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(54) Forming machine for forming soles and insoles for footwear

(57) Forming machine (1) for forming soles and insoles for footwear including a base (2) which supports: at least one storage container (3) for said unformed insoles; handling means (19) to retrieve said insoles (15) from said storage container (3) and position them between the forming means (4); forming means (4) including a die (6) and a punch (7) facing each other; pressing means (5) suited to reciprocally force said die (6) and said punch (7) against each other along a thrust axis (X-X), to produce the forming of said insoles. At least one of said die (6) and punch (7) is linked to a rocking bolster plate (14) pivoted to said pressing means (5), suited to set said die (6) or punch (7) at an angle to said thrust axis (X-X) allowing the progressive closure of said die and punch during the rotation of said plate (14) around said pivot and the release of said insole by said handling means (19).

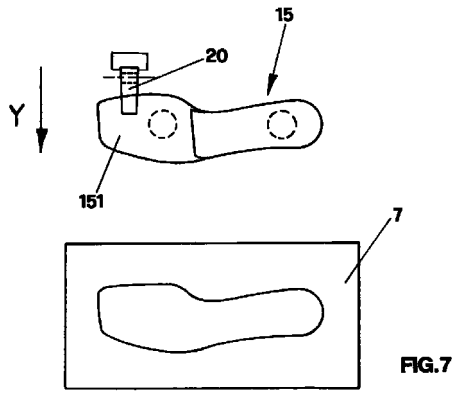

FIG.7

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Description

[0001] The invention concerns a forming machine particularly suited to automatically form the soles and insoles used in manufacturing footwear.

[0002] It is known that footwear includes, in addition to the top part commonly called "upper", an underside, illustrated in fig. 1, which basically consists of the insole A, the actual sole B and the heel C.

[0003] Experts in the footwear sector know that to form the sole B giving it a permanent shape, being curved along its length and with the curve being steeper the higher the heel C, mechanical presses are commonly used fitted with a mobile die and a stationary punch.

[0004] These presses have a hydraulic or pneumatic circuit that can transmit to the mobile die an adequate pressure against a sole inserted previously between the mobile die and its corresponding stationary punch.

[0005] The particular shape of the matching die and punch surfaces will also form the sole in a crossway direction, giving it a slight central cavity to follow the contours of an actual foot.

[0006] The aforementioned insole A is often glued over the sole B and, as can be best seen in the blow-up diagram in fig.2, basically includes the flat upper section A1, the intermediary metal arch A2 and the backing A3, in card fibre, over the heel area.

[0007] The insole A, after its separate parts have been joined together, is formed in a similar fashion to the method used above for the sole B.

[0008] The curve, since the insole is much thinner than the sole, is kept in place mainly by the existence of a metal arch A2 located along the section that connects the front and back sections.

[0009] When this curve is very steep, to suit high heel shoes, the initial distance between the die and the punch has to be sufficient to allow the operator to easily insert each basically flat insole, before operating the active forming operation of the insole by the press.

[0010] There is thus the technical problem of inserting the insole between the open die and punch, in a precise, stable manner, even when the insole is left free so that it can be worked on with the press in safe conditions.

[0011] Known forming machines use a vertical press fitted with a mobile, upper die and a stationary, lower punch.

[0012] Still today the insole is inserted between die and punch by the machine operator who takes one insole at a time from a storage container of unformed insoles and places it horizontally on the stationary punch before operating the closure of the mobile die.

[0013] A first inconvenience can easily be noted in the precision of the insole's positioning, that greatly influences the accuracy of the forming, and this precision depends on the expertise of the operator, although it can never be the same for all the insoles.

[0014] Another inconvenience is in the stability of the insole resting on the punch, after the operator releases it and before the pressing action made by the die, a stability that at times yields during the die closure action.

[0015] Another inconvenience is that the aforesaid manual operations are complicated and lengthy, where the operator even has to extract the formed insole before inserting a new unformed insole.

[0016] On top of all this, these operations have to be carried out under safety standards prescribed by legislation, which require the implementation of safety means that increase production costs.

[0017] The most recent forming machines, that we may define as being semi-automatic with reference to the operation of positioning the insole between die and punch, include a horizontal conveyor belt which receives unformed insoles at regular intervals, still being basically flat, this belt moves forward "in steps" between the die and punch when they are both in their open position, while the press actuating the die is operated with regular strokes to make it close over the insole and the conveyor belt.

[0018] This belt thereby also acts as ejector means of the insoles from the forming zone.

[0019] However not even these machines eliminate the inconvenience of poor precision in positioning each insole under the die.

[0020] What's more these machines have the inconvenience of rapidly wearing out the conveyor belt that incurs the repeated pressing action of the die, an action that should instead be solely designated to the insoles.

[0021] Forming machines with vertical presses and horizontal feed belts have the added disadvantage of taking up a lot of space, particularly in a lateral direction, since their storage container for unformed insoles and the collection container for formed insoles have to be positioned sideways and on opposite sides of the press.

[0022] This invention intends to overcome the above inconveniences and disadvantages.

[0023] In particular, one of the scopes of this invention is to produce a forming machine that allows to automatically position the insoles between die and punch, with great precision and always in the same place.

[0024] Another scope is that the forming machine invention allows to completely eliminate manual interventions by the operator, both in positioning the insoles and in extracting them.

[0025] Another scope of the invention is to produce a very compact forming machine.

[0026] Yet another scope of the invention is to make all the operations related to forming insoles much faster, with the aim of lowering work costs.

[0027] The aforesaid scopes and others that shall be better illustrated below are achieved with the production of a forming machine for forming footwear soles and

insoles which, in accordance with the contents of the first claim, includes a base which supports:

- at least one storage container for said unformed insoles;
- handling means to retrieve said insoles from said storage container and position them between forming means;
- said forming means, including a die and a punch facing each other;
- pressing means suited to reciprocally force said die and said punch against each other, along a thrust axis, to produce the forming of said insoles;
- ejector means of the formed insole from the work zone of said die and punch;

that is characterised in that at least one of said die and punch is linked to a rocking bolster plate pivoted to said pressing means, suited to set said die or punch at an angle to said thrust axis, allowing the progressive closure of said die and punch during the rotation of said plate around said pivot, and the release of said insole by said handling means.

[0028] An advantage of the invention is that the rocking bolster plate is located on the mobile part of the pressing means and holds the die belonging to the same means.

[0029] According to a variant in execution the rocking bolster plate is located on both the mobile part of the pressing means to hold the die, and on the stationary part to hold the punch.

[0030] Additional characteristics and details of the invention shall be better illustrated in the description of a particular execution of the invention and of the aforesaid variant, given as a guideline but not a limitation and illustrated in the attached diagrams, where:

- fig. 1 shows the usual construction of the lower part of a shoe;
- fig. 2 shows a common construction of the insole;
- fig. 3 is a side view of the forming machine invention;
- fig. 4 is the corresponding plan of the same machine;
- fig. 5 illustrates a detailed plan of the working part of the machine;
- fig. 6 is a side view of the same working part;
- fig. 7 shows a representation of the initial positioning of the insole between the die and punch;
- fig. 8 is a side view of the same operation in fig. 7;
- fig. 9 shows another plan of the operation that follows fig.'s 7 and 8;
- fig. 10 shows, again as a plan, the operation that follows fig. 9;
- fig. 11 illustrates a variant in execution of the invention.

[0031] The forming machine invention is illustrated as a whole in the two diagrams in fig.'s 3 and 4, where it is generally indicated by 1.

[0032] It includes the base 2 which supports the storage container 3 containing the unformed insoles, the handling means (that shall be indicated later) to retrieve the insoles from the storage container and position them between the forming means 4, and the pressing means 5 suited to operate the same forming means 4.

[0033] To be more precise, the forming means 4 include the die 6 and the punch 7 set facing each other at a suitable distance to receive, when in their open position, the unformed insole from the handling means.

[0034] The pressing means 5 is suited to reciprocally force the die 6 and punch 7 against each other along a basically horizontal thrust axis X-X, to produce the forming of the actual insole.

[0035] In the example of production in fig.'s 5 and 6 the pressing means 5 has a stationary part 8 holding the punch 7, linked mechanically to the ends of four identical cylindrical slides, indicated by 9, being parallel to the thrust axis X-X and set at the top of a rectangle, and a mobile part 10 that holds the die 6, slide coupled to the same slides 9.

[0036] To be more precise, the mobile part 10 of the pressing means 5 includes the main bed 11 sliding on the cylindrical slides 9 under the action of the thrust means 12 and pivoting, by the pin 13, the rocking bolster plate 14 that holds the die 6.

[0037] The pin 13 creates an axis of rotation for the rocking bolster plate 14, that is basically square to the thrust axis X-X and in this way allows the die 6 to be set at an angle to the thrust axis X-X.

[0038] This inclined position is suited to allow a progressive closure of the die 6 on the punch 7, against the insole 15 between the two during the rotation of the rocking bolster plate 14 around the pin 13.

[0039] For this purpose the rocking bolster plate 14 is made to flex elastically against the main bed 11 by the use of elastic means 16 inserted between the two plates 11 and 14.

[0040] In the production in fig.'s 5 and 6 these elastic means include a slides rod 17 that has one end 171 pivoted to the rocking bolster plate 14 and its opposite end 172 slide coupled in a through hole 111 made in the main bed 11, and pivoted on its attachment 112.

[0041] The rod 17 works with the spring 18 fitted outside the actual rod, which has one end against the main bed 11 and the other end against the rocking bolster plate 14 in order to keep the die 6 at an angle to the thrust axis X-X, in its idle position with the die open as illustrated in the above figures.

[0042] The unformed insole 15 is placed in the position indicated in the same figures by the insole handling means, generally indicated by 19 in fig. 6, including a pincer 20, having movements suited to grip the insoles received one by one in series from the insole feed sections 21 of the storage container 3, and to transfer them

with precision in the forming zone between die 6 and punch 7.

[0043] The positions of the insole storage container 3 and its feed sections 21 can be practically located above the forming zone of the machine, so that the pincer 20 can work vertically with alternating movements, gripping the insole 15 by its toe 151, as shown in the enlarged detail to the side of fig. 5.

[0044] The forming machine invention includes ejector means of the insole, generally indicated by 22, after it has been formed.

[0045] These means have a band element 23, whose central section 230 runs between the insole 15 and the punch 7, linked to runners, for instance free wheels all indicated by 24, and to tensioners generally indicated by 25, suited to make it flex elastically and shift alternately to eject the insole when the die is opened.

[0046] Said tensioners include a take-up element, consisting for example of a pneumatic cylinder 26 connected to one end of the band element 23, and an elastic element consisting of a spring 27 connected to the other end of the same band element.

[0047] The operations performed in forming each insole are illustrated in the series of figures 7 to 10.

[0048] In particular fig. 7 illustrates a representation of the relative position of the insole 15, with its toe 151 already gripped by the pincer 20, and die 6 and punch 7, before the actual pincers downward movement, in the direction of arrow Y, to place the insole 15 between the open die 6 and punch 7.

[0049] Figure 8 illustrates how the pincer 20, on positioning the insole, turns partially in the direction of arrow Z, to place the insole 15 against the punch 7 over the heel 152 of the insole.

[0050] At the same time the rocking bolster plate 14, under the action of the thrust means that makes it travel in the direction of arrow W, presses the die 6 against the insole 15 beginning, because of the angle between the actual plate and the thrust axis X-X, from the heel section 152, as shown in fig. 9.

[0051] The initial bearing on the die 6 locks the insole in the precise position required for forming, thereby enabling the pincer 20 to release the insole 15 by now being firmly locked in position and to rapidly rise before the thrust means complete the closing operation of the die 6 on the punch 7.

[0052] Said closing operation is therefore performed with a rotary movement of the rocking bolster plate 14 around its pivot, created by the pin 13, this movement being contrasted by the elastic means and described above during the closing operation of the die, and that are suited to return the rocking bolster plate to its initial inclined position during the subsequent opening of the die.

[0053] Completion of the die closing operation is shown in fig. 10 where the pincer 20, drawn with a dotted line, is open, given its position over the forming zone and is ready to retrieve a new insole from the overhead storage container to restart the work cycle.

[0054] Meanwhile the die begins its opening operation, the sequence being fully comprehensible.

[0055] It is moreover worth noting the functions of the aforementioned insole ejector means.

[0056] In particular, returning to fig. 6, it is important to note that the elastic flexing of the central section 230 of the band element 23 favours separation of the insole 15 from the punch 7 when the die 6 begins to open, even though there is still a possibility that the insole 15 sticks to the band element, instead of dropping into the collection container for the formed insoles placed under the forming zone.

[0057] The existence of the aforesaid ejector means 25 enables this inconvenience to be avoided. In particular, the series of actions performed by the piston 26 makes the band element 23 alternately shift sharply over its runner means 24, so that a downward motion is transmitted to any insole 15, that may be sticking to the band element 230, that ejects the insole downwards, making it detach on contact with an underlying stopper device, not illustrated in the figures.

[0058] The forming machine invention 1 can have the rocking bolster plate 14 described above linked to the die 6, as mentioned and illustrated above, or linked to the punch 7, with its operation being identical.

[0059] A further variant of execution is illustrated in fig. 11 where it can be seen that the machine has a pair of rocking bolster plates 60 and 70 facing each other and both at an angle to the thrust axis X-X.

[0060] The first rocking bolster plate 60 holds the die 6, while the second rocking bolster plate 70 holds the punch 7.

[0061] The double, symmetrical angle to the thrust axis X-X makes it easier to insert the insole 15 between die 6 and punch 7 by the pincer 20, especially when the insoles 15 have to be formed with a very steep central curve.

[0062] What's more the symmetrical rotary closing of the die 6 and punch 7 against the insole 15, starting from the heel 152, will avoid the possibility of the insole being stretched slightly along its length during forming in the machine executions that implement a single rocking bolster plate.

[0063] From the above explanations it can be understood that the forming machine invention achieves all the pre-set scopes.

[0064] In the execution, the form and number of working parts may vary with respect to the machine description, illustrated in the attached diagrams. In particular the insole handling means, as well as the thrust means that operate the machine's pressing means, could be pneumatic, mechanical or any another kind.

[0065] It is nevertheless understood that any variants differing from the execution examples described and illustrated herein shall be considered protected by this invention.

Claims

1. Forming machine (1) for forming soles and insoles for footwear including a base (2) which supports:

   - at least one storage container (3) for said unformed insoles;
   - handling means (19) to retrieve said insoles (15) from said storage container (3) and position them between the forming means (4);
   - forming means (4) including a die (6) and a punch (7) facing each other;
   - pressing means (5) suited to reciprocally force said die (6) and said punch (7) against each other along a thrust axis (X-X), to produce the forming of said insoles;

   characterised in that at least one of said die (6) and punch (7) is linked to a rocking bolster plate (14) pivoted to said pressing means (5), suited to set said die (6) or punch (7) at an angle to said thrust axis (X-X) allowing the progressive closure of said die and punch during the rotation of said plate (14) around said pivot and the release of said insole by said handling means (19).

2. Machine (1) according to claim 1) **characterised in that** said pressing means (5) includes at least one main bed (11) mechanically connected to thrust means (12) that holds said rocking bolster plate (14), said rocking bolster plate being pivoted to the former by a pin (13) creating a basically square axis of rotation to said thrust axis (X-X).

3. Machine (1) according to claim 2) **characterised in that** said rocking bolster plate (14) is made to flex elastically against said main bed (11) by elastic means (16) inserted between said plates (11; 14).

4. Machine (1) according to claim 2) or 3) **characterised in that** said elastic means (16) include a slide rod (17) with one end (171) connected to said rocking bolster plate (14) and the opposite end (172) slidingly coupled in a through hole (111) made in said main bed (11) cooperating with a coaxial spring (18) fitted to the outside of said rod (17) and having one end against said rocking bolster plate (14) and the opposite end against said main bed (11).

5. Machine (1) according to claim 1) **characterised in that** said handling means (19) include at least one mobile pincer (20) suited to grip said insoles (15) one by one in series and to set them between said die (6) and said punch (7).

6. Machine (1) according to claim 1) **characterised in that** said thrust means (12) is made up of a fluid actuator.

7. Machine (1) according to claim 1) **characterised in that** said thrust means (12) is made up of a pneumatic actuator.

8. Machine (1) according to claim 1) **characterised in that** said thrust means (12) is made up of a mechanical actuator.

9. Machine (1) according to claim 1) characterised in that it includes ejector means (23; 24; 25) of said insole from said die (6) and said punch (7) consisting of a band element (23; 230) placed between said insole and said die or punch linked to runner means (24) and to tensioner means (25) suited to make it flex elastically and alternately shift to eject said insole (15) when said die is opened.

10. Machine (1) according to claim 1) **characterised in that** said tensioner means (25) include take-up elements (26; 27) connected to the ends of said band element.

11. Machine (1) according to claims 1) and 9) **characterised in that** said take-up elements (26; 27) include at least one spring (27).

12. Machine (1) according to claims 1) and 9) **characterised in that** said take-up elements (26; 27) include at least one pneumatic element (26).

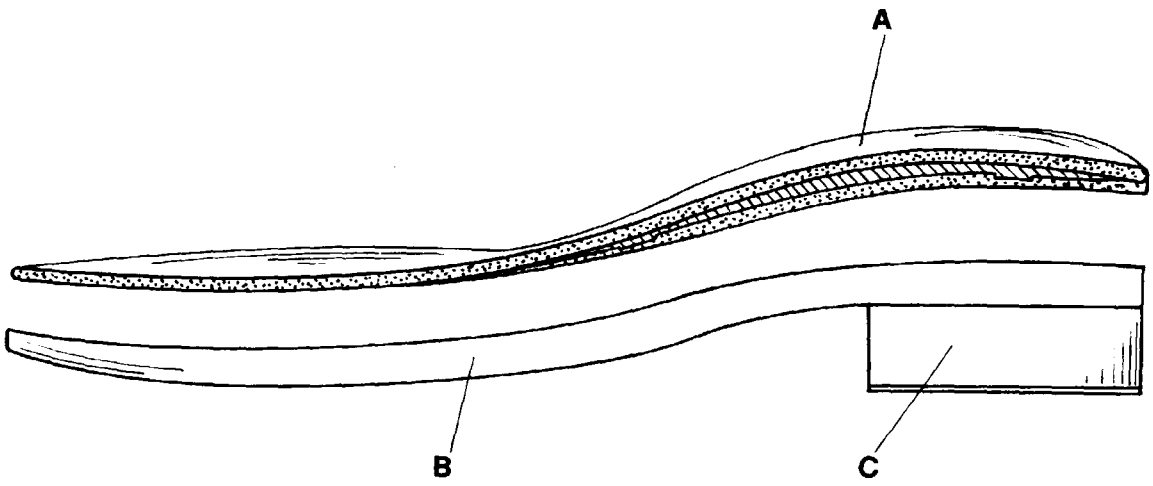

FIG.1

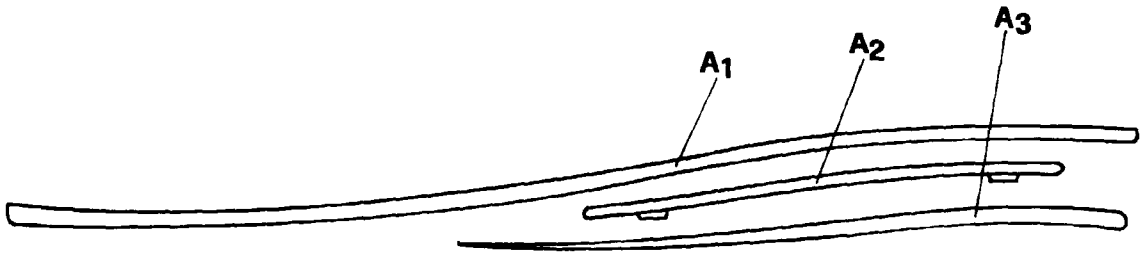

FIG.2

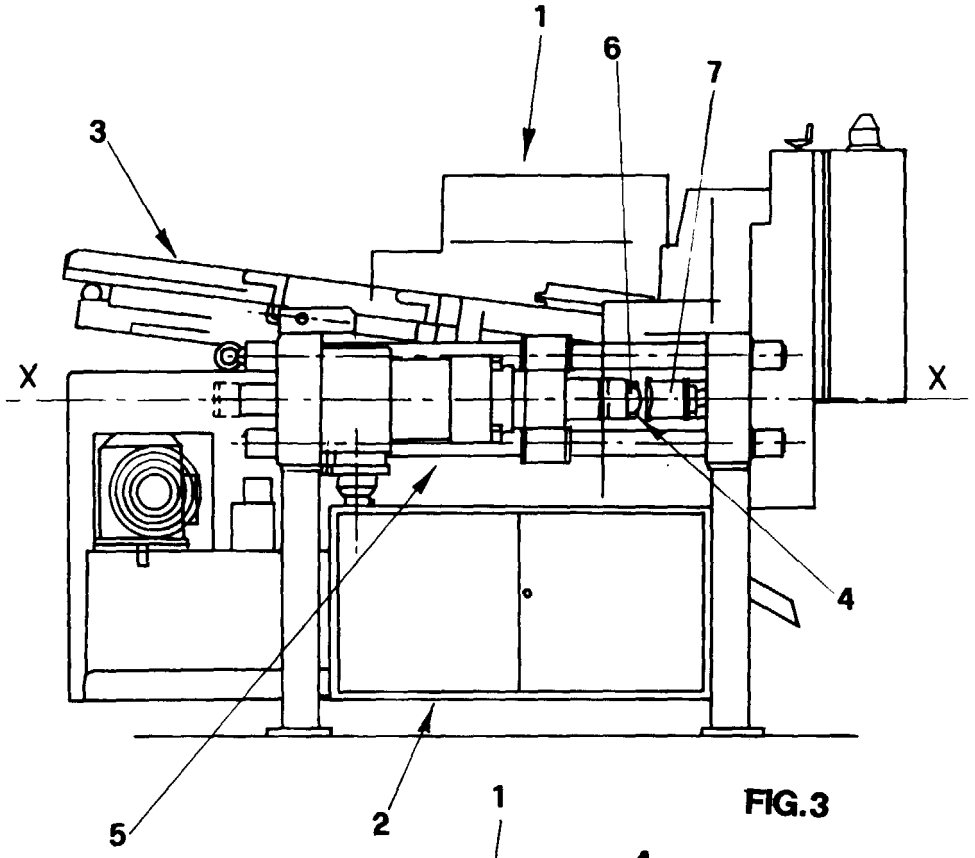

FIG.3

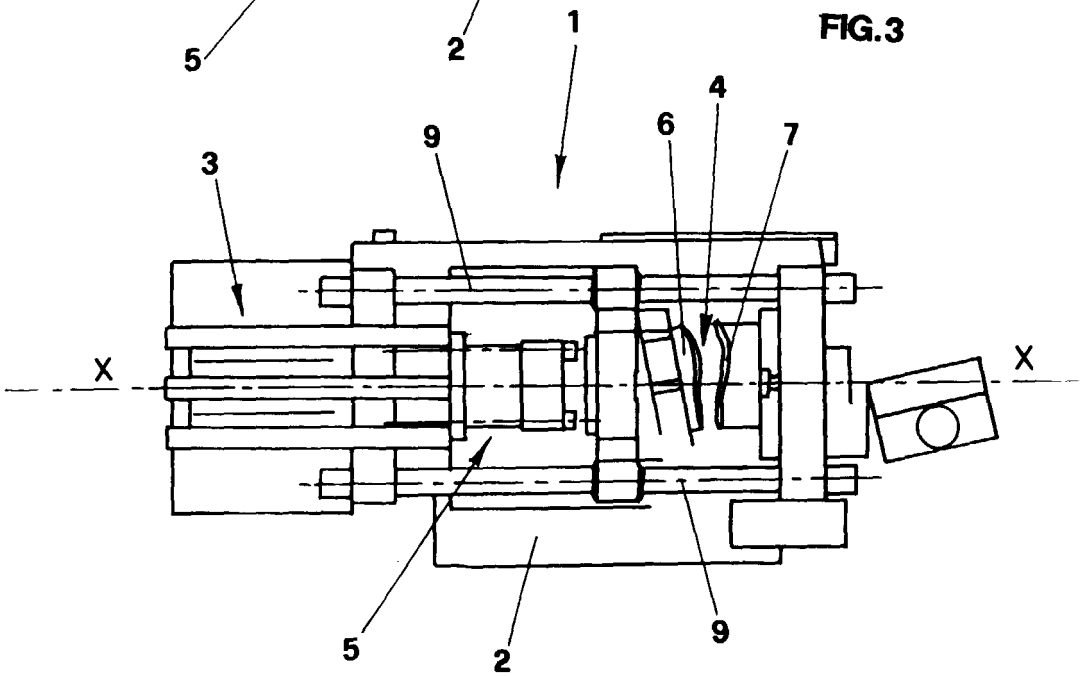

FIG.4

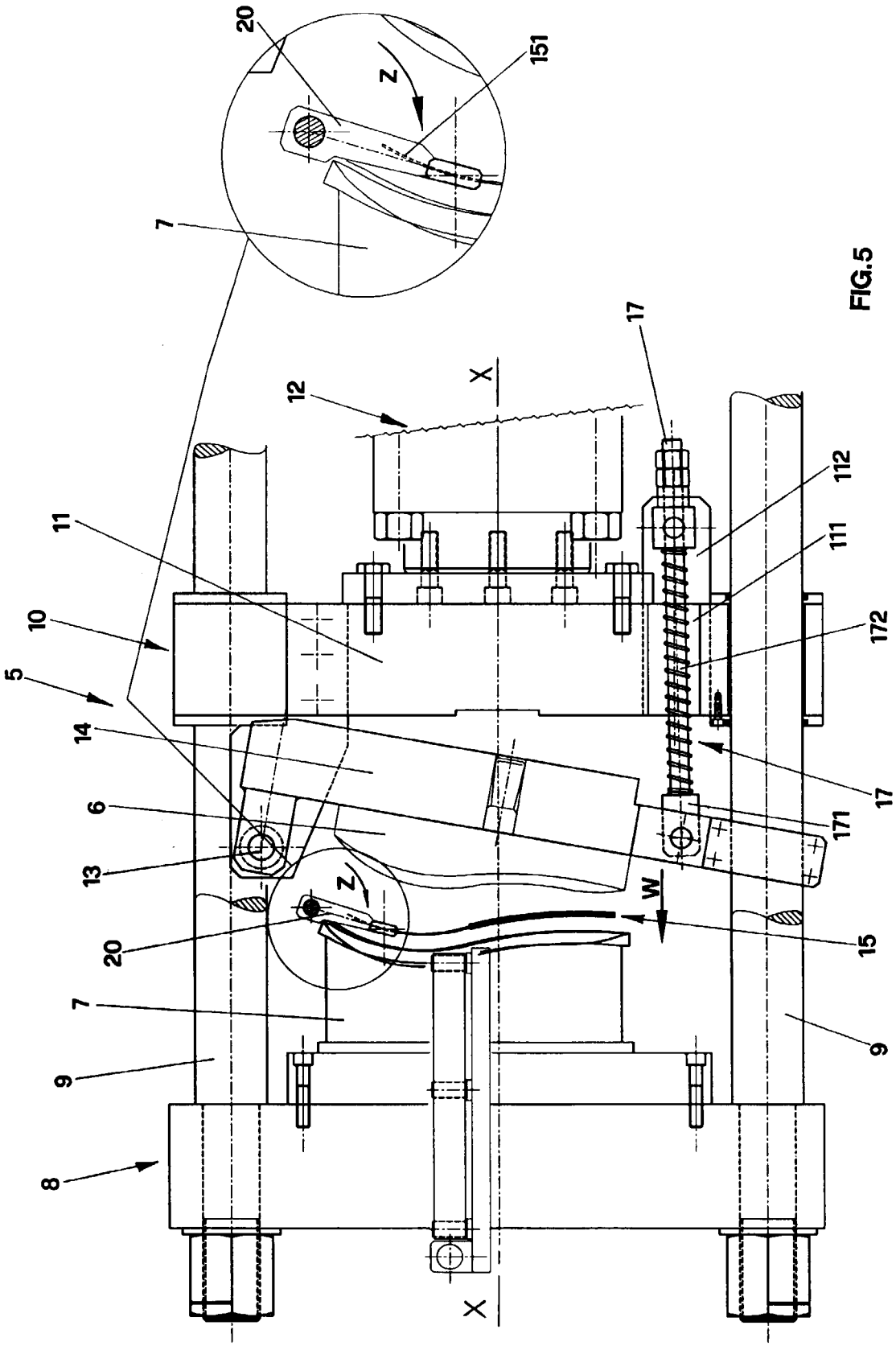

FIG.5

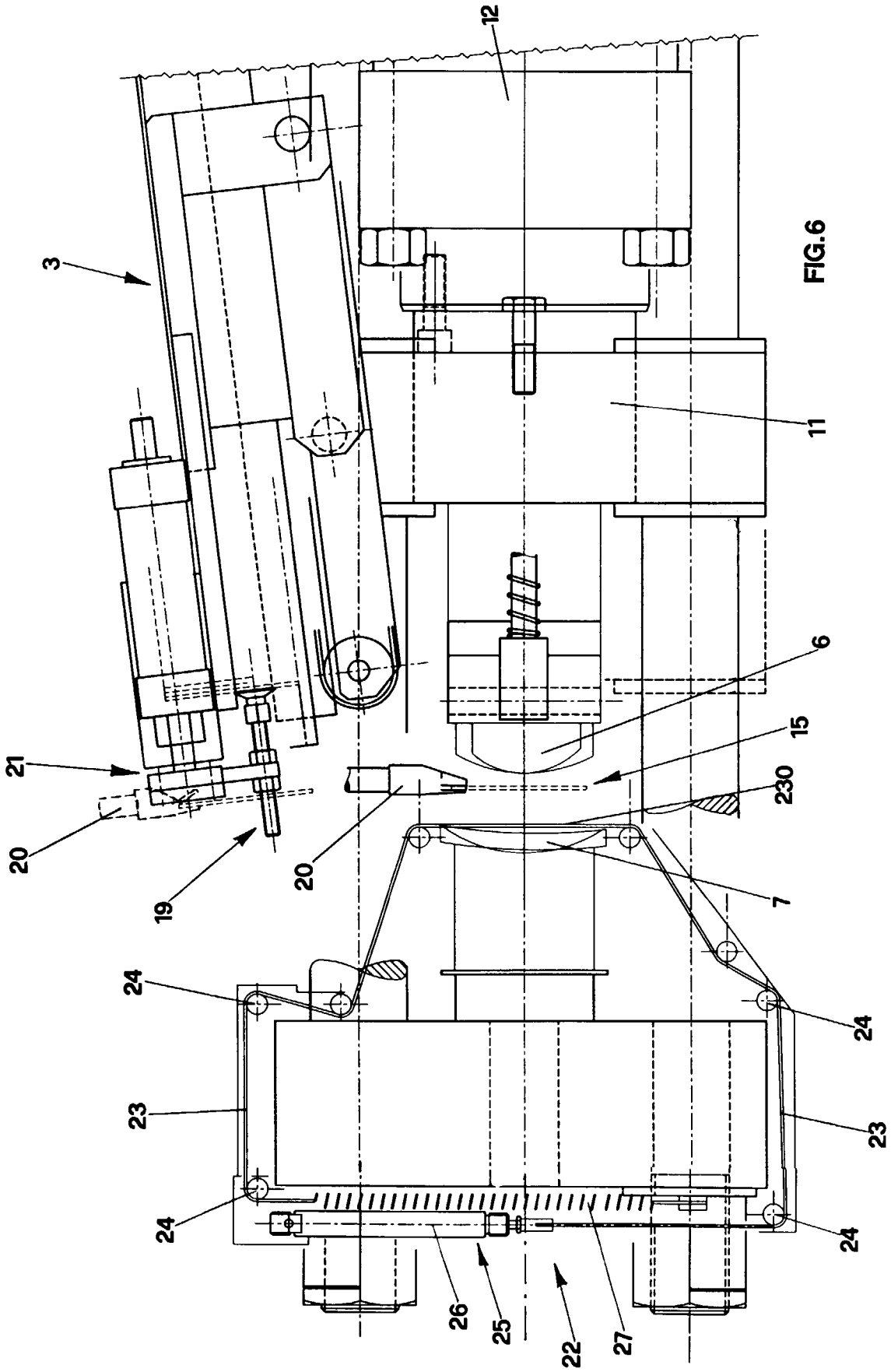

FIG.6

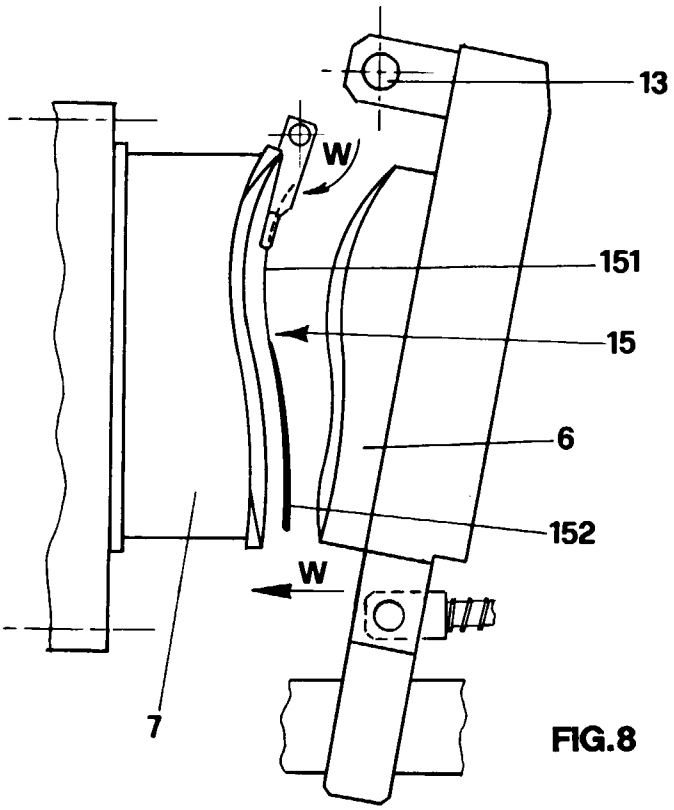

FIG.8

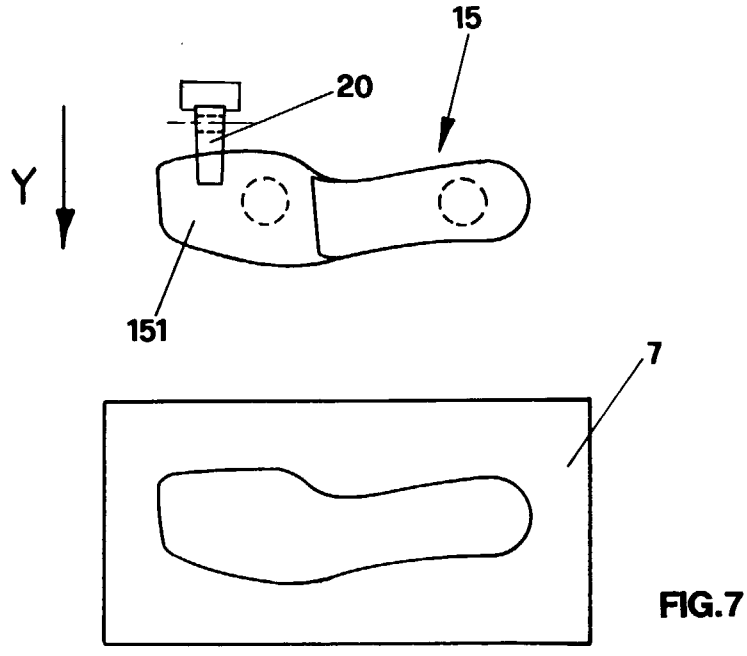

FIG.7

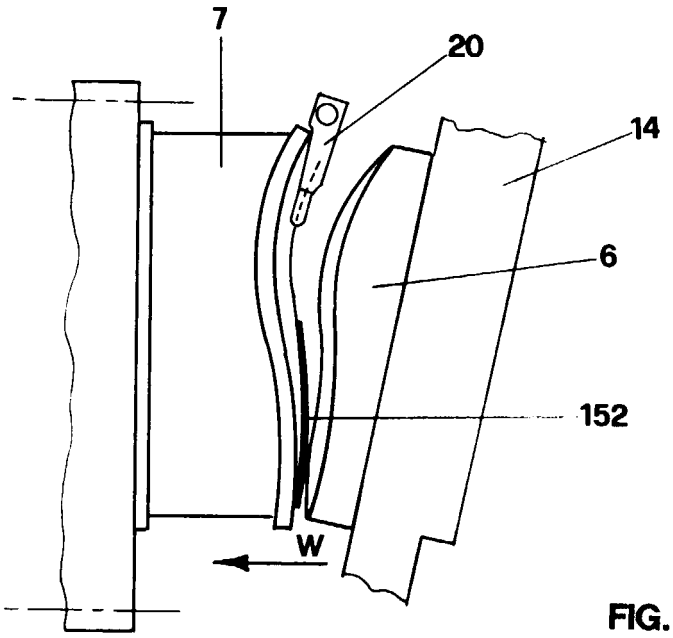

FIG.9

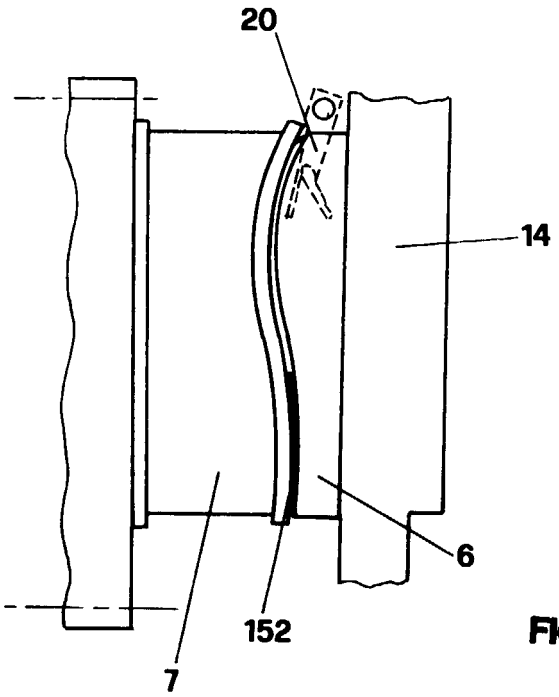

FIG.10

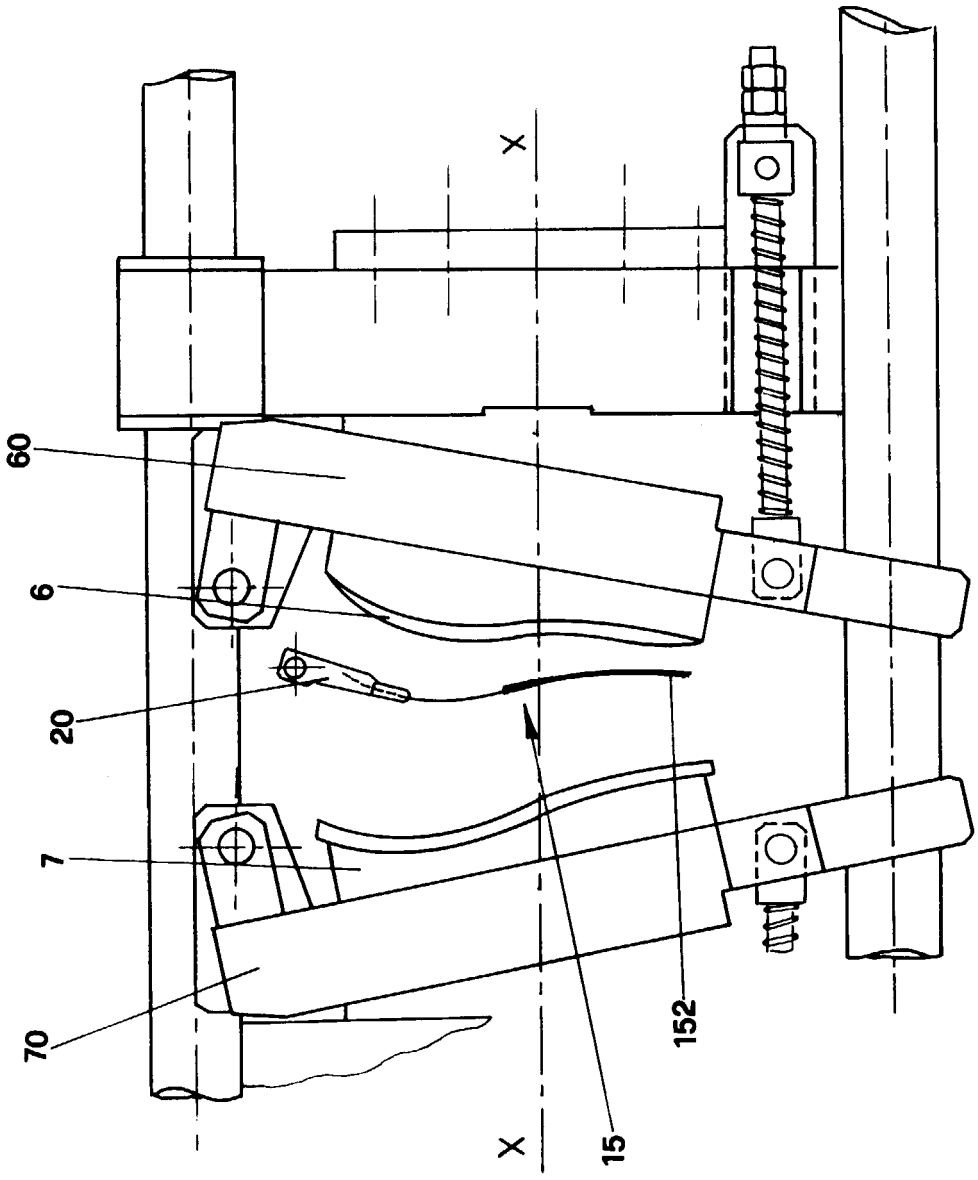

FIG.11

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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 3294

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.7)
A	FR 2 364 003 A (MOHRBACH E KG) 7 April 1978 (1978-04-07) * page 2, line 13 *	1,7-9	A43D35/00
A	US 1 655 126 A (LEWIS J BAZZONI) 3 January 1928 (1928-01-03) * claims; figures *	1	
A	GB 1 020 634 A (BRITISH UNITED SHOE MACHINERY COMPANY LTD) 23 February 1966 (1966-02-23) * claims; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) 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 March 2000	Claudel, B

CATEGORY OF CITED DOCUMENTS

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10-03-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2364003 A	07-04-1978	DE 2641240 A	16-03-1978
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82