former has a semimanufatured article fitted thereon which consists of an uppers 19 and an insole 20. Advantageously, the post 18 is adjustable in height to enable the shuttle holder to accommodate a range of semimanufactured articles and formers. A suitable locking means of a conventional kind such as a clevis, not shown, is arranged to retain the toe and heel ends of a shoe fixedly in place. Also provided, but not shown because conventional, are a means of driving the shuttle holder in a guided fashion along the rails, means of detecting the position of each shuttle holder along the path, and actuator means for the translation mem-

bers.

The following process steps are carried out at the stations denoted by the reference characters A to E and the positions denoted by X, Y, W, Z in Figure 1:

X: in this position, i.e. with the leg once aligned to the center rail 11 of translation member 14, the operator will load and unload the semimanufactured articles to be started through the process over rail 11 or as exiting the process over rail 12, respectively, and inspect the semimanufactured article after the carding step and before application of the adhesive;

A: the semimanufactured article is locked (by operation of the clevis arrangement);

W: in this position, i.e. with the leg once aligned to the center rail 11 of translation member 13, the shuttle holder is held up for switching either to the rail 10 of the carding leg or the rail 12 of the adhesive application leg;

B: pre-carding;

C: carding;

Y: in this position, i.e. with the translation member 14 leg aligned to the rail of the carding leg 10, the shuttle holder is held up for switching to the center rail 11;

Z: to this position, i.e. with the translation member 13 leg aligned to rail 12, the shuttle holder is brought after moving over rail 11 from position W, via the translation member 13;

D: brushing;

E: adhesive application.

The shuttle holder movements along the path, the residence times of the shuttle holders at the various processing stations and the other positions, and the translation member movements are controlled and coordinated by a central control unit in accordance with a program stored in the unit and positional information from the individual shuttle holders and other signals, among which are control signals entered by the operator.

The main operational connections between the central unit UC, the shuttle holders 5, the locking A and processing B, C, D and E stations, and the parallel translation members 13 and 14 are shown diagramatically in Figure 3. As can be noticed, the central unit UC receives positional signals from the position detectors P associated with the shuttle holders and sends control signals to the drive motors M for driving the shuttle holders and to processing stations B, C, D and E, to thereby start, stop and select the processing procedures. Further signals can be received by unit UC from travel limit switches and other consent means associated with the machines in the system, and from on/off switches, generally shown at S, controlled by the operator.

The program functions performed by the central unit are as follows (although not necessarily in the order shown):

monitoring the state of the consent means;

timing the processing step durations;

computing the shift paths between processing stations;

timing the shuttle holder movement durations;

transmitting actuating signals to each of the shuttle holders for their respective shift movements;

detecting the shuttle holder positions;

sending timing signals to each shuttle holder;

sending actuation signals to the parallel translation members;

detecting the states of the consent switches under control by the operator.

The completion of a full steady-state processing cycle of a system according to a preferred embodiment which includes seven shuttle holders, takes place as follows, within the time lapses shown in brackets.

The operator unloads a processed workpiece from, and loads one to be processed onto, a shuttle holder located at position X (2s); the translation member 14 occupies the position shown in full lines in Figure 1 (on the left looking at the drawing);

the shuttle holder moves to station A where the workpiece is locked to the former (3s);

the shuttle holder reaches position W (3s) on the translation member 13 that locates as shown in full lines in Figure 1 (right-hand position);

the translation member 13 moves into the position shown in dash lines in Figure 1 (left-hand position) (1s);

the shuttle member reaches station B where it is pre-carded (3s);

after a pause (2s), the shuttle holder moves to station C where it is carded (4s), and then into position Y (1s) while the translation member 14 occupies the left-hand position;

the translation member 14 is moved into the right-hand position (1s) where the workpiece can be inspected by the operator;

the shuttle holder moves once again through the locking station A (3s) and reaches position W (3s) with the translation member 13 being in the left-hand position;

the translation member 13 is moved to the right-hand position (1s);

after a pause (3s), the shuttle member reaches the brushing station D (3s) and then the adhesive applying station E (3s);

subsequent to the last-named step, the workpiece is taken to the translation member 14 (1s) occupying the right-hand position;

the translation member 14 is switched leftward

(1s), and the cycle ends with the workpiece being discharged by the operator.

As may be seen, the overall duration time of a complete processing cycle is approximately 38s. When using the processing times specified above and seven shuttle holders, the parallel translation members 13 and 14 will stay in the left-hand position for about 7s and in the right-hand position for about 5s. They will both locate simultaneously on the same side for about one half their respective residence time in either position.

For the carding operation, a machine may be advantageously used whose tooling can admit of a setting with 4 degrees of freedom. Specifically, and as symbolically shown in diagramatic form in Figure 2, where indicated at x is the horizontal direction of movement of the shuttle holder 5, the carding head, shown at 21 in the drawing, can move along a horizontal axis y, a vertical axis z, a vertical setting axis j, and a horizontal setting axis w. Advantageously, the relative movement of the tool bit and the workpiece along the x direction is accomplished by holding the tool bit stationary and reciprocating the shuttle holder along the rail to have either sides of the workpiece processed.

As can be seen, the system just described operates in a fully automated manner, while still allowing the operator to intervene before the major process steps; and this can take place without discontinuing the processing cycle, and therefore, at a high rate of system throughput.

While one embodiment of this invention has been described and illustrated, it is understood that several changes and modifications are possible within this same inventive concept. For example, the track rails for the shuttle holders could be other than straight or parallel to one another, and be a larger number than three; the translation members could comprise single, rather than double, U-shaped members; and the process steps to be carried out on the system could be other than those described hereinabove.

Claims

1. A system for serially processing semimanufactured articles for footwear making, being particularly adapted for edge carding uppers (19) attached to an insole (20) and applying an adhesive thereon for gluing to an outer sole member, characterized in that it comprises:

   a multiplicity of shuttle holders (5) for holding the semimanufactured article;

   track means (10,11,12) for the shuttle holders (5) adapted to define at least two travel paths sharing a common section (11);

   at least one processing station (B,C,D,E) with processing means for the semimanufactured article, lying adjacent to the track means (10,11,12) in each of the two travel paths at non-shared portions thereof;

   means (M) of driving the shuttle holders (5) along the track means;

   means (P) of detecting the shuttle holder (5) positions;

   a control unit (UC) being so connected to the shuttle holder driving means (M), the means (P) of detecting the shuttle holder positions, and the processing stations (B,C,D,E) as to be input signals from said means and stations and to issue control signals, in response to said input signals, to thereby shift the shuttle holders and have the processing steps carried out on the semimanufactured article in accordance with a predetermined program.

2. A system according to Claim 1, characterized in that the track means define two travel paths comprising three rails (10,11,12), of which one (11) forms the common section of the paths, and two translation members (13,14) operative to alternatively merge with one or the other of said paths, and that it comprises actuator means for the two translation members (13,14) connected to the control unit (UC) to receive control signals therefrom for switching either of the two translation members, in accordance with the program, and selectively connect the common rail (11) to either of the other two rails (10,12).

3. A system according to Claim 2, characterized in that the three rails (10,11,12) lie parallel to one another.

4. A system according to either Claim 2 or 3, characterized in that the processing stations adjacent to the track means include a carding station (C) and an adhesive applying station (E), each associated with one of the other two rails (10,12).

5. A system according to any of the preceding claims, characterized in that the shuttle holder (5) movement relative to the processing stations (B,C,D,E) constitutes one component of the relative movement of the semimanufactured article processing means and the semimanufactured article.

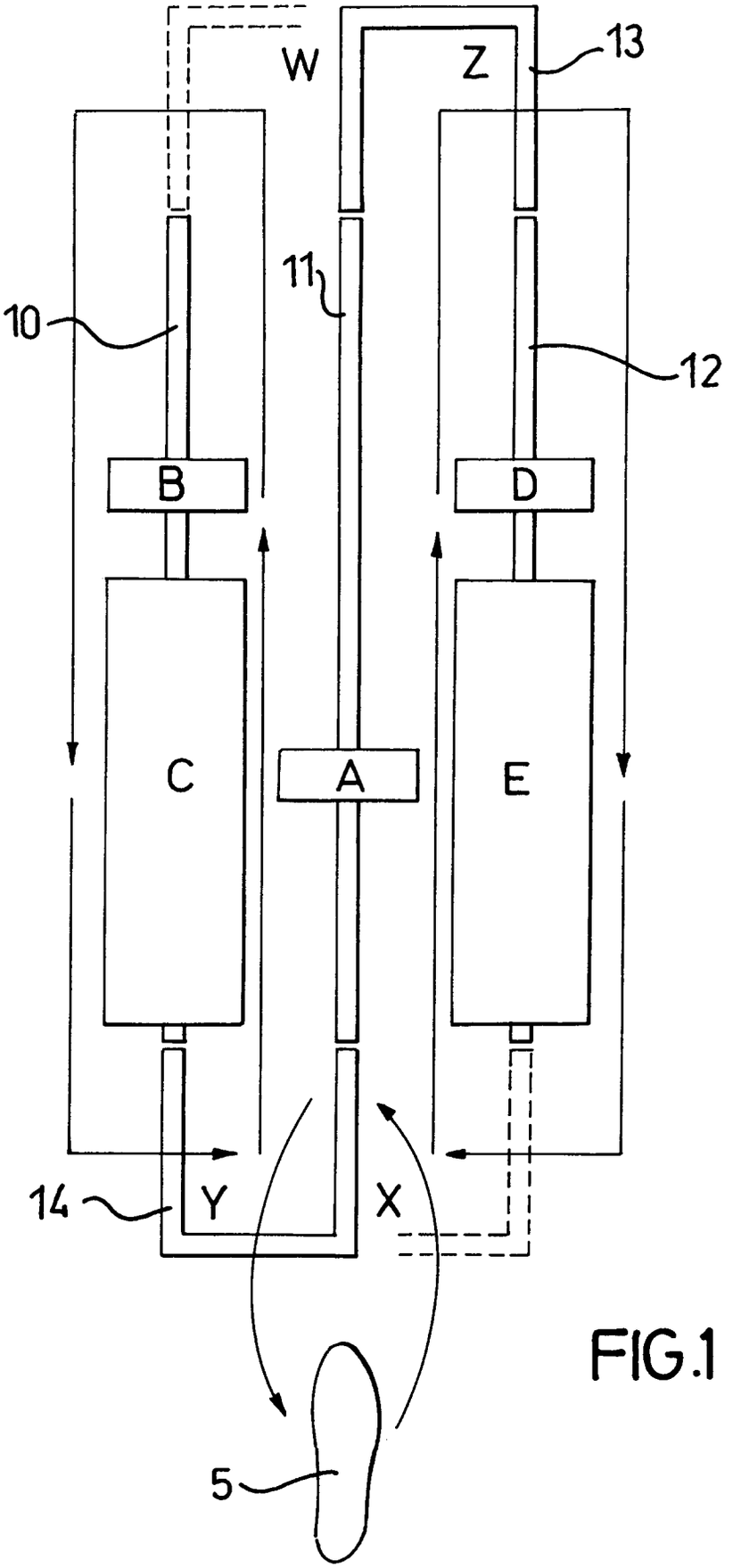

FIG.1

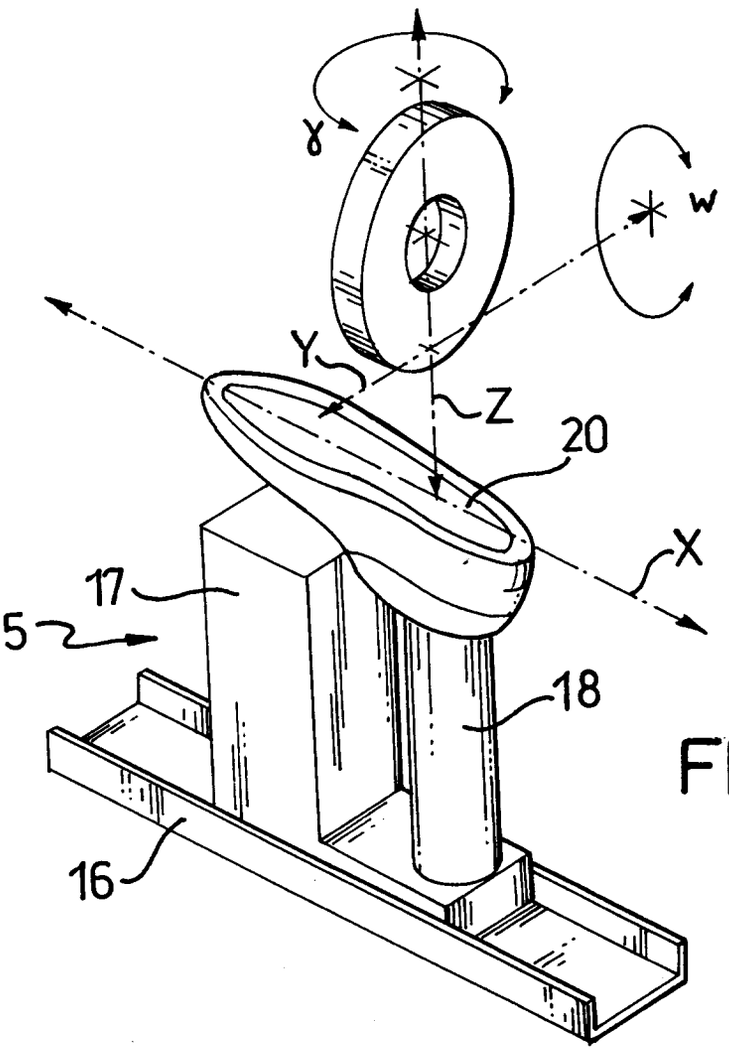

FIG.2

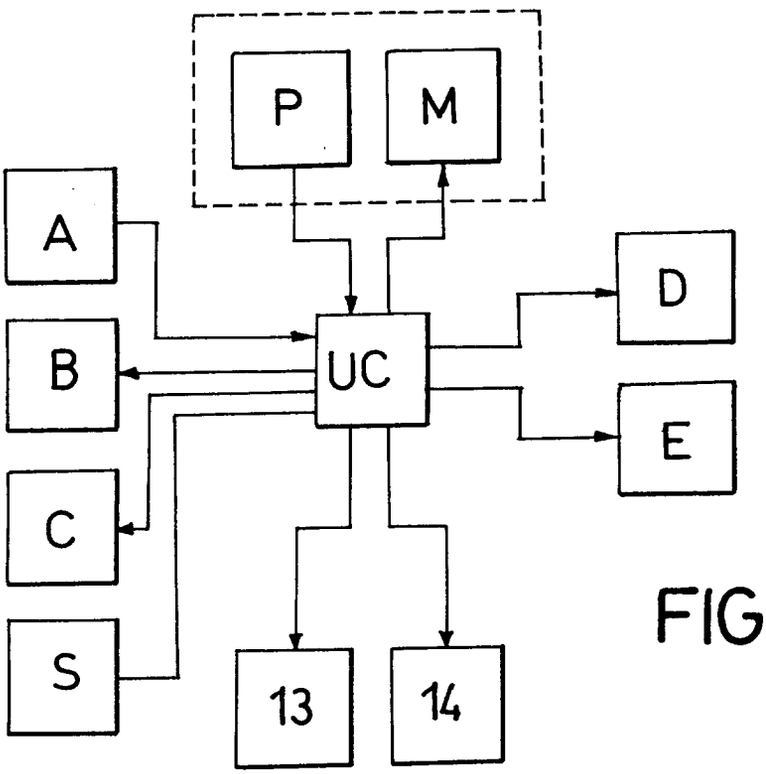

FIG.3

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EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0152

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.5)
X	EP-A-0 329 007 (PSB GMBH FÖRDERANLAGEN UND LAGERTECHNIK) * column 2, line 15 - line 23 * * column 3, line 25 - line 30 * * column 3, line 56 - column 4, line 5 * * column 7, line 34 - line 38; claims; figure 5 *	1-5	A43D111/00 A43D119/00
X	US-A-4 639 963 (FISHER) * column 1, line 26 - line 49; claims; figure 1 *	1,4	
A	EP-A-0 340 390 (SCHÖN & CIE GMBH)		
A	GB-A-1 439 101 (VIGES SPA)		
A	EP-A-0 336 632 (INTERNATIONAL SHOE MACHINE CORP.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A43D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 NOVEMBER 1992	SOEDERBERG J.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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