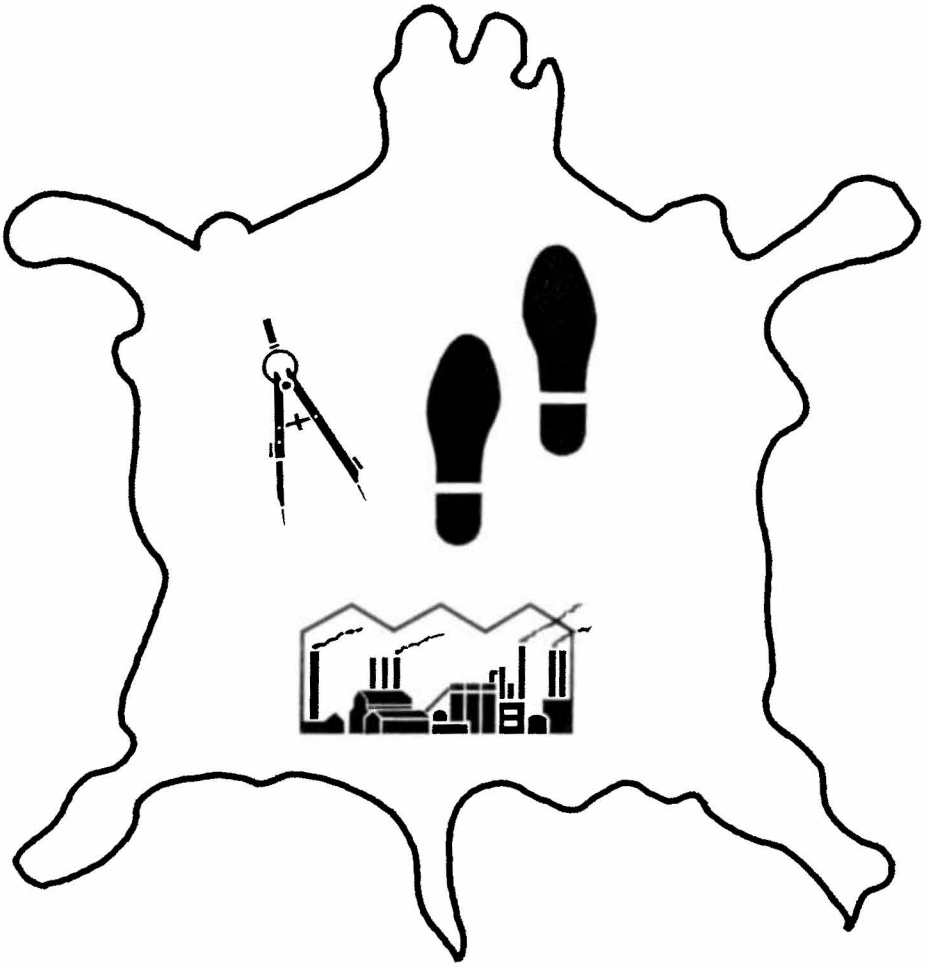
SHOE INDUSTRY

DIPLOMA COURSE

PATTERN MAKING & ENGINEERING*



*This document has been produced without formal editing

This learning element was developed by the UNIDO Leather Unit's staff, its experts and the consultants of the Clothing and Footwear Institute (UK) for the project US/PHI/85/109 and is a part of a complete Footwear Industry Certificate/Diploma Course. The material is made available to other UNIDO projects and may be used by UNIDO experts as training aid and given, fully or partly, as hand-out for students and trainees.

The complete Certificate/Diploma Course includes the following learning elements:

Certificate course

-Feet and last
-Basic design
-Pattern cutting
-Upper clicking
-Closing
-Making
-Textiles and synthetic materials
-Elastomers and plastomers
-Purchasing and storing
-Quality determination and control
-Elements of physics
-General management
-Production management
-Industrial Law
-Industrial accountancy
-Electricity and applied mechanics
-Economics
-SI metric system of measurement
-Marketing
-Mathematics
-Elements of chemistry

Certificate/Diploma course

-Closing
-Collection building
-Advanced technology
-Work study
-The role of the production manager
-Production planning
-Material purchasing & control
-Quality control
-Material and related science
-Adhesives
-Pattern making and engineering
-Shoe costing
-Grading

PATTERN MAKING

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I. PATTERNS MAKING PRINCIPLES

1. Patterns making process starts after the product idea has been selected and the product conception developed (last, materials, manufacturing process, etc.)
2. Pattern making does not include ideas research or creation. The pattern maker shall respect the product idea/style as it has been produced by the designer.
3. The pattern maker shall give consideration to the following aspects:
   - 3.1 respect of the product idea even if the idea does not correspond to the pattern maker's personal taste.
   - 3.2 aesthetics
   - 3.3 foot comfort
     not to hurt and not to compress the foot still having the shoe well holding on the foot
   - 3.4 accuracy
   - 3.5 facilitating the manufacturing process
   - 3.6 providing clear and complete specifications
   - 3.7 material economy
   - 3.8 cleanliness, neatness
4. The pattern maker shall have:
   - 4.1 a methodic mind
   - 4.2 an inventive mind, not to produce model ideas but, to be able to find rational solutions to all technical problems encountered
   - 4.3 an open mind to always improve his work/expertise
   - 4.4 well developed drawing and cutting skills
5. The basic steps of patterns making can be resumed as follows:
   - 5.1 producing last copy
   - 5.2 making standard plans
   - 5.3 designing model on last
   - 5.4 producing model plans
   - 5.5 producing patterns for upper, lining, soling, reinforcements, accessories.
   - 5.6 determining technical specifications
   - 5.7 producing pull over/prototypes
     (the making shall be done by qualified workers)

5.8 analysis of pull over/prototypes

5.9 correction of pull over/prototypes

5.10 production of patterns file

II. LAST COPY

(see diagram pp. 26 -36)

1. General

1.1 The last is a tridimensional object used as a mould for shoe manufacturing.

1.2 It has a volume and a shape which can accomodate human foot and its general outline caters for aesthetics and fashion trends.

1.3 Therefore the last is a volume which does not present any regular geometric shape, line or area.

1.4 This volume presents a combination of convex and concave curves more or less pronounced and as such the last surface can not be flattened without alterations.

1.5 As a result it is not possible to obtain an absolutely accurate copy of the last surface.
Any last copy, even if done with the greatest care, will show discrepancies for what concerns the dimensions, the shape and the area.

1.6 When producing last copies it is important to do it in such a way that the discrepancies will be as minimal as possible and be of the same nature.

1.7 There are different ways of producing last copies (we shall use the last taping method).

2. Last Copy Production

2.1 The tape

The tape used should preferably be a good quality masking tape which presents the advantage of being easy to apply even on sharp curves, easy to remove, easy to design on it and easy to flatten, producing a clean work without soiling the lasts. the ideal width is 3/4" or 19 mm.

2.2 The taping method

The taping should be done from toe to backpart and each tape strip should overlap the preceeding one by about half the tape width.

3. Last Bottom Copy

3.1 Taping the last bottom

3.2 Marking the last feather edge line.

3.3 Removing the last bottom copy from toe toward backpart.

3.4 Applying and flattening the last bottom copy on cartolina, making cuts with scissors when necessary
Note: The length of the cuts is automatically given by the last copy unflattened area. The orientation of the cuts shall coincide to the curves radius. The distance between cuts should be around 8 - 10 mm.

3.5 Cutting out last bottom copy

3.6 Determining and tracing the last insole copy axis using, when feasible, tracing paper

3.7 Referencing the last bottom copy
last reference, size, fitting, side, date, code number

4. Last Sides Copy

4.1 Taping the last top

4.2 Marking the back and front axis points.

4.3 Tracing the back line using a square or flexible ruler.

4.4 Tracing the front line using a flexible ruler.

4.5 Marking the last feather edge line

4.6 Marking matching points (if needed)

4.7 Marking former points (for grading purpose)

4.8 Cutting the last copy front and back lines

4.9 Cutting the last feather edge line. If preferred with a 4 - 5 mm marging

4.10 Removing the last copy (both sides) from toe towards backpart

4.11 Applying and flattening the last copy (one side after the other)
Note: The length of the cuts is automatically given by

the last copy unflattened area. The orientation of the cuts shall coincide to the curves radius. The distance between cuts should be around 8 - 10 mm.

4.12 Cutting out the last copy (one side after the other).

4.13 Referencing the last copies
last reference, size, fitting, side, date, code number

5. Last Sides Copy Control

5.1 If found necessary the last copies accuracy can be verified thru the production of a pull over.

5.2 Each side is cut in a man made material not presenting too much stretch and the front and back lines are assembled with zig zag sewing machine.

5.3 The pull over is then put on the last.

III. MEAN FORM

(see diagram pp. 37 - 49)

1. General

1.1 The shoe last inside side is different from the outside and as a result the corresponding last copies are also different. Very often the outside length will be shorter than the inside, the forepart width will be greater on the outside than on the inside and the top and bottom lines will show different curves.

1.2 Therefore the ideal would be to have patterns made from each inside and outside copies separately. However because of some technical contingencies such as the need to have a common line on the front part it is usual to produce what is called a mean form.

1.3 This is obtained thru the modification of both sides last copies so that certain lines would become similar or common while some other would remain unchanged.

1.4 As a result the mean form will be similar to one side last copy. However it will present lines and areas proper to each of the two sides of the last and will be used to design patterns matching each of the said sides.

2. The Front Mean Line

2.1 Depending on how the front mean line is determined there might be unwanted alterations occuring with respect to the width of the outside and inside copies.

2.2 To prevent this it is advisable to proceed as follows:

2.2.1 determining the front mean line which is obtained by superposing the inside and outside front lines and tracing the average line.

2.2.2 making of the corresponding template

3. The Back Mean Line

3.1 What applies for the front mean line is also valid to a certain extent for the back line therefore it can be

advisable to determine the back mean line and make the corresponding template in the same manner as for the front line.

4. The Mean Form Preparation

4.1 Tracing the front mean line on a piece of cartoline with the help of the template.

4.2 Utilizing the mean line as new front line the inside last copy outline is traced while pivoted on the mean line to keep the same width.

4.3 Tracing the outside last copy outline is performed in the same manner as above.

4.4 All inside and outside outlines including the back line are then smoothed to eliminate irregularities.

5. Mean Form Control

5.1 If found necessary the mean form accuracy can be verified thru the production of a pull over.

5.2 Each side is cut in a man made material not presenting too much stretch and the front and back lines are assembled with zig zag sewing machine.

5.3 The pull over is then put on the last.

Note: One has to realize that when a mean line is used it is detrimental to the accuracy, therefore the decision as to where and when utilizing the mean line system is advisable depends on the degree of accuracy needed and on the technical contingencies that may arise.

IV. STANDARD PLANS
(see diagrams pp. 50-68)

1. Definition General

1.1 A standard plan is a plan which is established for a given last and a determined shoe manufacturing process.

1.2 A standard plan shall serve for all models which can be accommodated with the said plan.

1.3 The advantage of standard plans are:

1.3.1 increased accuracy of the patterns which as a result will improve the quality of the product and lower the manufacturing cost because of easiest and fastest operations.

1.3.2 higher efficiency of the pattern making unit

1.3.3 application and development of standardization

2. Construction of a Standard Plan

2.1 Tracing of the mean form outlines

2.2 Design of the back line to provide for satisfactory upper top line tension, correct curve of the back part and minimal material excess in the lasting marging

2.3 Determination and tracing of front straight lines

2.4 Determination and tracing of the lasting allowance.

3. Standard Plan Control

3.1 As a standard plan is supposed to be used for as many models as it can accommodate it is of utmost importance to check it.

3.2 To check a standard plan the best is to use it to develop a model plan from which a pull over or prototype can be produced.

3.3 The choice of the model to test the standard plan is very important. It should be related to the kind of shoe the last has been designed for, for example:

i) lady court shoe for a high heel lady shoe last
ii) mocassin for mocassin last
iii) casual shoe on casual shoe last
iv) sandal if the last is specially designed for the purpose
v) derby if the last is suitable for this type of shoe

4. Different Standard Plan

4.1 Different standard plans might be needed for the same last if specific models are produced or if specific materials are used or if the manufacturing process changes, examples:

i) standard plan suitable for plain vamp models might not fit models with apron and mudguard

ii) a standard plan might be suitable for cow hide leather and be not acceptable for suede leather which is a stretchy material

iii) lasting by hand or lasting by machine would most likely require two different standard plans

4.2 As a result it might be necessary to have specific standard plans for: veldtschoen - slip lasting - mocassin - boots - etc.

4.3 Very often the standard plans for ladies shoes are double, which means that they show both inside and outside sides. This is preferable because ladies shoes models frequently show inside lines different from outside and therefore it is easier to design the model lines on a double plan. Also this is possible because many ladies shoes are low on the instep.

4.4 Standard plans for low shoe upper generally require little geometrical construction because the last copy is used as the base for plan construction. However for high upper shoes up to the ankle level and higher there is need for a geometrical construction to build/design the top part of the upper.

V. MODEL DESIGN ON THE LAST
(see diagram p. 69)

1. Because the last is a tridimensional object presenting no regular geometrical lines or volume it is not easy to produce a two dimension model/plan which will harmoniously fit the last.

2. Therefore in many cases shoe designers and pattern makers would first design the model on the last to insure that every line and every component will be at the right place, will have the right curve, will meet the aesthetic and comfort requirements.

3. Designing on the last requires some specific skills which can be developed only thru practice.
   The key to design on last is to make sure that one is very much steady during the process, therefore one has to find the right way of grasping the last and of securing a firm but still flexible holding of the pen.

4. Depending on the model and the last it might be necessary to draw the model lines on both sides of the last. In some instances to draw the outline side would suffice.
   Note: when designing new models of which general lines are similar to existing styles the designing on last might not be necessary and one can proceed directly with model plan making based on the existing ones.

VI. MODEL LINES TRANSFER

(see diagram p. 70)

1. After a model has been drawn on the last the problem is to transfer the lines from tridimensional object on to a plan.

2. There are various methods to perform the transfer of the model lines.

   2.1 One can tape the last, draw the model lines on the taped last, remove the shell, apply it on a piece of cartolina and cut each component according to the model lines. The various parts are then used as templates to make the model plan.

   2.2 Another method consist in cutting last copies made of tracing paper. Cuts are then made on the copy so it can be applied on the last without difficulty. The copy is fastened to the last with tacks, the model lines appear thru the transparent paper and can be drawn easily with a pencil. The copy is removed from the last then it is applied on the standard pattern and the lines are transferred simply by rubbing with the finger nail over the lines. As the lines are transferred only by rubbing them on the plan the copy need to be turned over. This is to to be taken into consideration when selecting the foot (right or left) before designing on the last.

VII. MODEL PLAN
(see diagrams pp. 71-125)

1. To make the model plan, the pre established standard plan outline is reproduced on a piece of cartolina as well as any other existing standard lines or points which could be needed. The model lines are then drawn on the plan. This can be done directly or thru the transfer of the model lines already drawn on the last as mentioned earlier.

2. The advantage of designing the model on the last is that the pattern maker can see exactly where every line will be located on the actual shoe, he can assess the balance of each component and judge of the overall aesthetic of the design.

3. When a new model similar to an existing one is being developed it is advisable to use the plan of the existing model and incorporate the necessary modifications. This will save time, provide improved accuracy and facilitate the introduction of standardization.

4. The model lines can be drawn with a pencil or a pen, they can also be cut with a well sharpened knife. Cutting the lines makes the work more accurate and provides an easy way to transfer the model lines in view of producing detail patterns.

5. If the cutting method is used one has to make sure that all curves are cut, that no cut will cross the border of the plan and that reasonable space is kept between cuts to prevent spoiling or weakening the plan.

VIII. DETAIL PATTERNS

(see diagrams pp. 74,76,78,82,83,85,87,90,92,93,95,97,99,101)

1. The model plan will be used to produce detail patterns. These patterns are:
   - net patterns (with no allowance)
   - cutting patterns (with sewing and folding allowance)
   - tracing/working patterns
2. All the model lines will have to be transferred so that detail patterns be made for each component.
3. To transfer the line several methods can be used. Pricking wheel, knife short incisions, knife cuts including cutting the plan into pieces. This latter method is advisable only if the model plan is reconstituted afterwards.
4. When a component outline has been transferred to a piece of cartolina using one of the above mentioned method the outline is completed if necessary and then the pattern is cut out. This is a net pattern.
5. In some instances only a part of the component outline will be transferred from the plan and the detail pattern will be completed separately (example vamp/tongue).
6. To make cutting patterns the necessary manufacturing allowances have to be added and this is done with the help of compasses.
7. To make tracing patterns the necessary incisions have to be made. The incisions has to be as narrow as possible for accuracy. If wider incisions are needed/preferred for easier marking purposes it is advisable to distinguish the good side of the incision so that it can be used as the guide.

IX. LINING CONSTRUCTION

(see diagrams pp. 62-66, 75, 76, 84, 85, & 88)

1. Depending on every specific case lining patterns will be based on:
   1.1 the model lines on the plan
   1.2 the separate upper components patterns
   1.3 standard lining components patterns

2. Lining patterns outlines shall not necessary follow the upper component lines, they have to be conceived in relation with technical requirements such as closing and lasting easy operation, combination of different materials such as leather and fabric, material economy, standardization, foot comfort and shoe interior aspect.

3. It is advisable not to superpose upper components assembling with lining components assembling.

4. Lining being inside the upper shall necessarily be smaller.

5. To facilitate the lasting operation, particularly in the cement lasted process the lining lasting margin shall be reduced further.

6. Standardization shall be applied as much as possible to lining components.

X. PATTERNS MAKING SPECIFIC PROBLEMS
(see diagrams pp. 126-132, 155-163)

1. Pattern making is an activity which always requires the technician's attention and ingenuity in order to solve all problems inherent to footwear manufacturing.

2. Each style, each type of shoe, each technical process, each material or last will bring problems of which solutions, most of the time, cannot be found in a book. Some of these problems are illustrated on the attached drawings, they refer to:

   2.1 Pivoting

   2.1.1 some upper components patterns present curves which for technical reasons need to be straightene particularly those covering both sides of the last such as vamp and apron.

   2.1.2 the pivoting of a pattern will consist in determining one or several pivoting points around which the pattern will rotate.

   2.1.3 each time a pattern is pivoted a certain number of alterations occur which affect the dimensions, the shape and the area of the pivoted pattern. Therefore the choice of the pivoting point (s) is very important.

   2.1.4 for example, if two components are to be assemblec together and one of the patterns has to be pivotec one has to make sure that the line common to both components would have the same length after pivoting.

   2.1.5 sometimes it is difficult to determine the right pivoting points and it might be necessary to proceed through trials.

   2.2 Deadening

   2.2.1 Deadening a pattern consits in modifying it in such a way that the top front line end will be

inclined towards the last bottom. As a result the upper will have the tendency to stand up when applied on the last and the perimeter of the lasting margin will be shorter.

2.3 Springing

2.3.1 This is the opposite of deadening which will result in having the top front line end rising up. The upper will then sit well on the last when applied on it but the lasting margin perimete: will be longer.

2.4 Blocking

2.4.1 Some models having the upper part very high on the instep can not be accommodated with pivoting only. In that case the pattern will be made with partial pivoting or without pivoting at all but the cut upper component will go through the operation of blocking which consist in forming the material by means of pressure and heat so that it will take the required shape.

2.4.2 There might be need for a second pattern to recut the component after blocking.

2.5 Provision for material thickness on the instep

2.5.1 Some models will require that a pattern be increased in order to compensate for material thickness when there is another component underneath [strap of the monks shoe over quarter and tongue, saddle over apron, derby quarter over the tongue].

2.6 Mudguard and Apron

2.6.1 When a vamp is composed of two components, mudguar

and apron, it is always preferable to open the mudguard pattern so that when it is assembled to the apron the upper will be shaped in such a way that the lasting operation will be facilitated due to the removal of material excess. This will also prevent the apron from falling down when subjected to the lasting operation strain.

2.6.2 It is always advisable to reinforce apron material to prevent stretching and deformation during lasting process.

XI. VARIOUS MAKING PATTERNS METHODS IN RELATION TO PARTICULAR TYPES OF SHOES OR MANUFACTURING PROCESSES

1. Apart from specific making patterns problems some particular techniques may have to be considered in relation to various styles of shoes or technical manufacturing processes.

2. Particularly, the standard plans and model plans would have to be specifically designed for different styles such as:

   2.1 oxford [quarter/vamp line] (see pp. 81-85)

   2.2 derby [position of the vamp point](see pp. 73-80)

   2.3 monks shoe [strap over the instep](see pp. 100, 101 & 162

   2.4 apron and mudguard type shoes (see pp. 89, 91 - 93)

   2.5 sandals (see pp. 117 & 118)

   the positioning of the sandal straps is always very difficult if one wants to comply with comfort and aesthetic requirements therefore it is advisable to develop special standard patterns for sandals.

   2.6 boots and other high upper types of shoes (see p. 133)

   these products require the establishment of a geometrical construction in order to build and design the top part of the upper pattern.

3. Different technical processes such as the following would also require specific standard plans:

   3.1 veltschoen - of which lasting margin is to be determined in a different manner (see p. 141)

   3.2 slip lasting [California] of which patterns have to be very much accurate due to the fact that there is no lasting operation as such because the last is to be inserted in a bag-like upper. Therefore there is no recourse in case the upper would not match exactly the last. (see pp. 142 & 143)

   3.3 mocassin tubular (see PP. 144 - 147)

XII. BOTTOM COMPONENTS PATTERNS MAKING
(see diagrams pp. 148 - 154)

1. Pattern making does not concern only the upper but also the bottom or soling components. Those components are insole, insole reinforcement, outsole, heel, heel cover and sock.

2. Like for the upper the production of bottom components patterns start from the last and particularly the last bottom copy.

3. The last bottom copy which is obtained through the taping system has to be checked to insure that it is as accurate as possible. If necessary corrections have to be made to insure maximum accuracy.

   3.1 Insole: the insole pattern is easily obtained by the simple reproduction of the last copy. In special cases it might be necessary to introduce modifications to reduc or increase the original pattern for technical reasons [open toe shoes, veltschoen process]

   3.2 Outsole: the outsole is obtained from the insole pattern to which an allowance is added. This allowance is based on the upper components such as lining, upper, reinforcement, etc. which are considered and the thickness of the materials which they are made of.
   Besides there will be need for an additional allowance which will depend on the technical processes to be used and on the final aspect of the shoe which might present a very narrow or to the contrary a very wide sole edge depending on the type of the shoe and the fashion of the day.

   3.3 For high heel ladies shoes the design of the sole pattern requires the use of the heel and great care has to be taken in order to insure the correct alignment of both the sole and the heel.

3.4 Heel:

3.4.1 pattern for men's shoe heel are easy to make after the sole pattern has been established

3.4.2 pattern for high heel ladies shoes are rather difficult to establish and would require the design of the last bottom profile. Four views/ patterns will be necessary, the heel profile, the side view, the top and bottom views.

3.5 Heel cover : heel cover for ladies shoe can be made relatively easily using the taping method. However, it is necessary after the original pattern has been established to check it and bring the necessary modifications.

3.6 sock : socks can be of three kinds:

3.6.1 covering only the back part of the insole

3.6.2 covering the back part and the waist part of the insole

3.6.3 covering the whole insole

3.7 To prepare the sock patterns we utilize the insole patterns and make some modifications in order to:

3.7.1 reduce the lenght of the whole sock to facilitate the insertion and prevent wrinkles formation

3.7.2 increase the width of the sock to be sure to cover the whole insole and to have a good linkage between the upper lining material and the sock material.

XIII. PATTERN MAKING & MATERIAL ECONOMY

1. In the shoe industry the cost of materials represent a very high percentage of the total cost of the product therefore material economy should be given great attention.

2. The material economy is not only achieved during material exploitation, in fact it starts at the production development stage and particularly during the development of the cutting patterns. For example, a model of which pattern area is 2 sq. ft. might require 3 sq. ft. of material while another model with the same pattern area would require only 2.5 sq. ft. of material. The difference may come from the shape of the patterns.

3. Therefore it is necessary to produce cutting patterns which should be as economical as possible but this shall never be detrimental to the product aesthetic and quality.

XIV. STANDARDIZATION IN PATTERN MAKING

1. Standardization in pattern making is a necessity for industrialization. The first standardization step has to be applied on the back part of the last itself during the last development stage. The Product Research and Development unit of the firm shall then develop a certain number of standardized components, as for example:

   1.1 some upper components [such as saddle-back part, etc.]

   1.2 lining components [back part lining - socks, etc.]

   1.3 reinforcement component [toe puff - counter]

   1.4 soling component [insole reinforcement, heels, etc.]

2. The Product Research and Development technicians should develop as many standard components as possible but they should also introduce standardization in the pattern making process for accuracy and efficiency sake.

3. The standardization of the last back part, of the pattern making methods and of the shoe components is a necessity for the shoe manufacturing industrialization and development.

XV. PATTERNS IDENTIFICATION AND REFERENCING

1. Every pattern, such as last copy, mean forme, standard plan, model plan and components cutting patterns should be adequately identified and referenced.

1.1 Identification

1.1.1 every pattern needs to be clearly identified by its name with the indication of the last side when necessary [inside/outside last copies for example]

1.1.2 the last's reference and/or name should be indicated as well as the size and the fitting if applicable.

1.1.3 the lettering should preferably be of capital type to insure an easy reading and provide for a better presentation.

1.1.4 the identification should always be placed at the same location on similar patterns.

1.1.5 it might also be advisable to indicate the date the patterns are produced.

1.2 Referencing

1.2.1 Apart from the identification it is advisable to introduce a system of reference or code which will enable an easy storage and retrieval of the different patterns.

1.2.2 This reference can be materialized with letters and/or figures which would refer to a specific code. For example:

- the first letter/figure will indicate the category of shoes [mens/ladies/children]
- the second letter/figure can indicate the collection year
- the next can identify the serial number of the model within that collection and so on and so forth.

XVI. MANUFACTURING SPECIFICATIONS/INSTRUCTIONS

1. In order to have the prototype/sample correctly made it is necessary to provide the prototype/sample makers with the related manufacturing specifications.

   1.1 These specifications will provide cutting, splitting and skiving instructions, will indicate folding width, stitches length, distance between upper edge and seam, perforating die diameter, etc.

   1.2 Manufacturing specifications can be in the form of drawings, text or a combination of both. Illustrated specifications are always easier to understand.

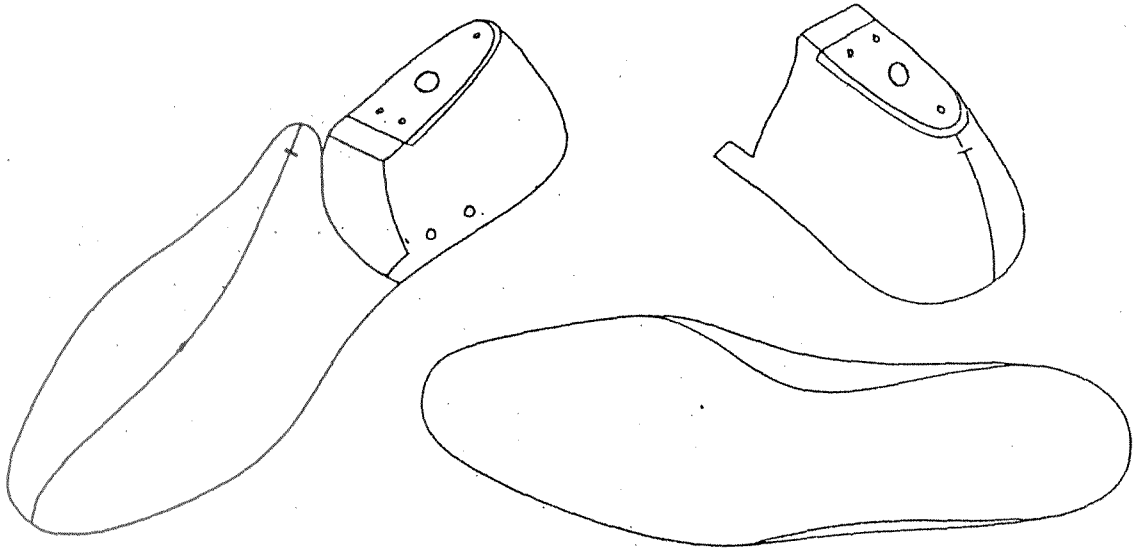
XVII. PATTERNS FILING

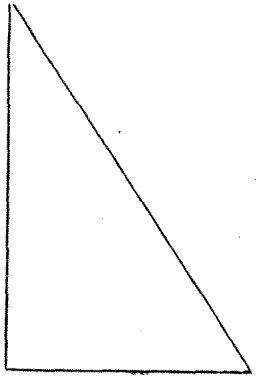
1. Patterns are part of a product file. They need to be kept in a safe place together with other product related documents such as, product specifications, manufacturing instructions, grading instructions, materials requirements, material costing sheet, etc.

2. The easiest way is to have all these documents including the patterns put in a brown envelope big enough to accommodate the patterns and strong enough to hold the content.

3. A drawing of the product should be pasted on the envelope for easy identification and color code can also be used by sticking colored labels. Every envelope has to bear the identification and reference data and should also be registered in a record book.

TRACING LAST INSOLE AND MIDDLE LINES





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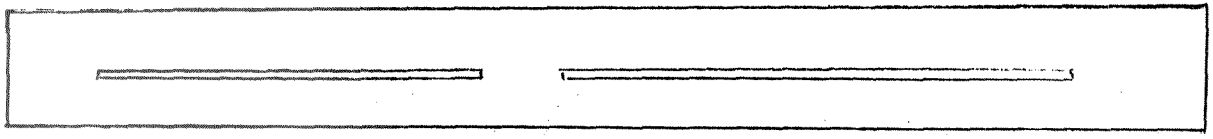


A

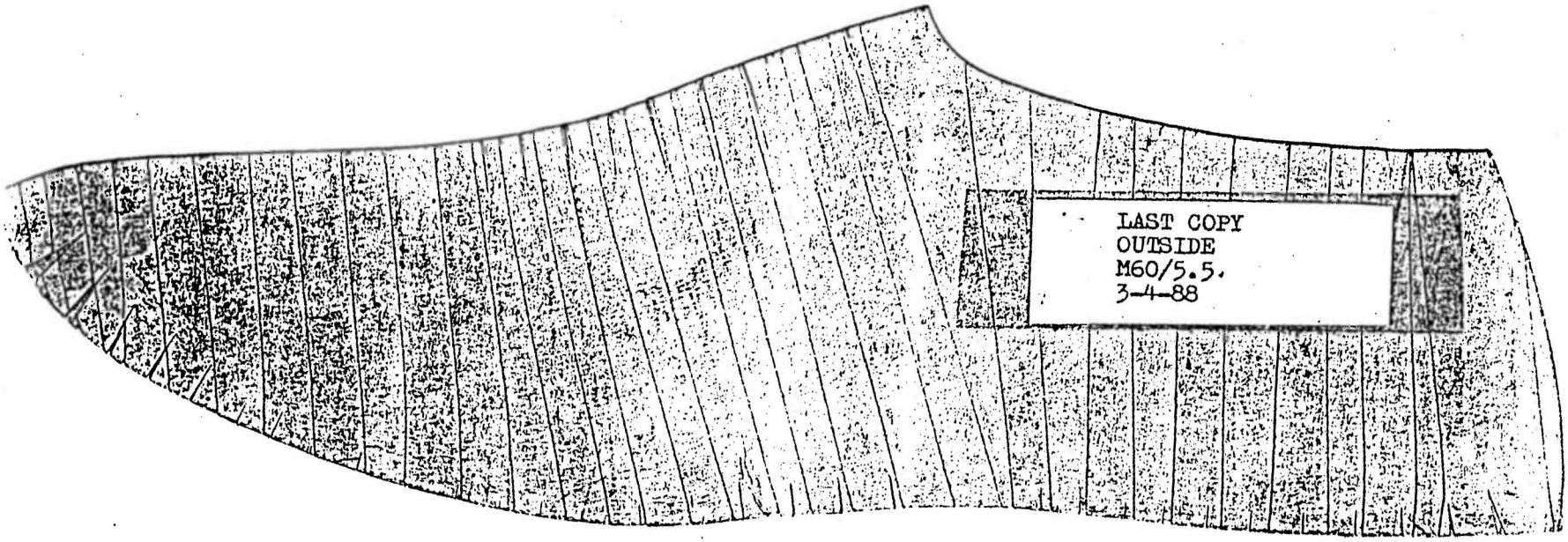
The easiest and most accurate way to mark the lines is:

i) for the front line - use a flexible ruller (A) as shown above, made of cartoline or flexible plastic material

ii) for the back line - use a triangle (B)

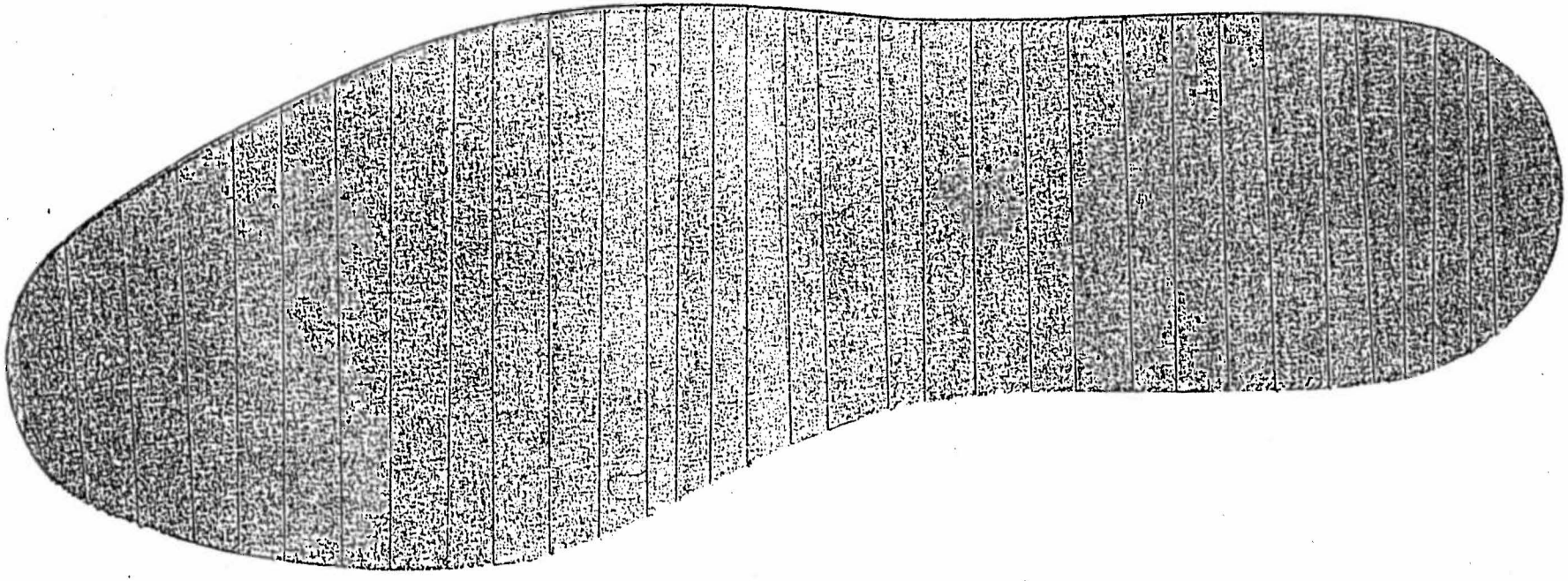
LAST COPY - LAST SIDE

tapping method



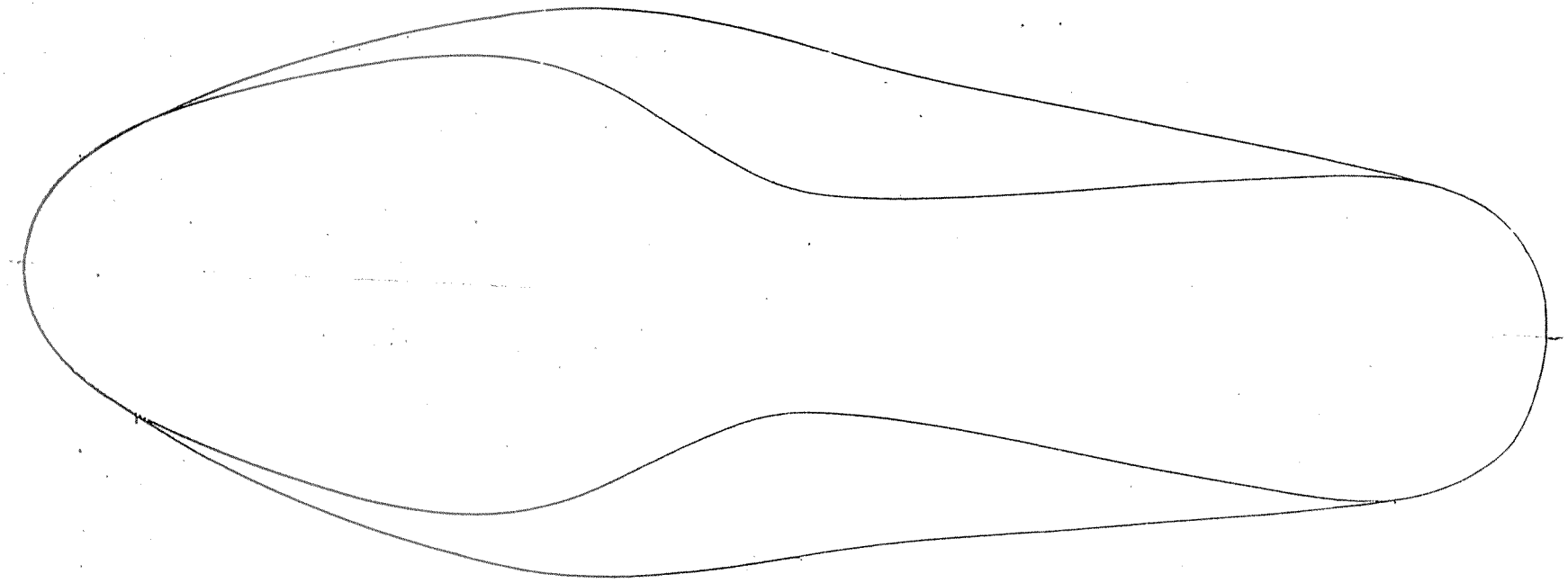
LAST COPY - INSOLE

tapping method



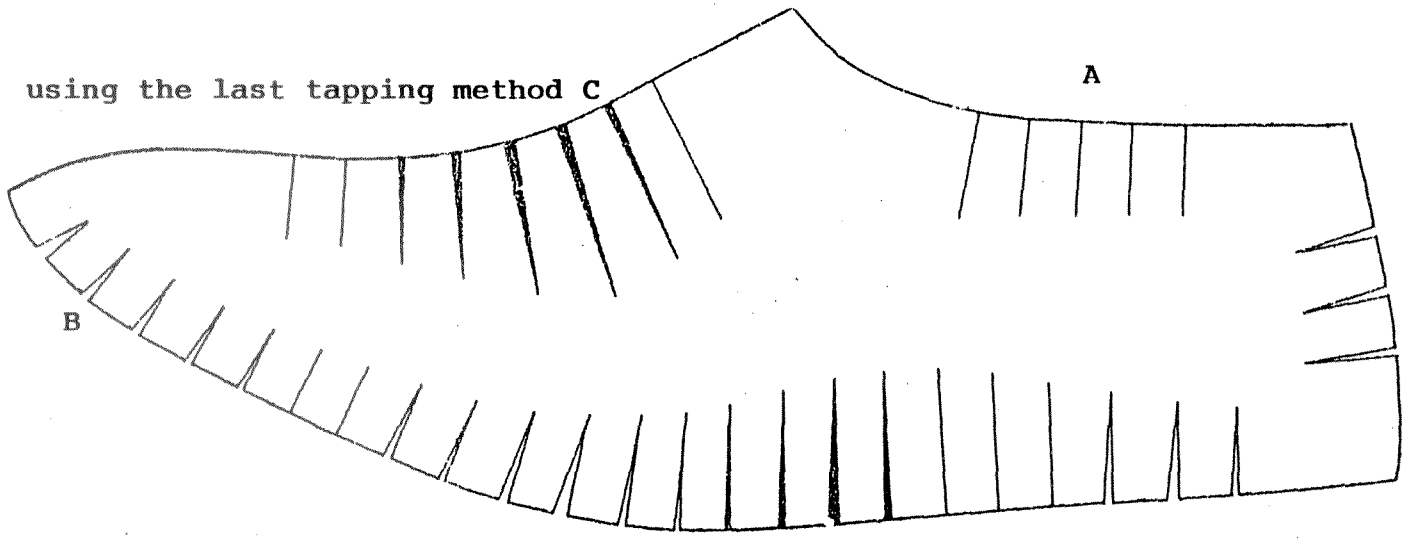
LAST COPY - INSOLE

insole axis determination using symmetry axis



LAST COPY - METHOD OF FLATTENING THE COPY

using the last tapping method C



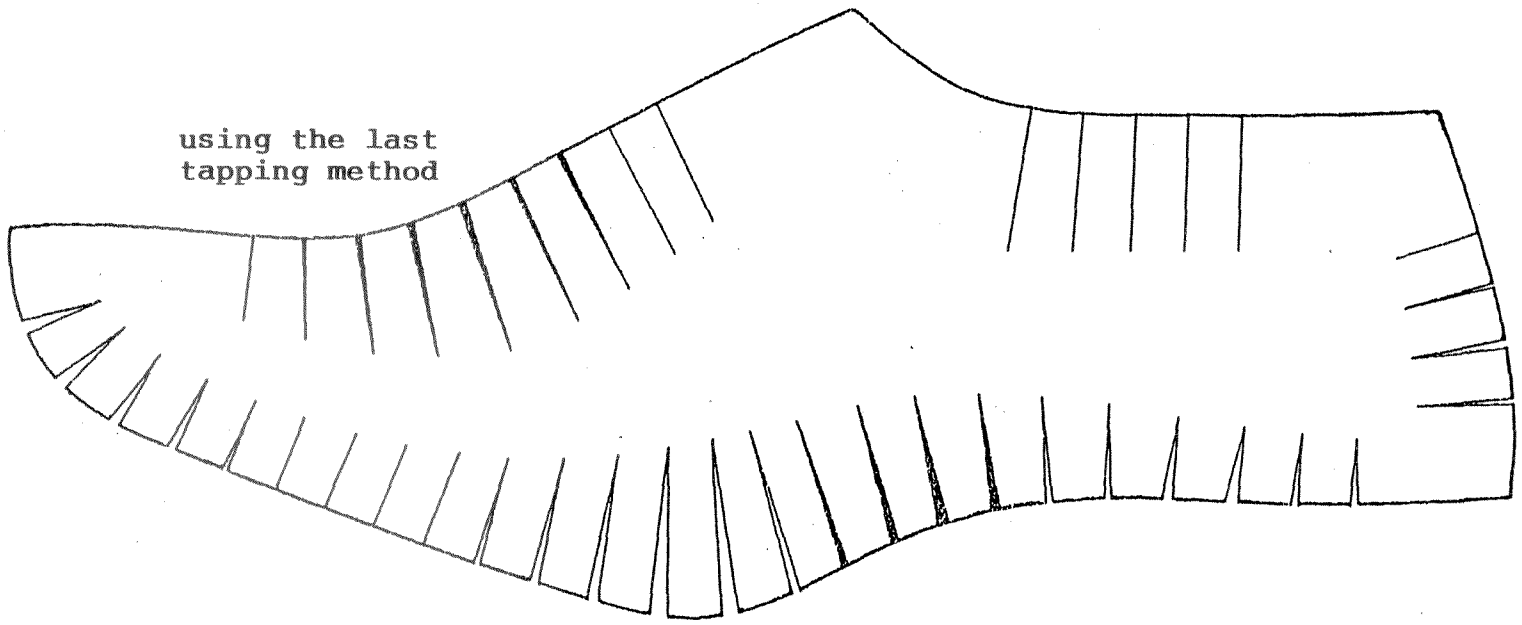
How to make cuts:

where: convex and concave areas (avoid cutting top line at the toe & at the back seat line)
distance between cuts: 10 mm
cuts orientation : perpendicular to the outline
cuts length: depends on the concavity and the convexity

Note: When flattening the last copy the strips will:

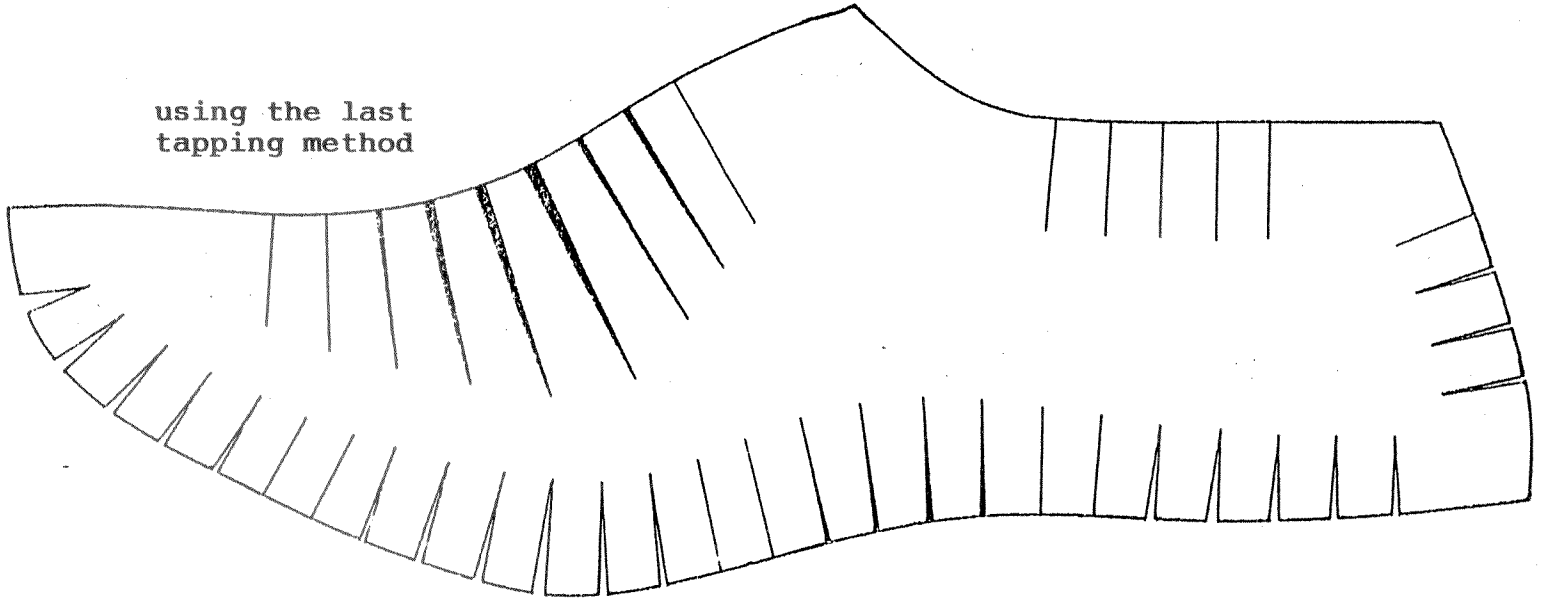
- stand side by side in the flat areas A
- separate one from each other in convex areas B
- overlap one each other in concave areas C

LAST COPY - INSIDE SIDE



While comparing this inside copy with the outside one (Diagram p.32) observe the variations in the length of the cuts as well as in the opening and overlapping of the strips.

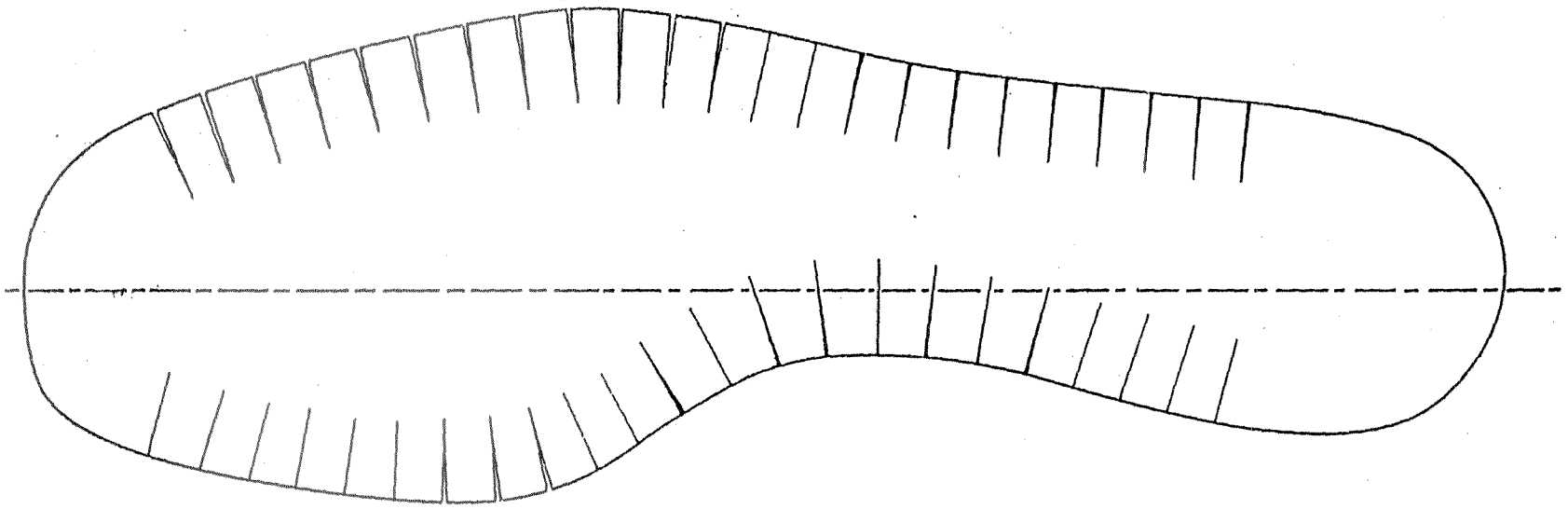
LAST COPY - OUTSIDE SIDE



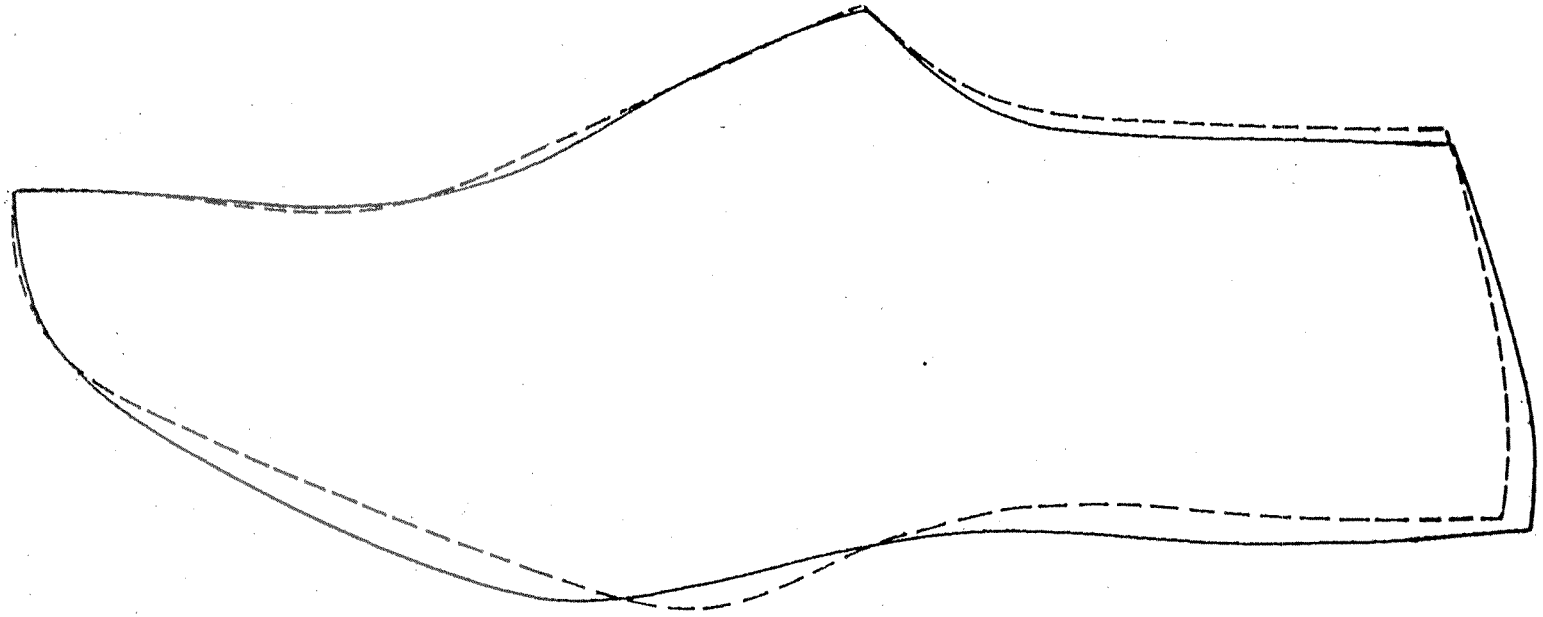
While comparing this outside copy with the inside one (Diagram p. 31) observe the variations in the length of the cuts as well as in the opening and overlapping of the strips.

LAST COPY - BOTTOM

using the last tapping method

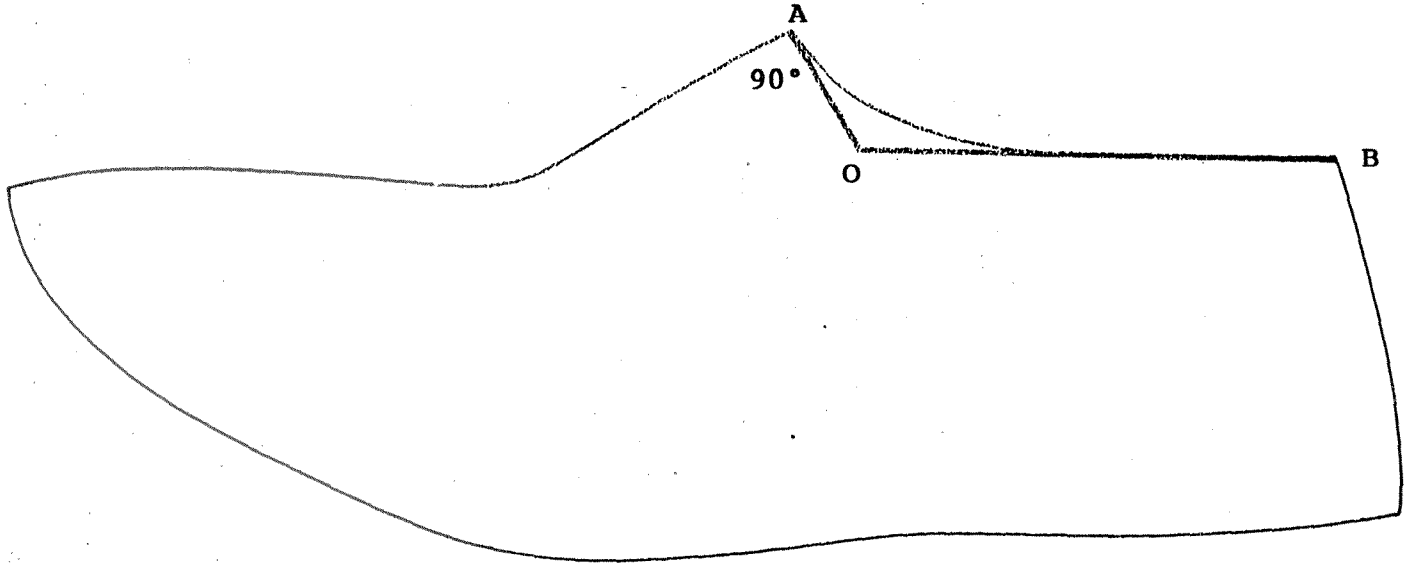


LAST COPY - SUPERPOSITION OF INSIDE AND OUTSIDE COPIES



- Observe the differences in:
  - lines/curves
  - direction
  - length
  - area
- Inside - - - -
- Outside ———

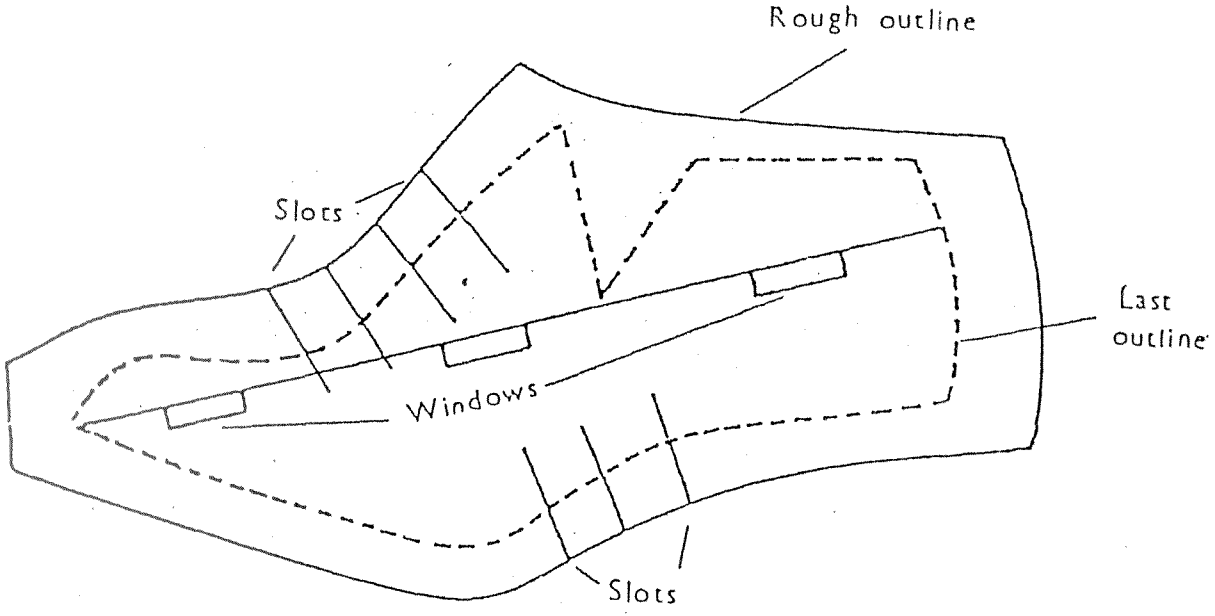
LAST COPY - STRAIGHTENING THE TOP LINE



- From A draw a line perpendicular to the instep line. A O = 30mm
- From O draw a line to B

LAST COPY

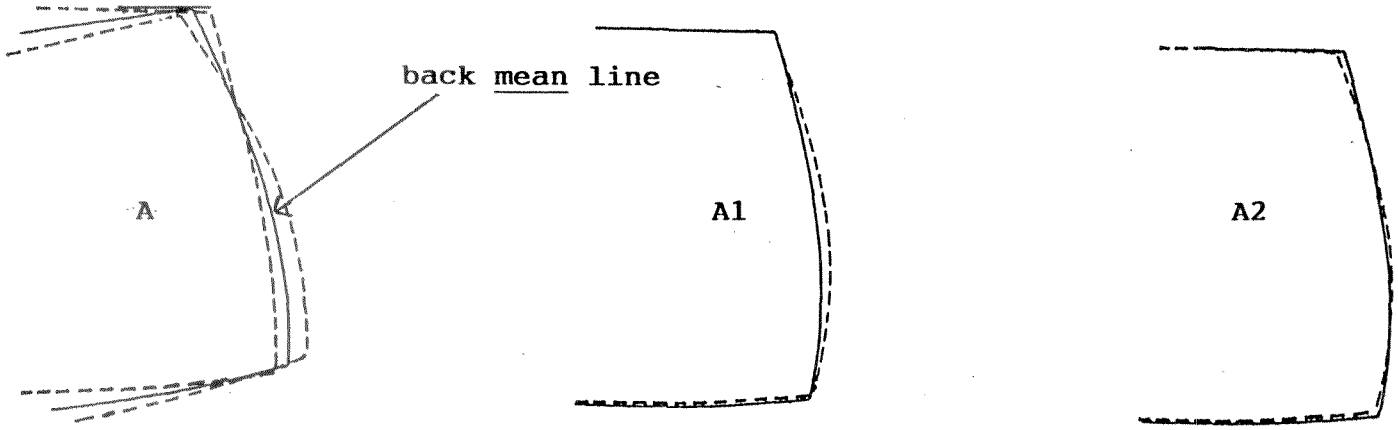
slotted form method



Windows are covered with adhesive tape so that the forme can hold easily on the last.

MEAN FORM ESTABLISHMENT

LAST COPY - BACKLINE MODIFICATION

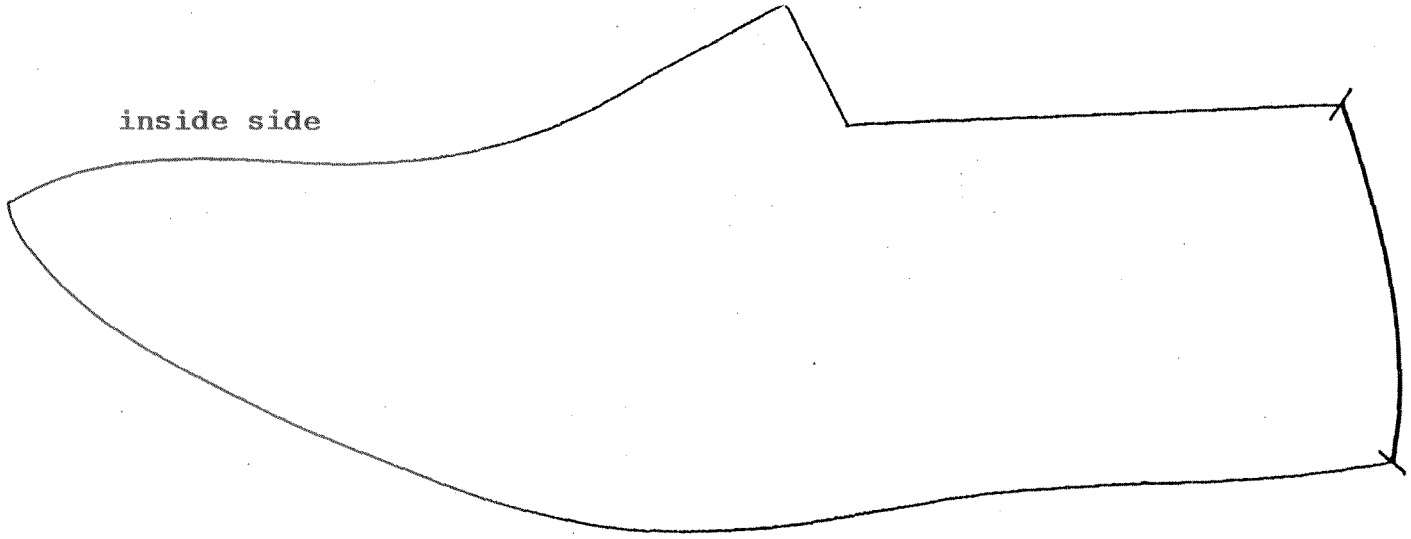


- Whatever might be the position of the last copies (A or A1) the mean line shall always be the same. However to keep the alterations of the original last copies to the minimum it is advisable to position the two copies as shown on A2.

  last copies - - - - -
  mean line ————————

MEAN FORM ESTABLISHMENT

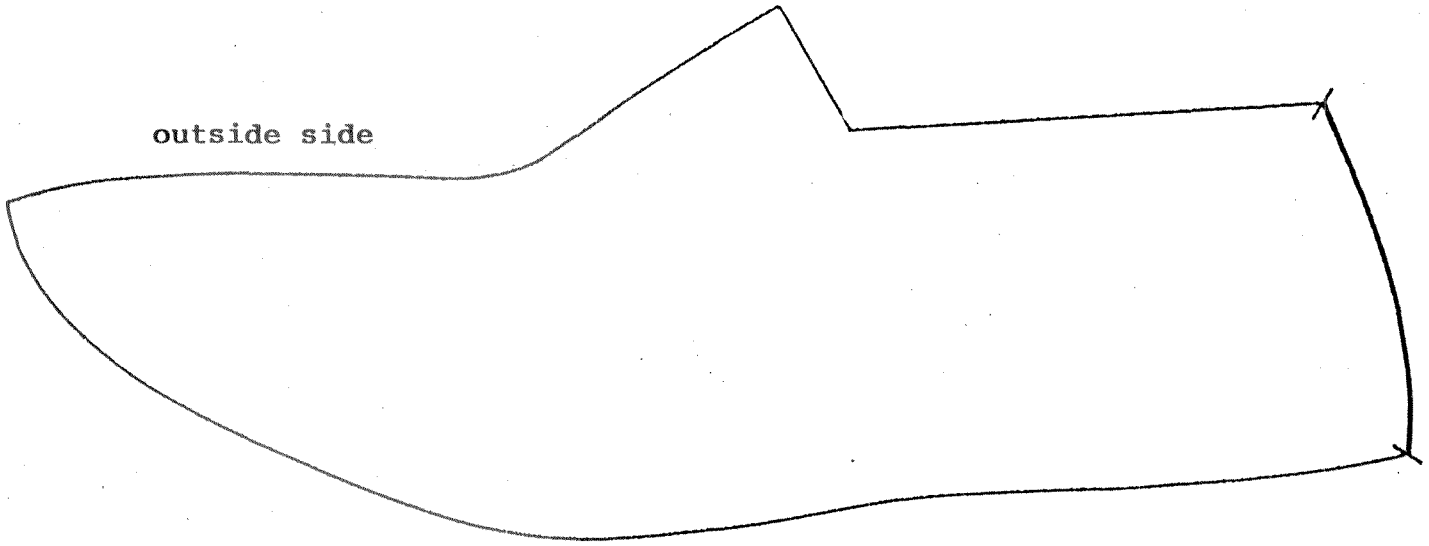
LAST COPY - BACKLINE MODIFICATION (MEAN)



In this case the backline is similar (mean) to that of the outside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

LAST COPY - **BACKLINE MODIFICATION (MEAN)**



In this case the backline is similar (mean) to that of the inside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

LAST COPY - FRONT LINE MODIFICATION

- Whatever might be the position of the last copies the mean line shall always be the same A.
- When tracing the front bottom line the last copy shall be positioned on the front mean line while pivoting in order to keep the same last copy width B.

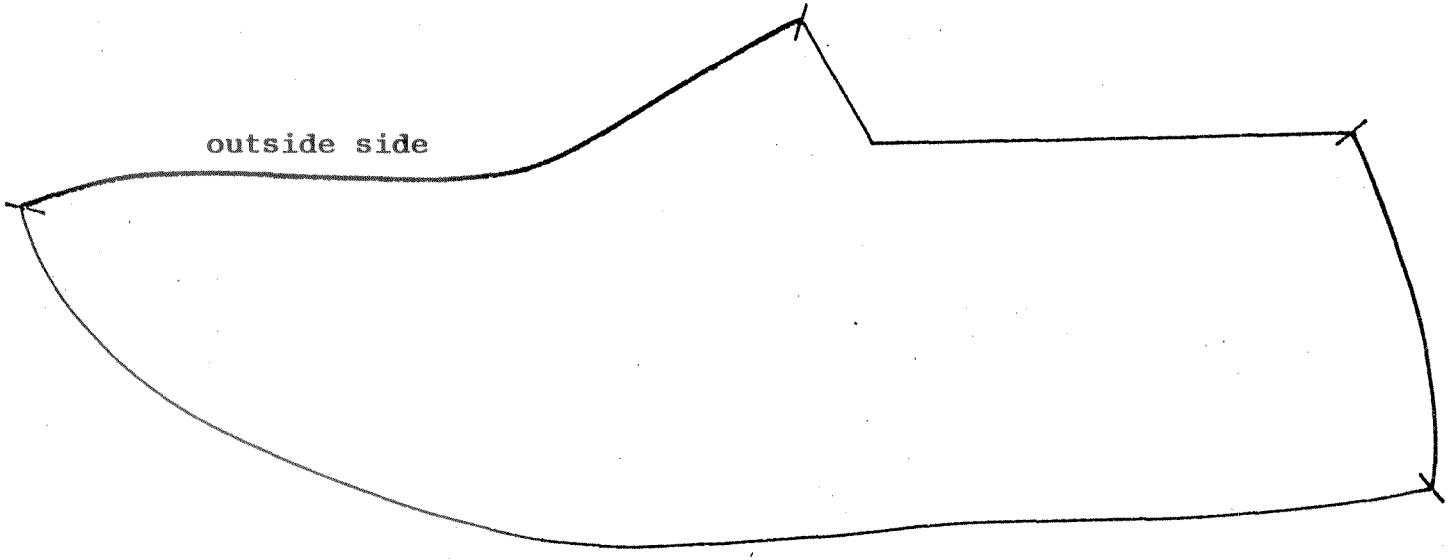
- - - - last copies

——— front mean line

——— front bottom line

MEAN FORM ESTABLISHMENT

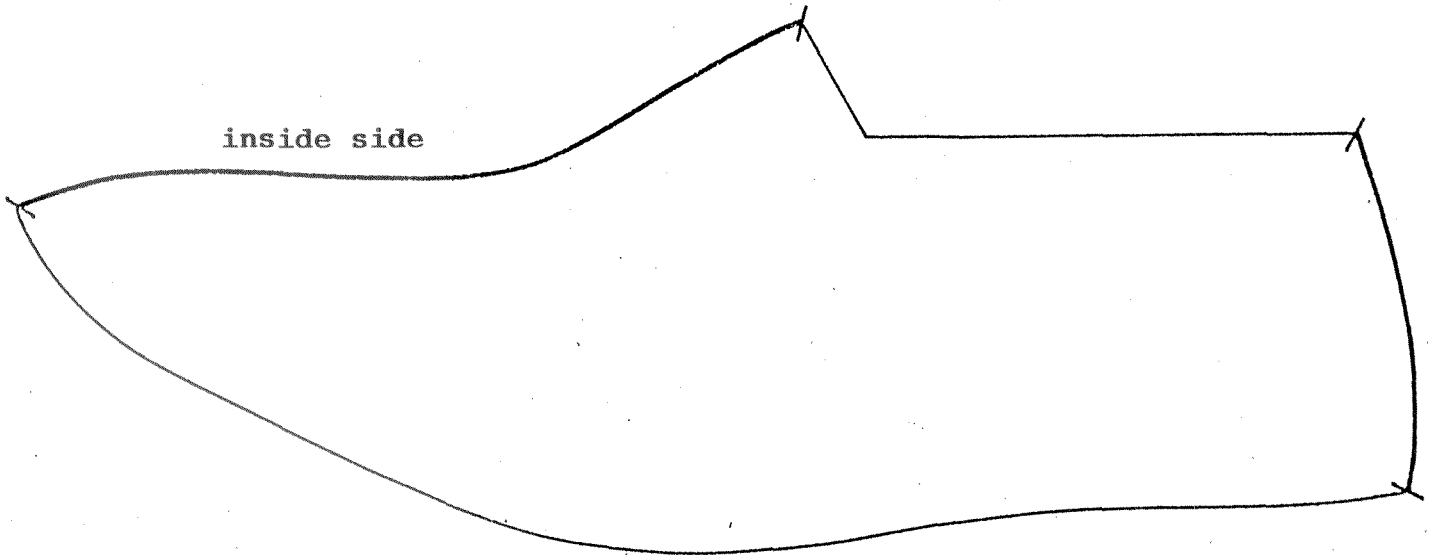
LAST COPY - BACK AND FRONT LINES MODIFICATION (MEAN)



In this case both the back and the front lines are similar (mean) to that of the inside side. The rest is not altered.

MEAN FORM ESTABLISHMENT

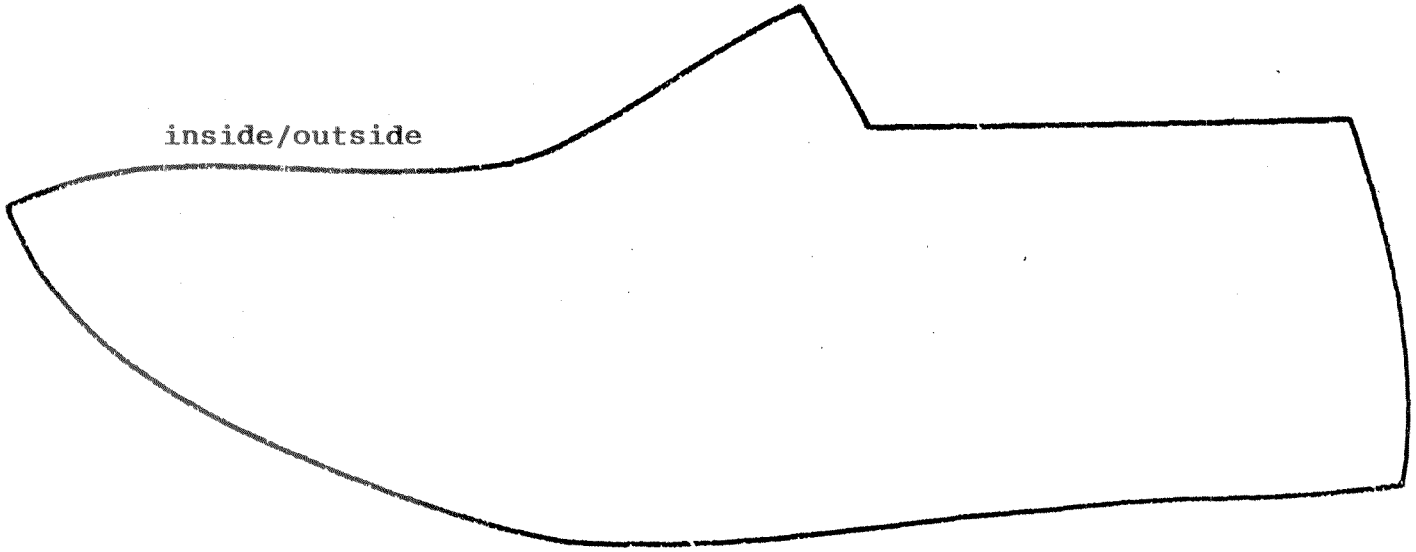
LAST COPY - BACK AND FRONT LINES MODIFICATION (MEAN)



In this case both the back and the front lines are similar (mean) to that of the outside side. The rest is not altered.

MEAN FORM ESTABLISHMENT

MEAN FORM - ALL AROUND

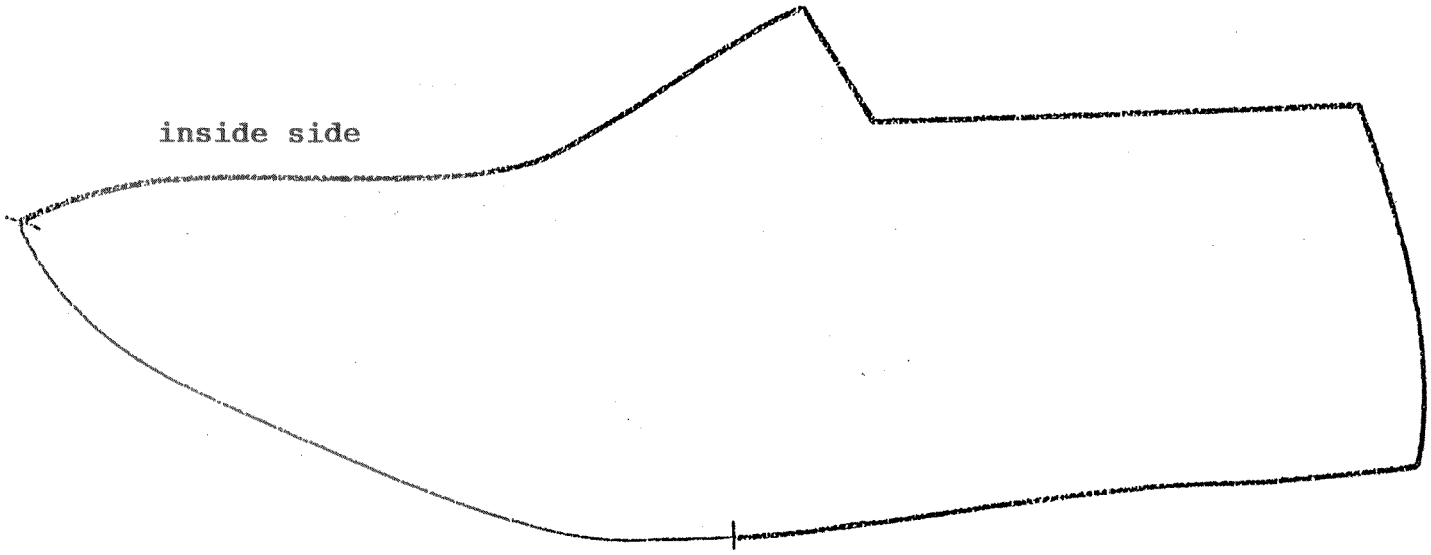


In this case all lines have been modified and are similar (mean) for both inside and outside sides.

This is acceptable only if the difference between the original last copies is very small.

MEAN FORM ESTABLISHMENT

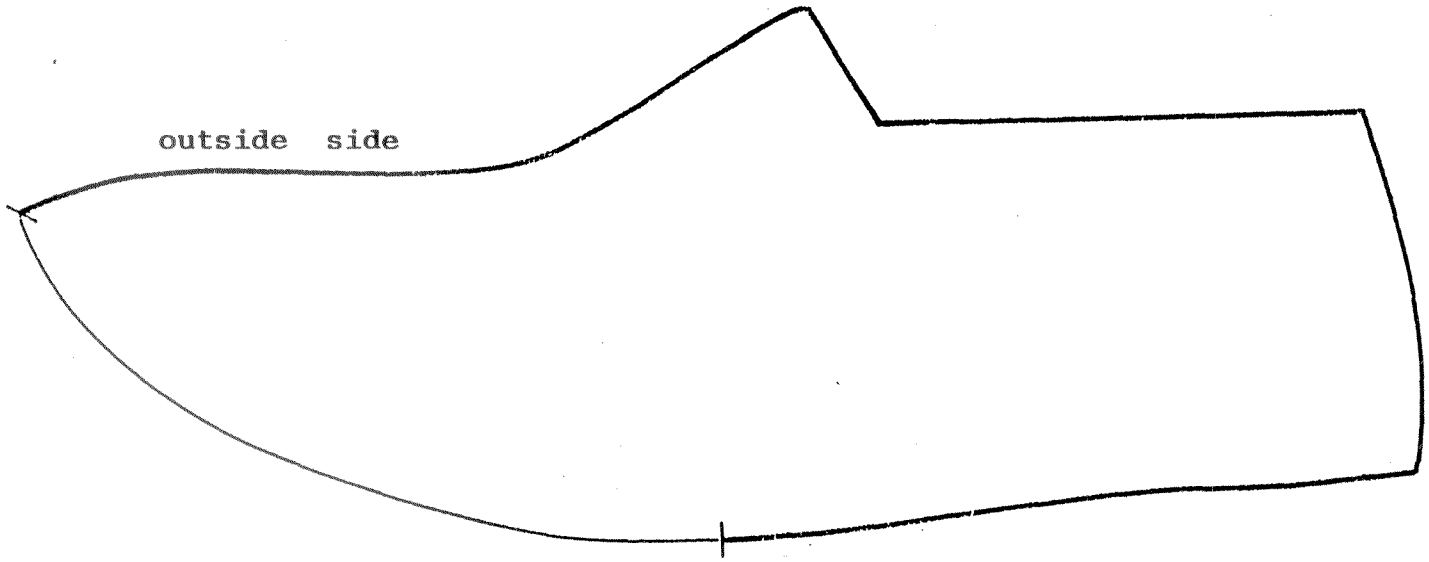
LAST COPY - LINES MODIFICATION (MEAN)



In this case the bold line is similar (mean) to that of the outside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

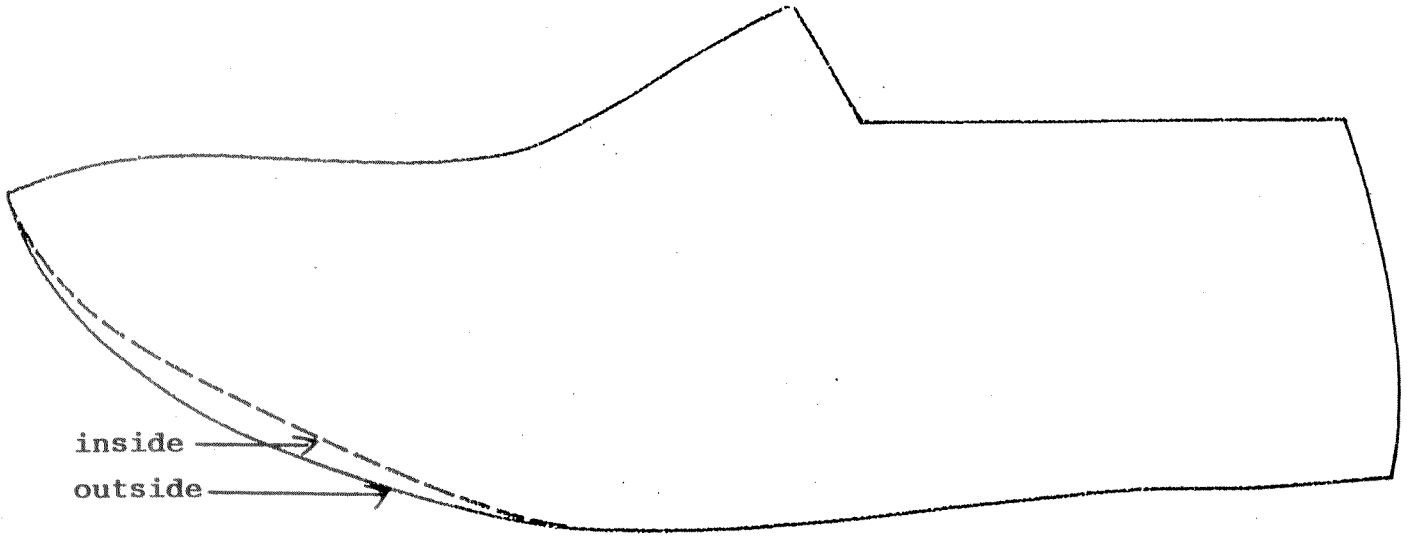
LAST COPY - LINES MODIFICATION (MEAN)



In this case the bold line is similar (mean) to that of the inside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

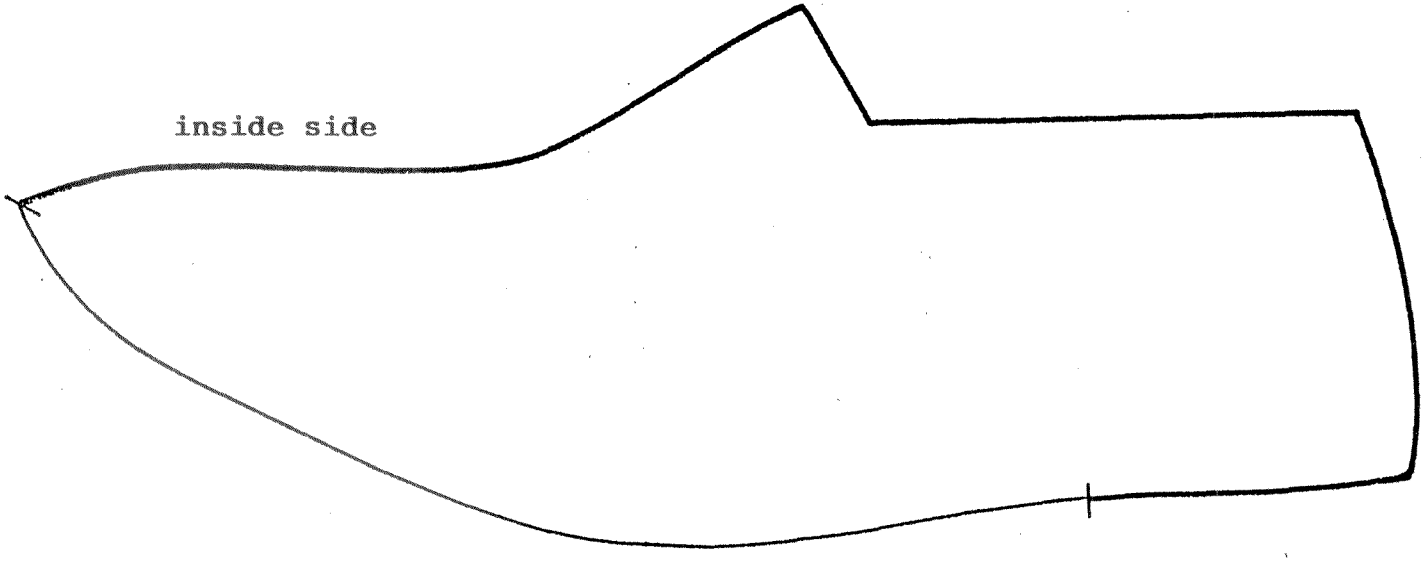
MEAN FORM - BOTH SIDES



Superposed inside and outside copies modified as on Diagram pp. 44 & 45 and
The difference has been maintained in the forepart. This would apply for most lasts.

MEAN FORM ESTABLISHMENT

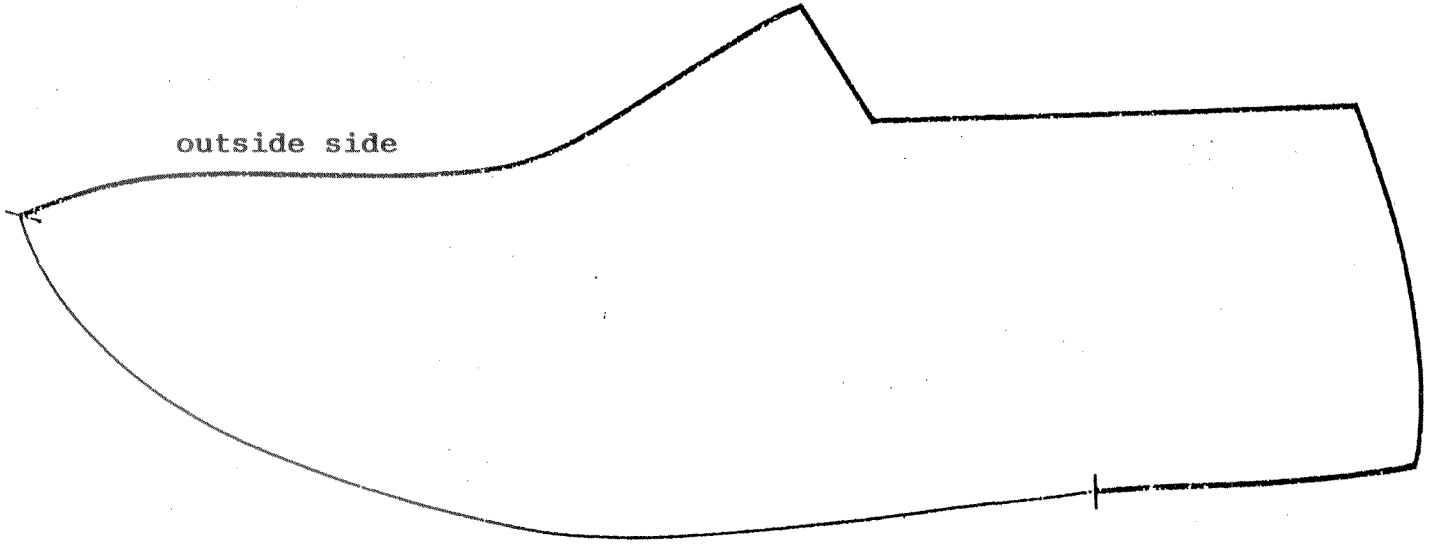
LAST COPY - LINES MODIFICATION (MEAN)



In this case the bold line is similar (mean) to that of the outside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

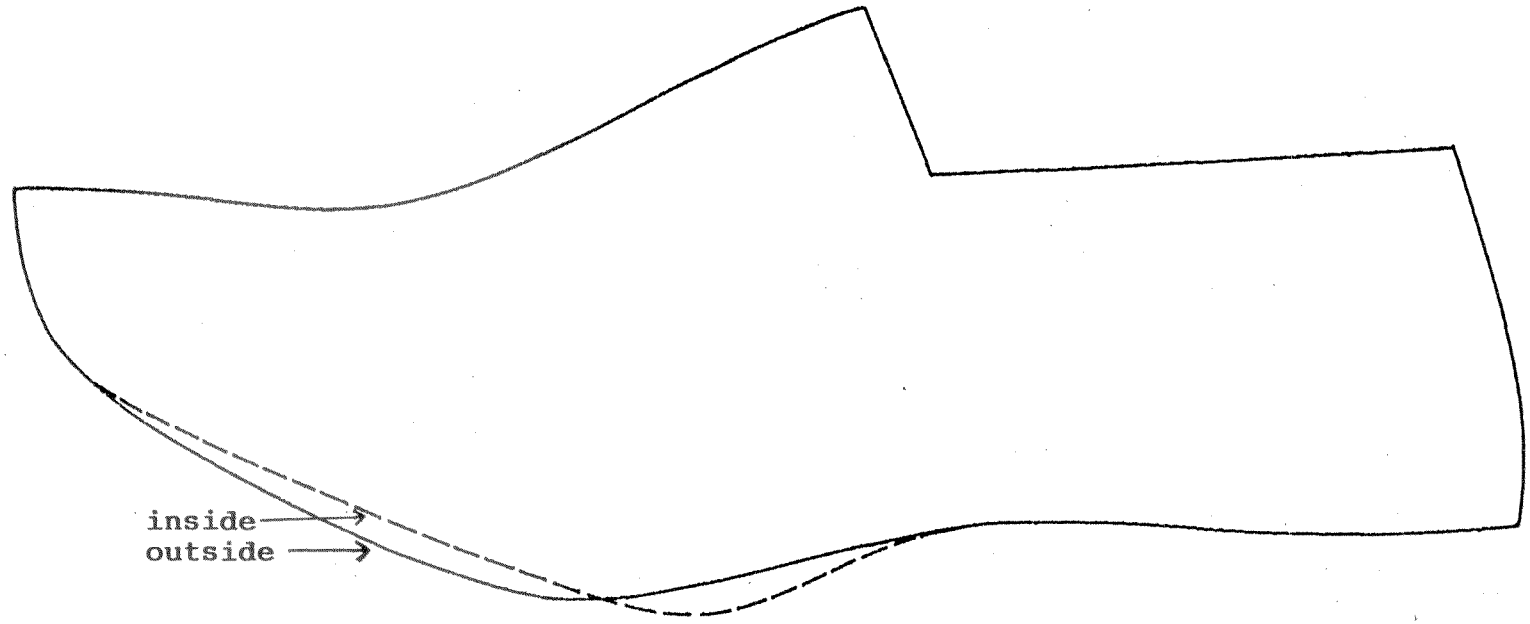
LAST COPY - LINES MODIFICATION (MEAN)



In this case the bold line is similar (mean) to that of the inside copy. The rest is not altered.

MEAN FORM ESTABLISHMENT

MEAN FORM - BOTH SIDES



Superposed inside and outside copies modified as on Diagram p. 47 and p. 48
The difference has been maintained in the forepart and the waist. This would apply when the waist is well pronounced (ladies high heel last for example).

STANDARD PLANS PREPARATION

VAMP HEIGHT (see diagram p. 51)

The ideal vamp height can be easily determined for each last in relation to the last copy top outline.

i) draw a straight line tangent to the instep*
ii) draw a straight line tangent to the forepart*
iii) from the intersection of the two straight lines draw a perpendicular to the last copy outline
iv) the vamp height can also be determined arbitrarily in relation with the fashion trend. Would the arbitrary vamp height point be located on the instep line there would be need to modify the standard plan as shown on diagram p. 53

BACK HEIGHT

- the back height is generally determined once for all in relation to fitting properties.
  For example 60mm for men's size 41
  55mm for ladies size 37
- the height is marked on the back line of the last copy

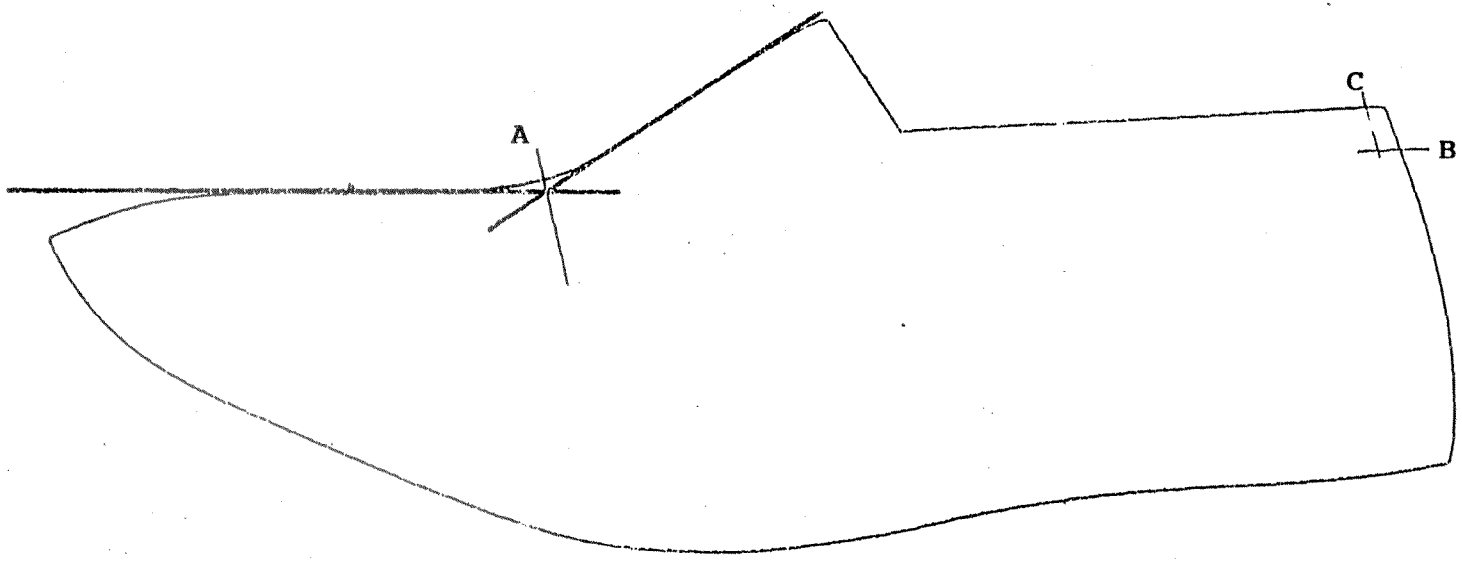
TOP LINE TIGHTENING

To obtain a good tightening of the upper top line the back line is modified.

The degree of modification depends on the last, the style, the technical process, etc. It is indicated by a line crossing the back height line.

*If the last copy outline is very much curvy the line can be secant (see diagram p. 52)

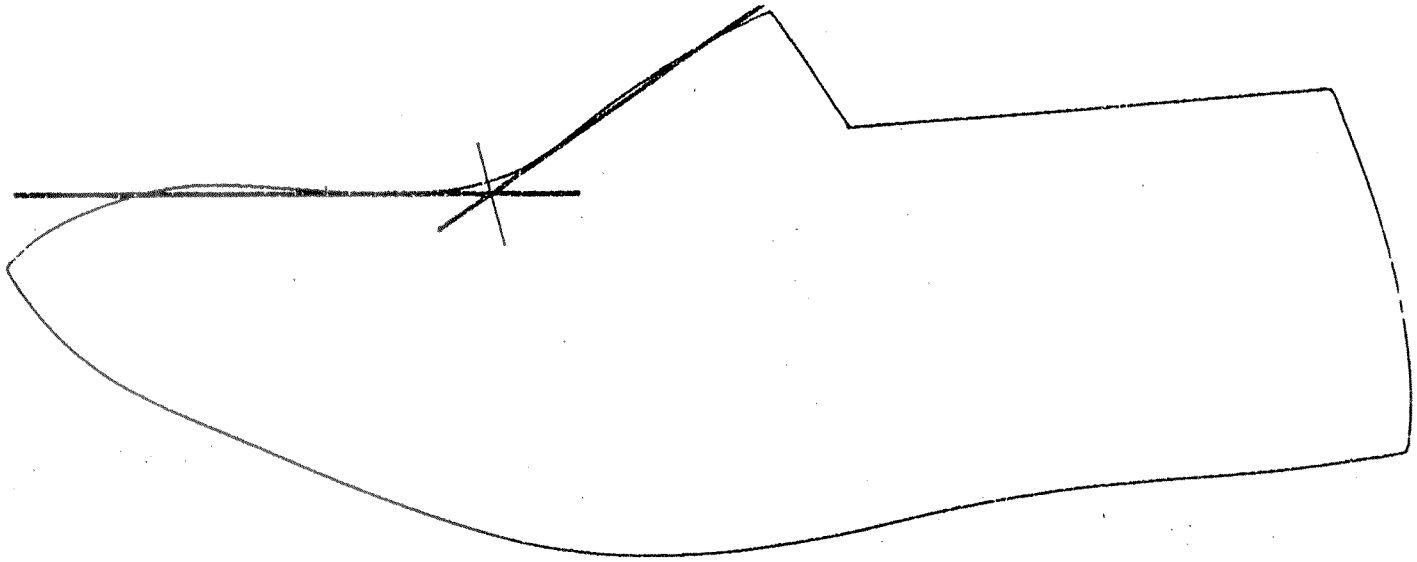
STANDARD PLAN - PREPARATION



Determination of:

- vamp height A)
- back height B) see explanation on p. 50
- top line tightening C)

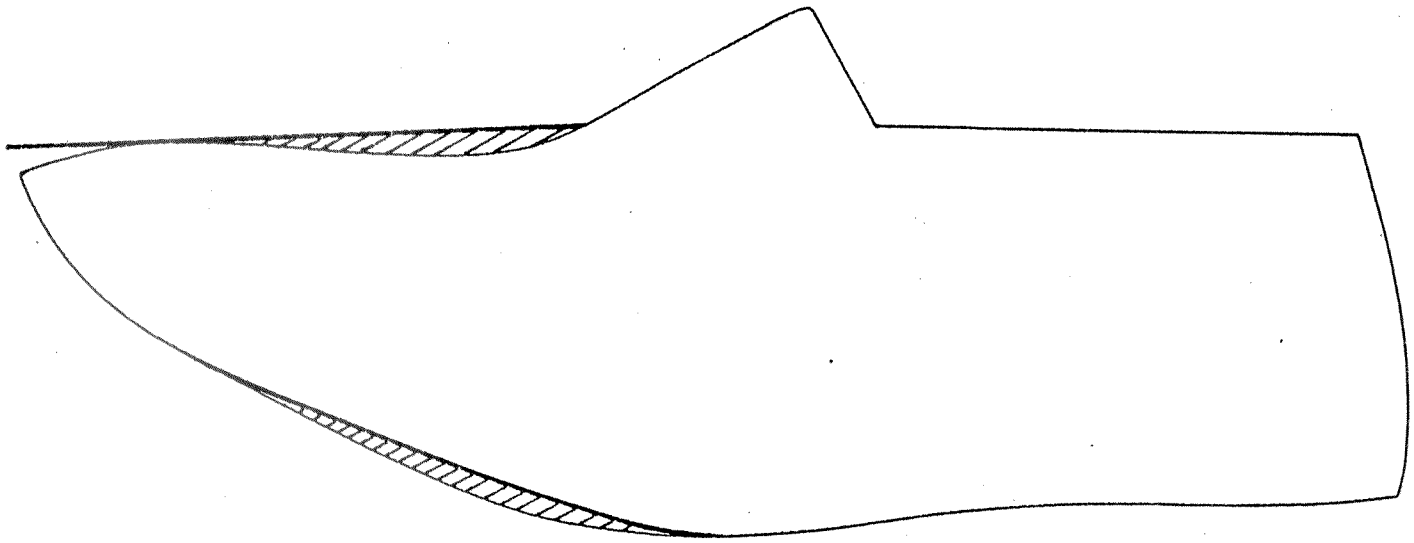
STANDARD PLAN - PREPARATION



Determination of vamp height

see explanation on p. 50

STANDARD PLAN - PREPARATION



Arbitrary determination of vamp height and corresponding plan modification.
see explanation on p. 50

STANDARD PLANS CONSTRUCTION

(see diagram p.55)

VAMP LINE AND LAST COPY CONTOUR

- draw a straight line, horizontally
- from one end draw a perpendicular line
- position the mean form so that:
  - i) the last copy toe point be in contact with the vertical line
  - ii) the last copy forepart line be tangent to the horizontal line
  - iii) the vamp height point be coinciding with the horizontal line
- draw the contour of the last copy

INSTEP LINE

- from the vamp height point draw a straight line tangent to the last copy instep line

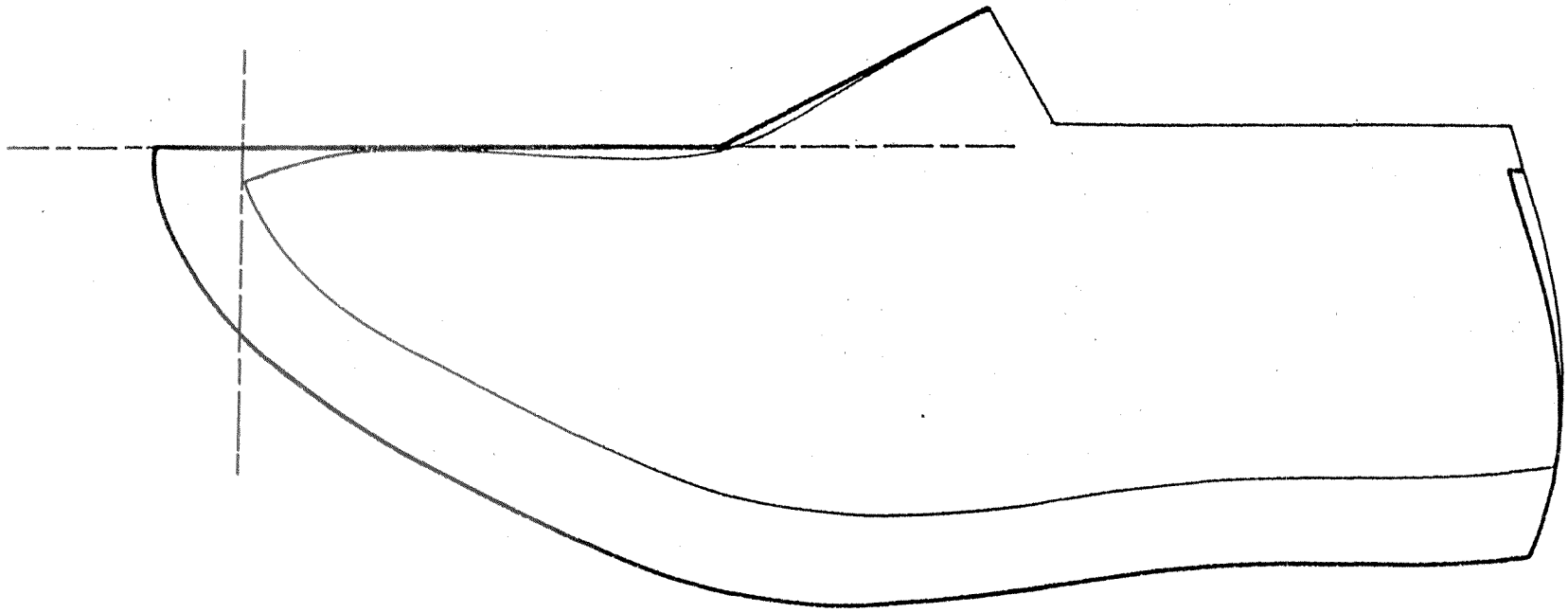
BACKLINE

- from the top line tightening point draw a curve joining the back line of the last copy at the bottom. Extend the line by about 20mm accentuating the curve

LASTING MARGIN

With the help of compasses draw a line parallel to the bottom line of the last copy. The width of the lasting margin is to be determined taking into consideration the lasting technique and equipment to be used, the various components to be included, the different materials to be employed and their respective thickness.
In some cases the width of the lasting margin may vary from one area to another (toe - side, waist - seat). The method used is the same, only the different areas have to be joined thru a smooth continued line.

STANDARD PLAN - CONSTRUCTION



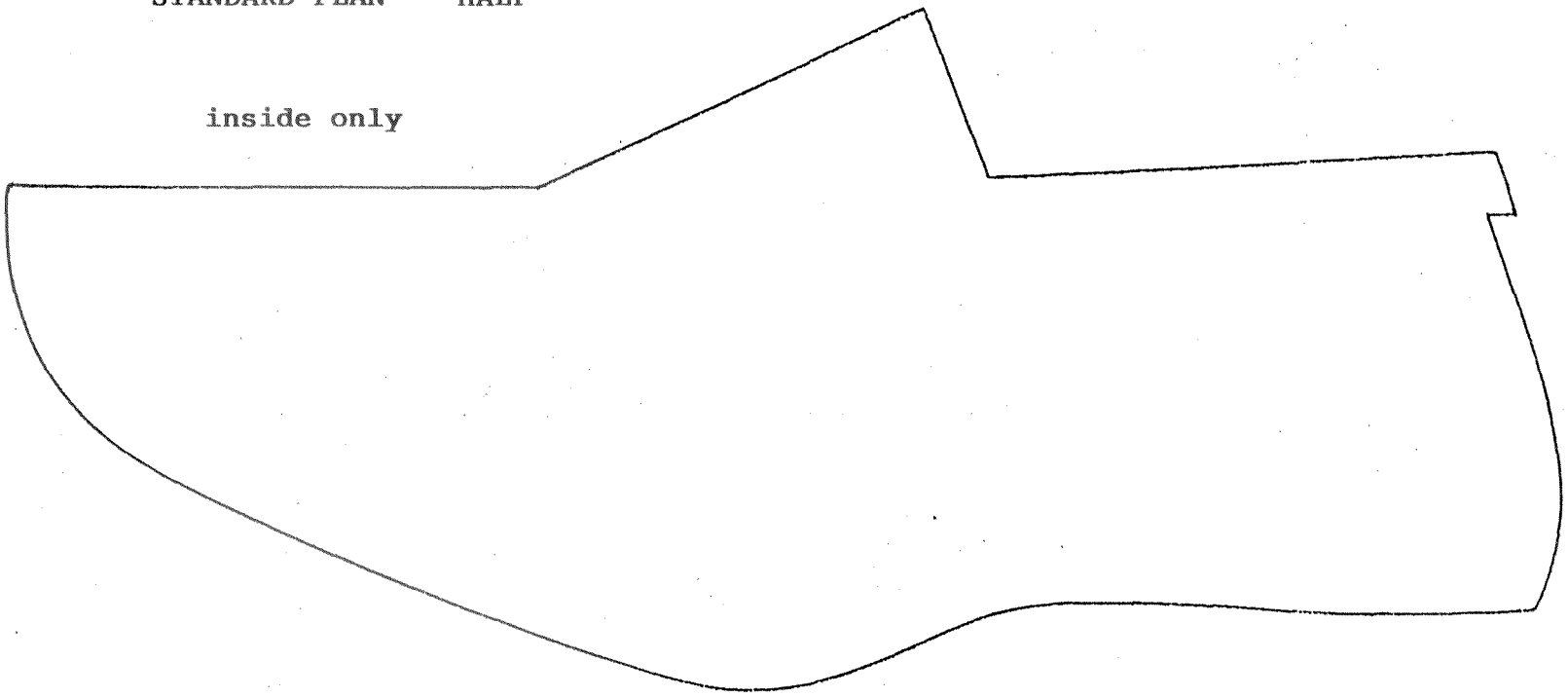
Construction:

- Vamp line - instep line - back line - lasting margin (see explanation p.54)
- Depending on the method to be used to establish the Model Plans the following standard plans can be developed:

  i) two half Plans one for inside and one for outside (see diagram p.56 & 57)
  ii) one half Plan for both inside and outside sides (see diagram p. 58)
  iii) one complete Plan showing both sides (see diagram p.59)

STANDARD PLAN -- HALF

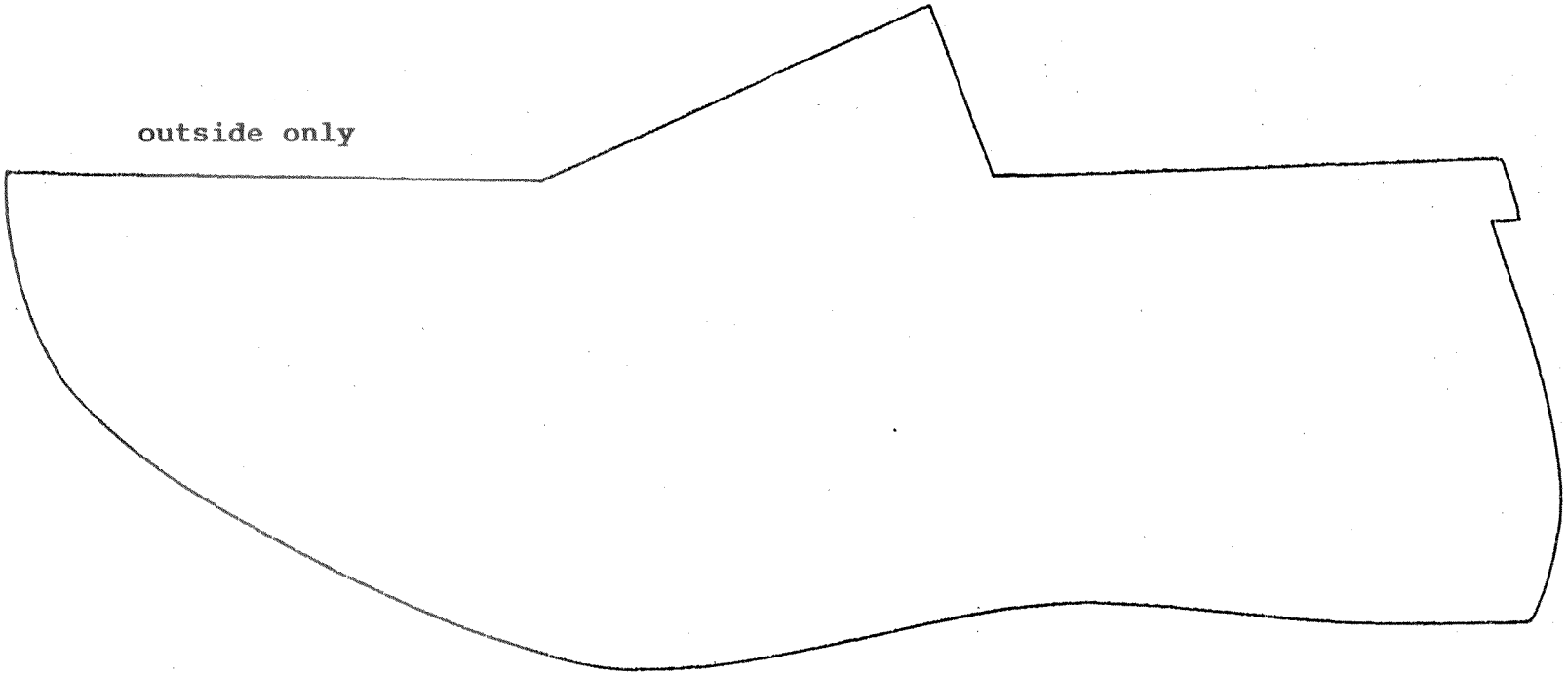
inside only



The use of this half (inside) Plan implies the simultaneous utilization of the other half (outside) Plan (see diagram p. 57). This method produces more accurate results but requires more time and is more difficult to perform. It should be used only if found absolutely necessary.

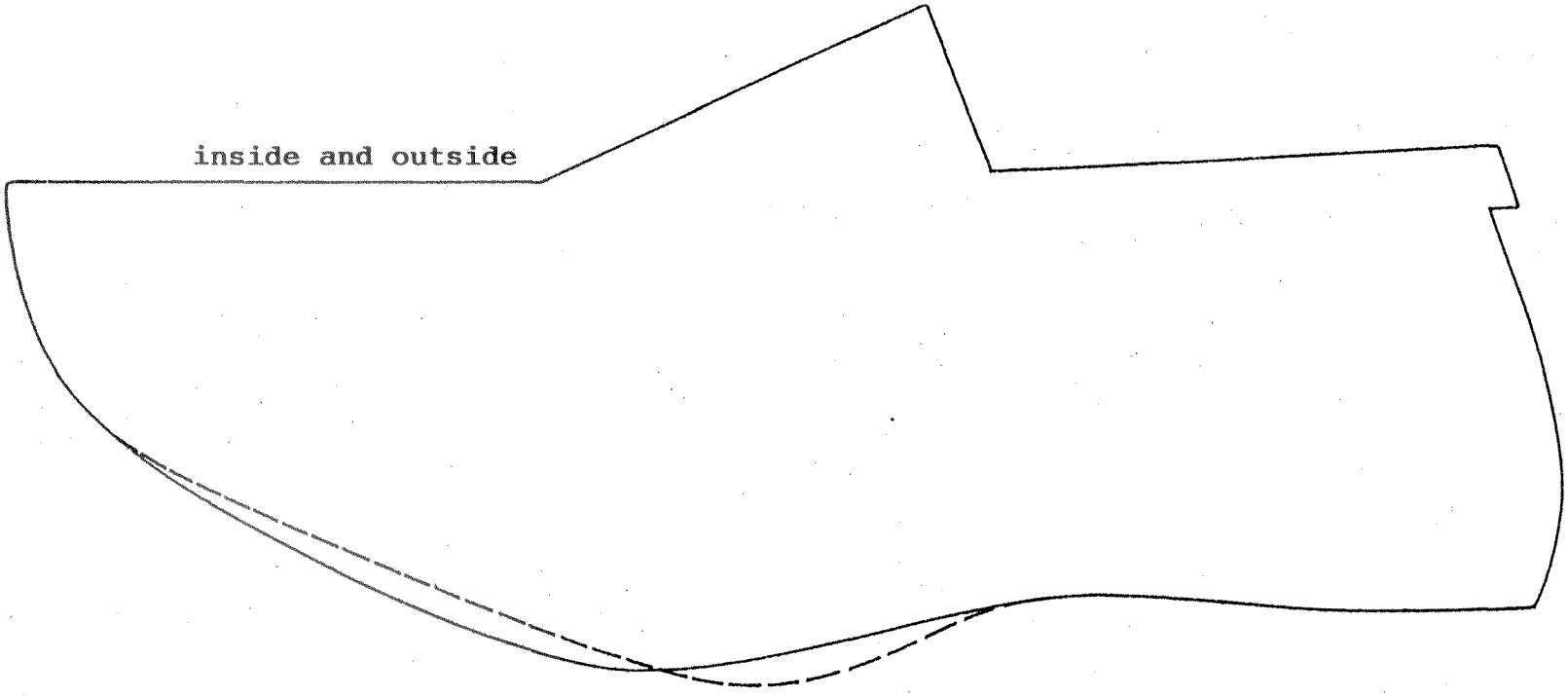
STANDARD PLAN - HALF

outside only



The use of this half (outside) Plan implies the simultaneous utilization of the other half (inside) Plan (see diagram p. 56). This method produces more accurate results but requires more time and is more difficult to perform. It should be used only if found absolutely necessary.

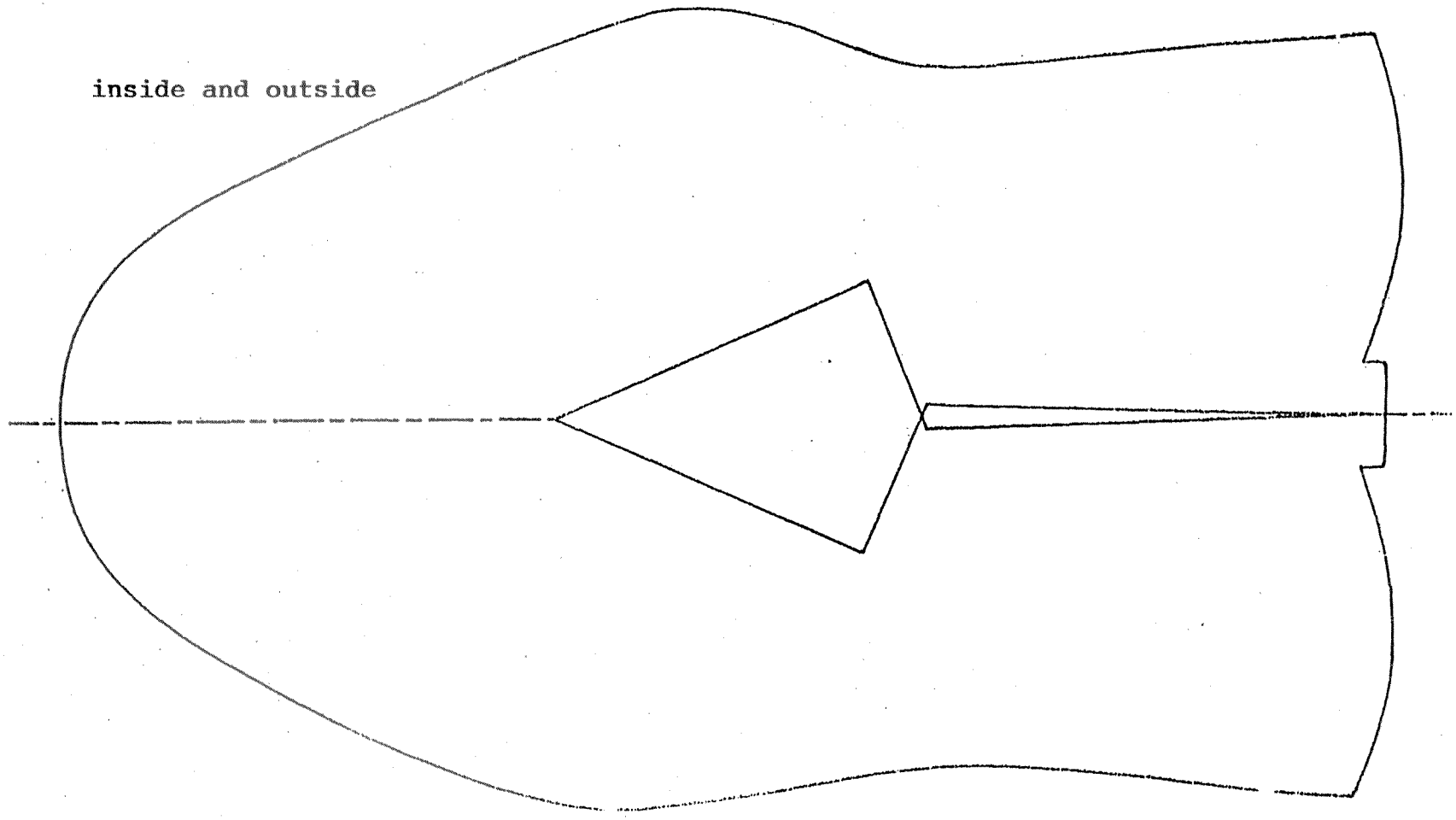
STANDARD PLAN - HALF



This method is frequently used and produces good results. The only problem encountered is that when the model outside lines are different from the model inside lines there might be a risk of confusion between the different model lines.

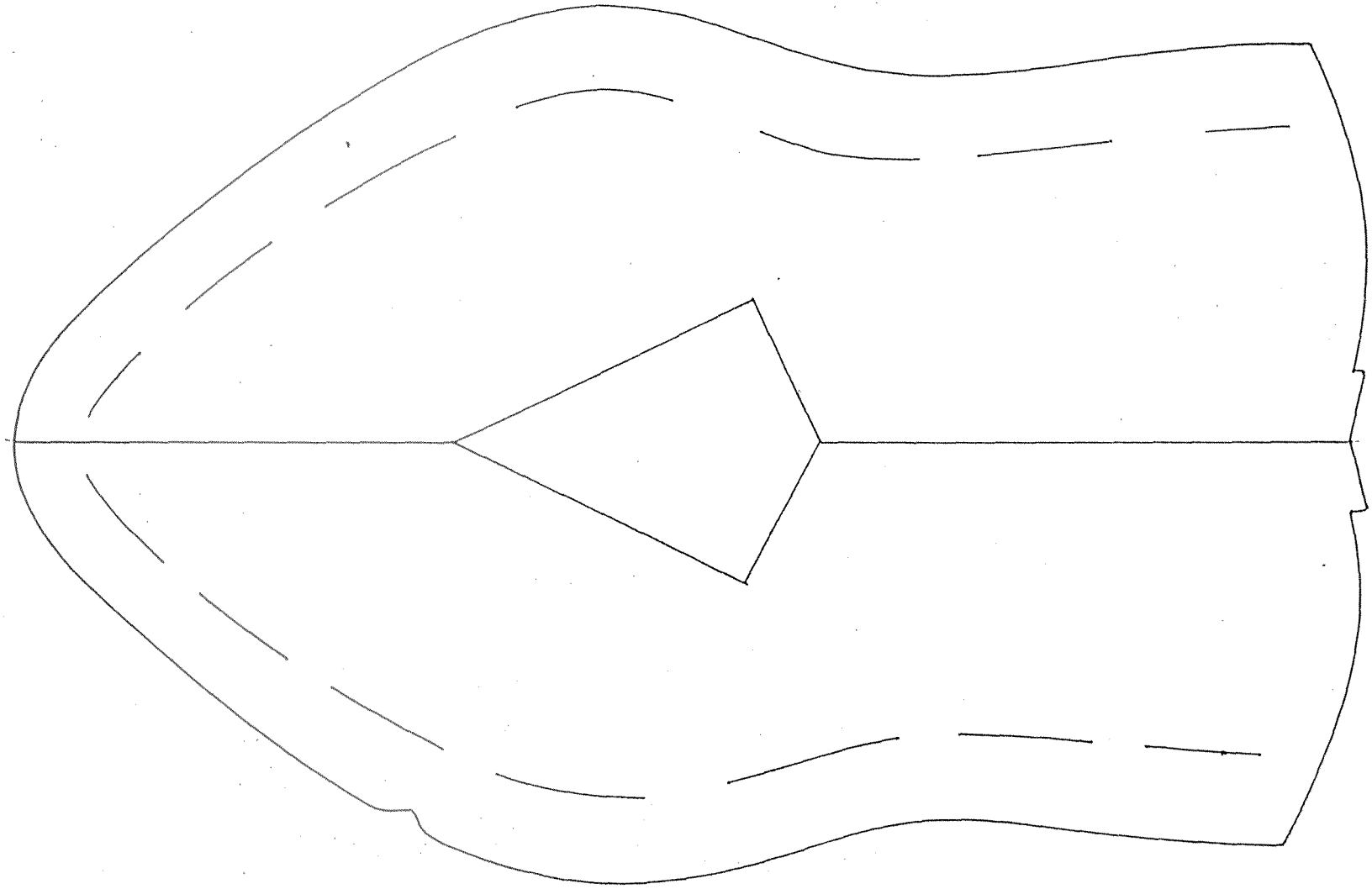
STANDARD PLAN - COMPLETE

inside and outside



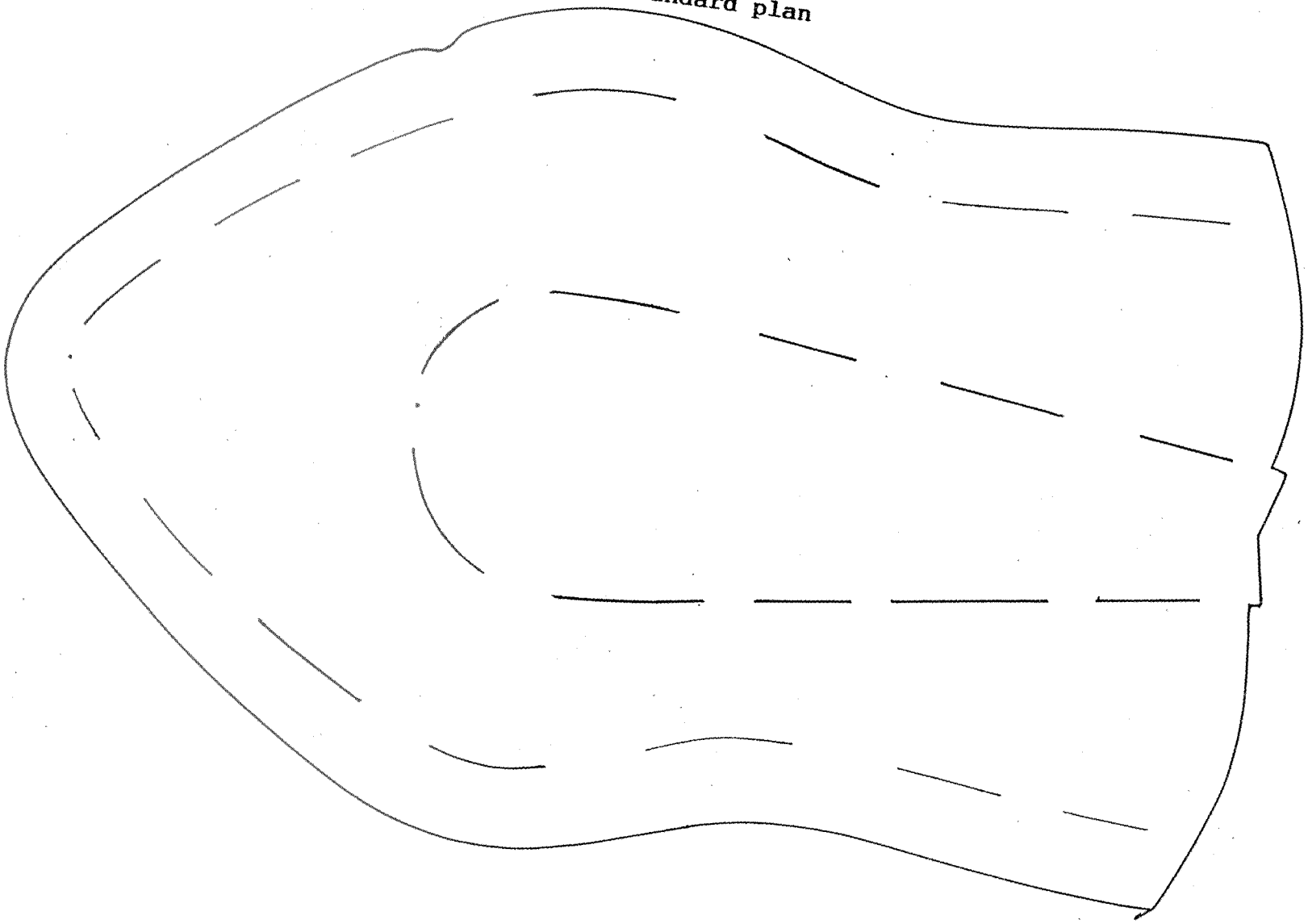
This method is recommended for all models of which inside side is different from outside side, particularly ladies' shoes.

LADIES'SHOES - **STANDARD PLAN**

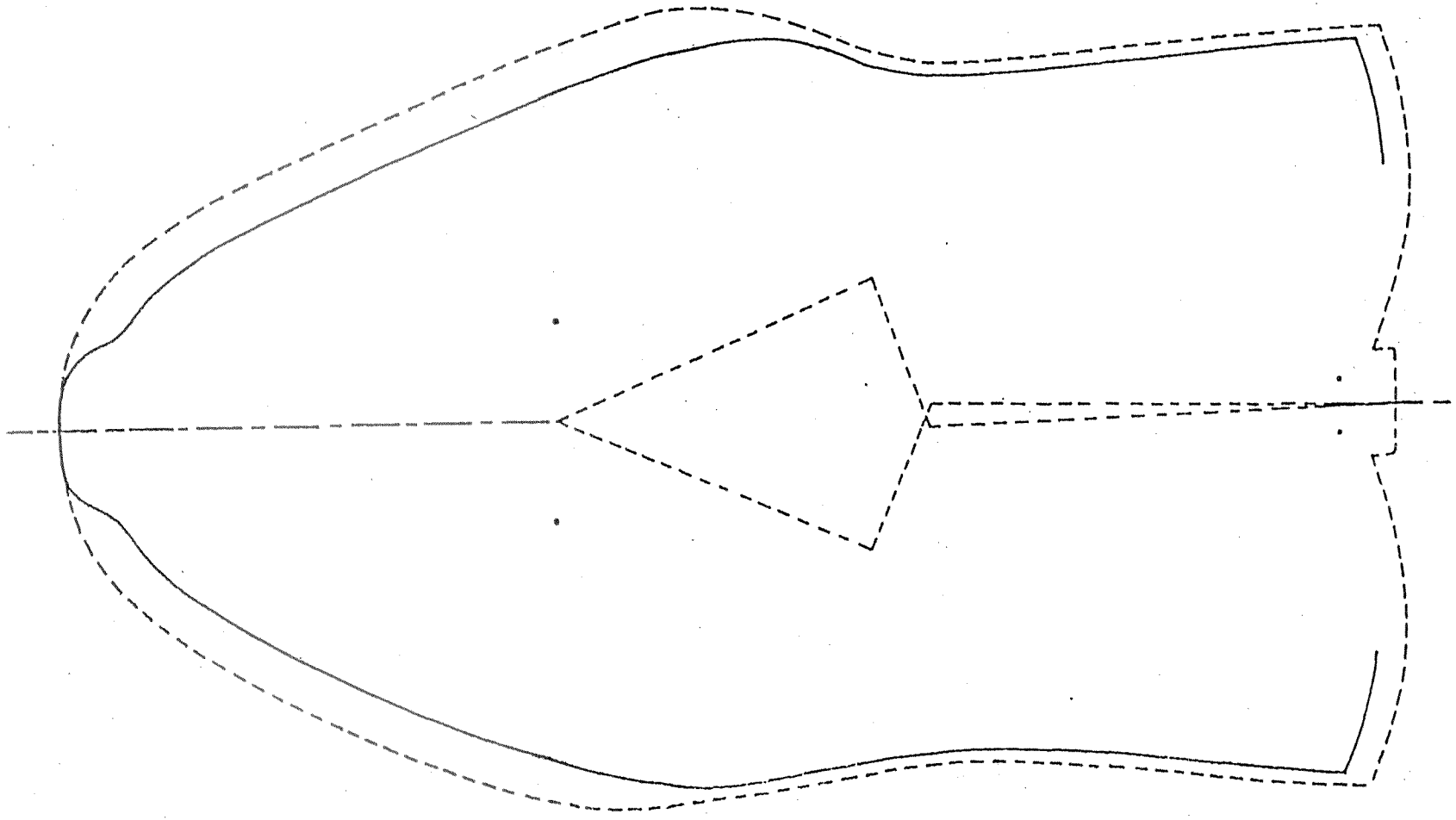


LADIES' SHOES - COURT SHOE PATTERN

made from standard plan



LADIES' SHOES - LINING
Standard Lining Construction



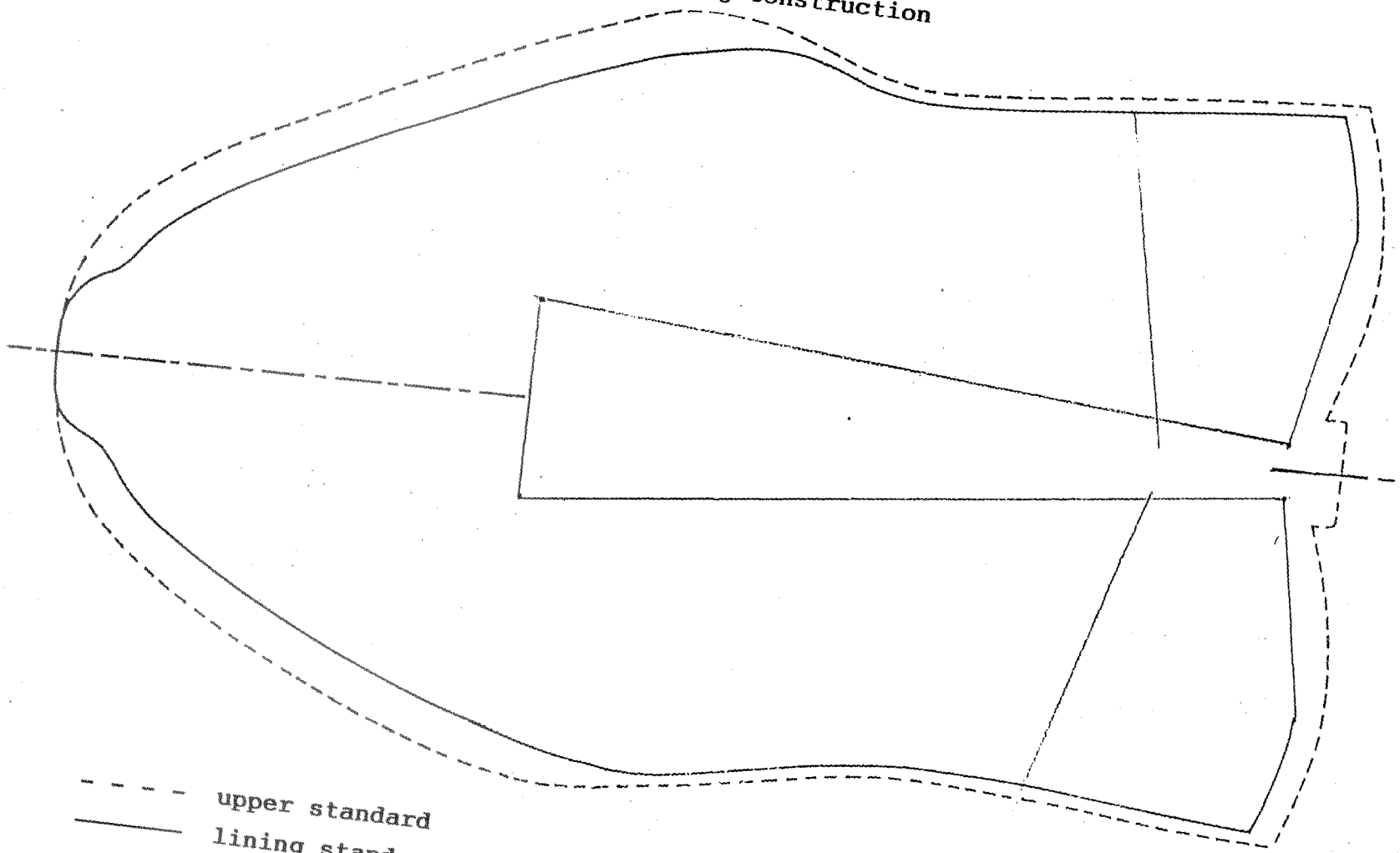
- - - - upper standard

——— lining standard

step 1

LADIES' SHOES LINING

Standard Lining Construction



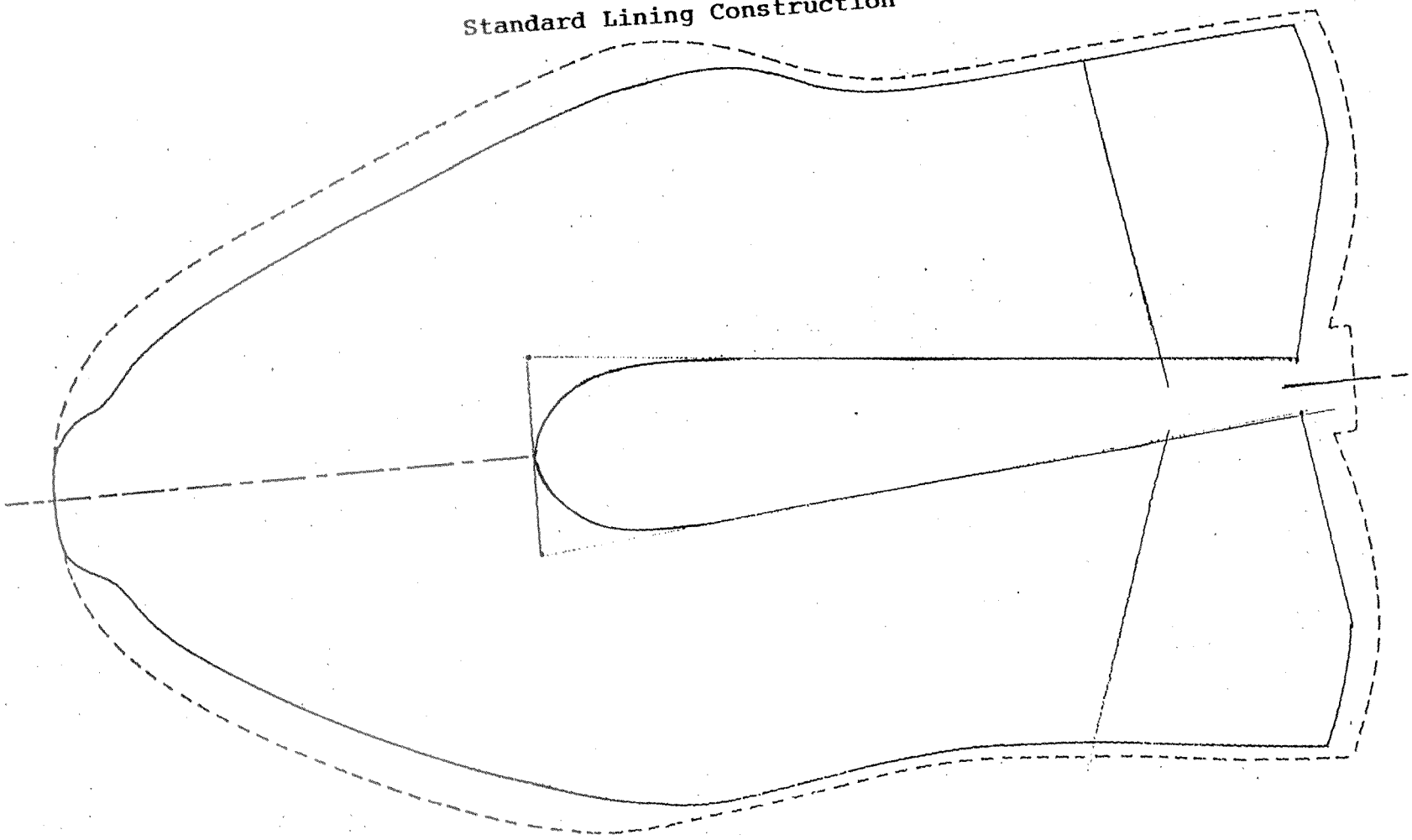
upper standard

lining standard

step 2

LADIES* SHOES LINING

Standard Lining Construction



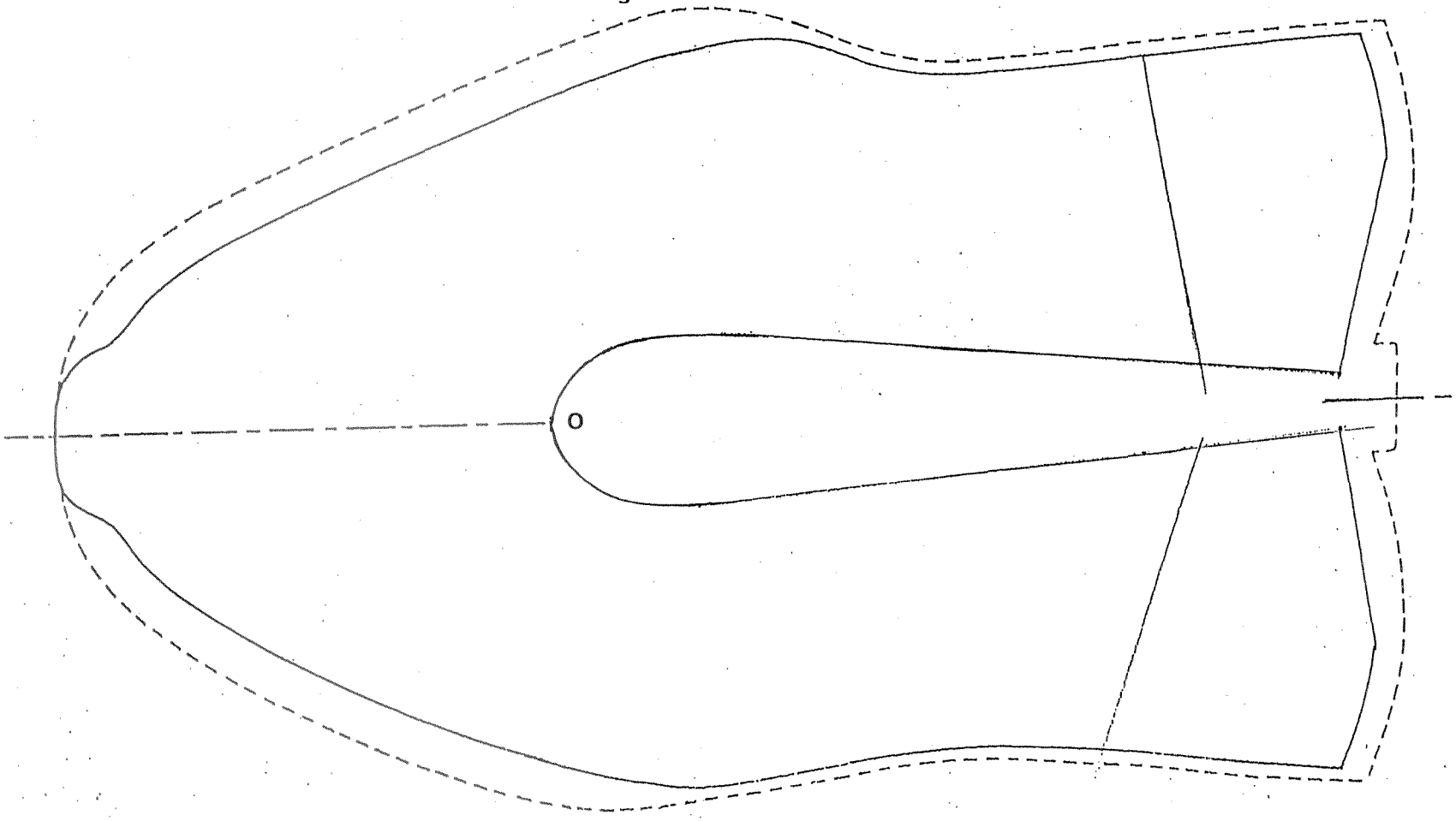
---- upper standard

—— lining standard

step 3

LADIES' SHOES LINING

Standard Lining Construction

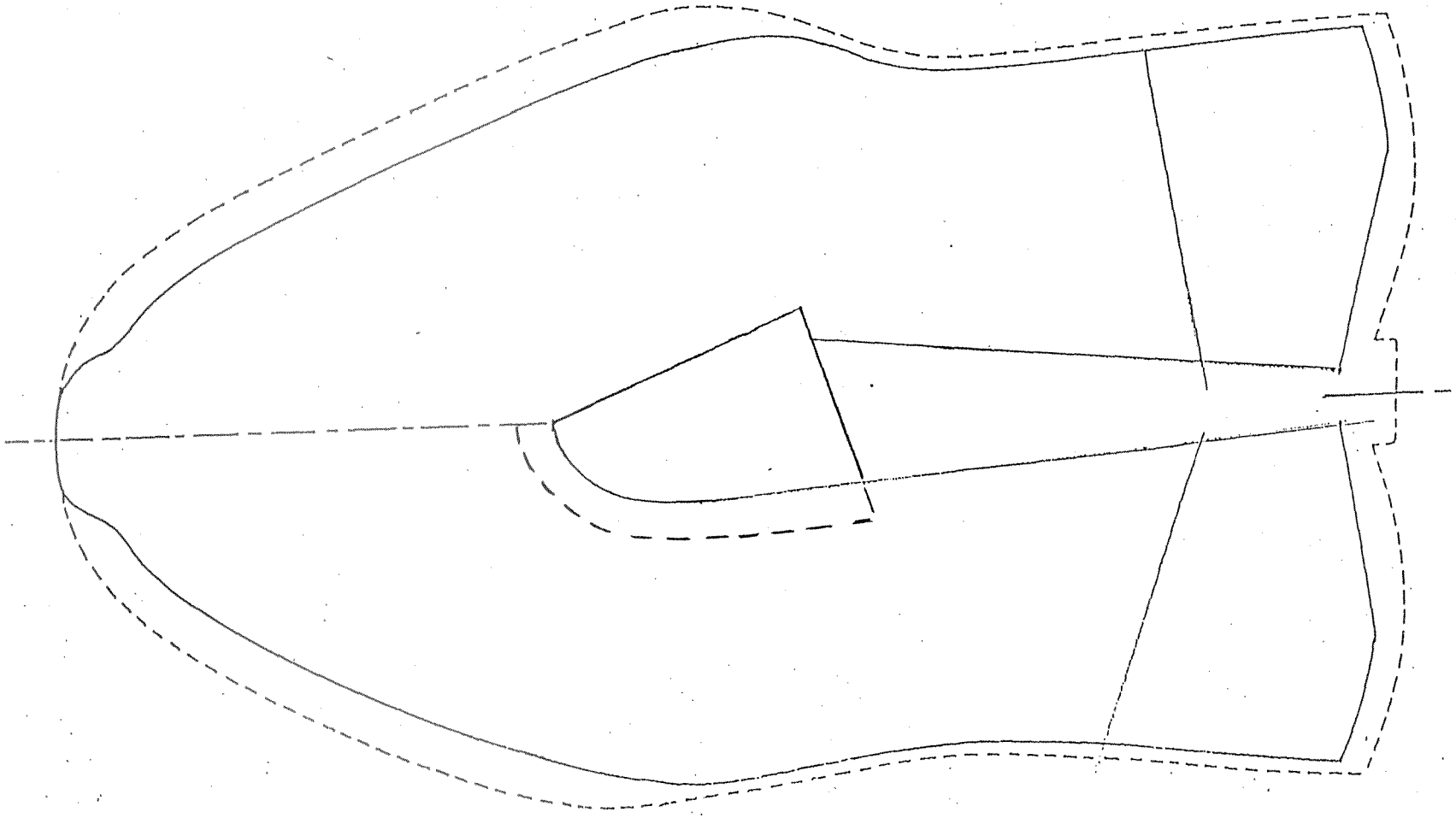


This standard lining can accomodate as is all styles to be produced on the same last provided the highest point of the upper forepart is not higher than the Opposition.

step 4

LADIES' SHOES LINING

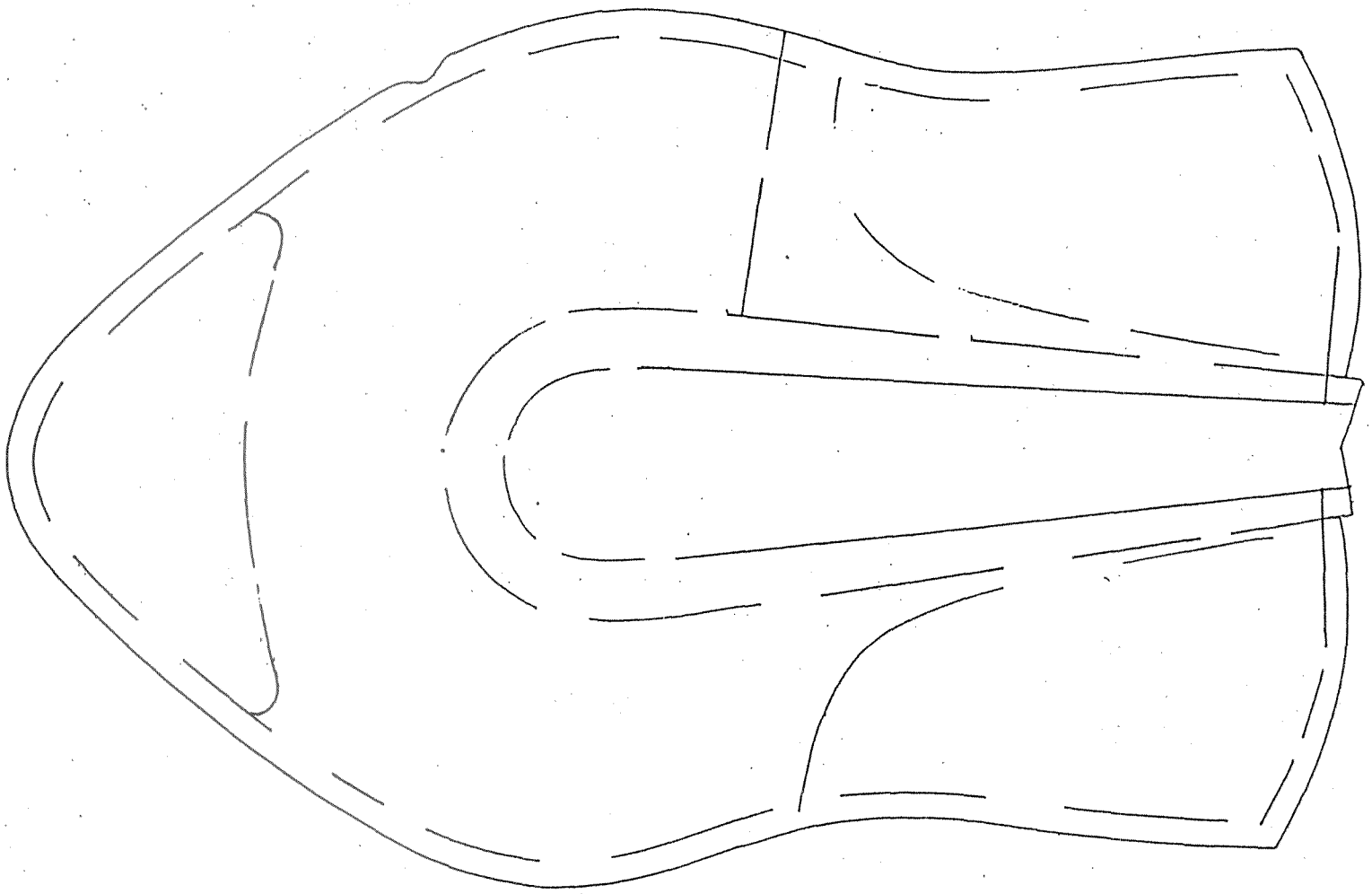
Standard Lining Construction



In case of upper forepart coming over the instep, the same standard lining can be used by adding a wedge like part.

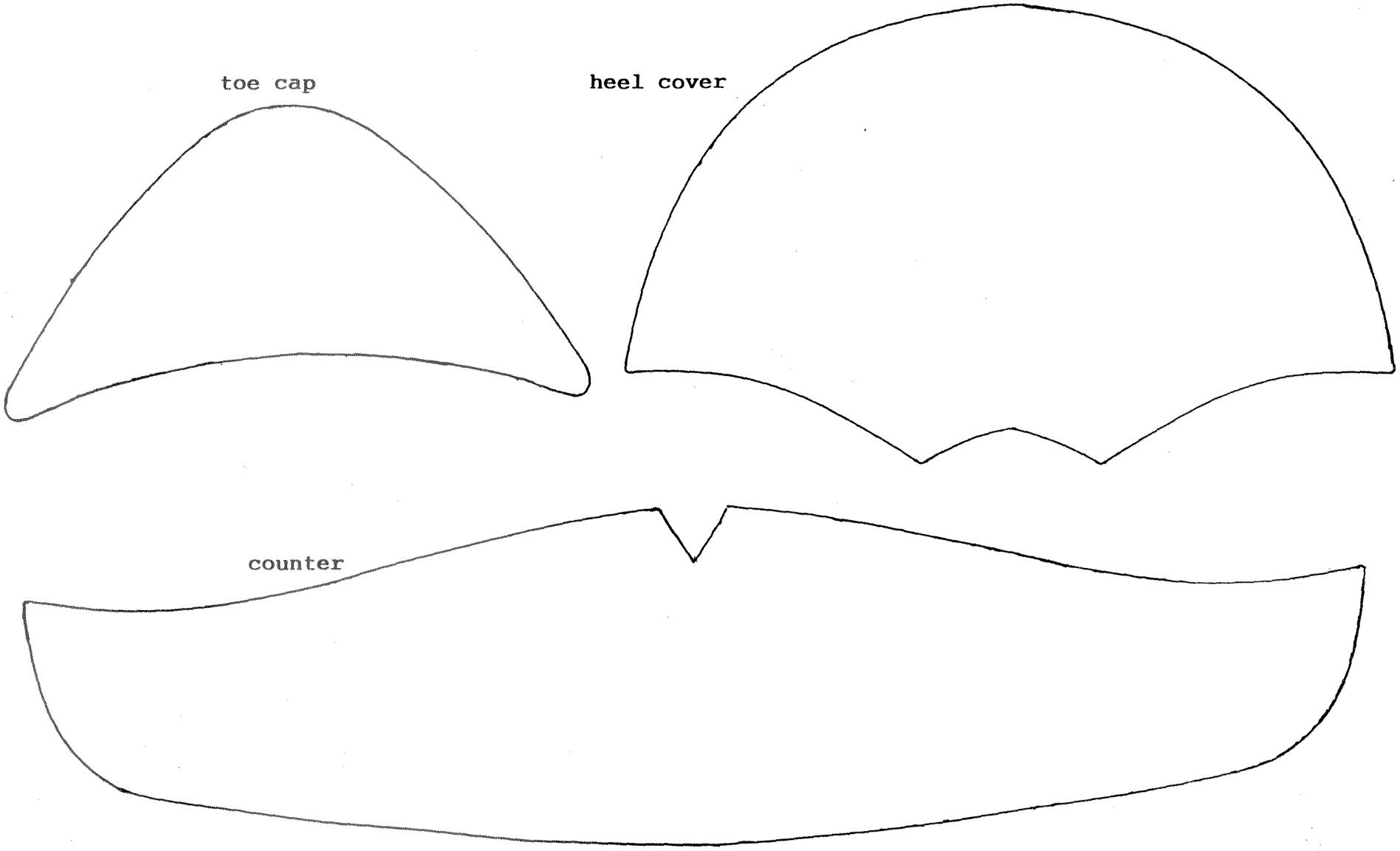
step 5

LADIES' SHOE - STANDARD COMPONENTS



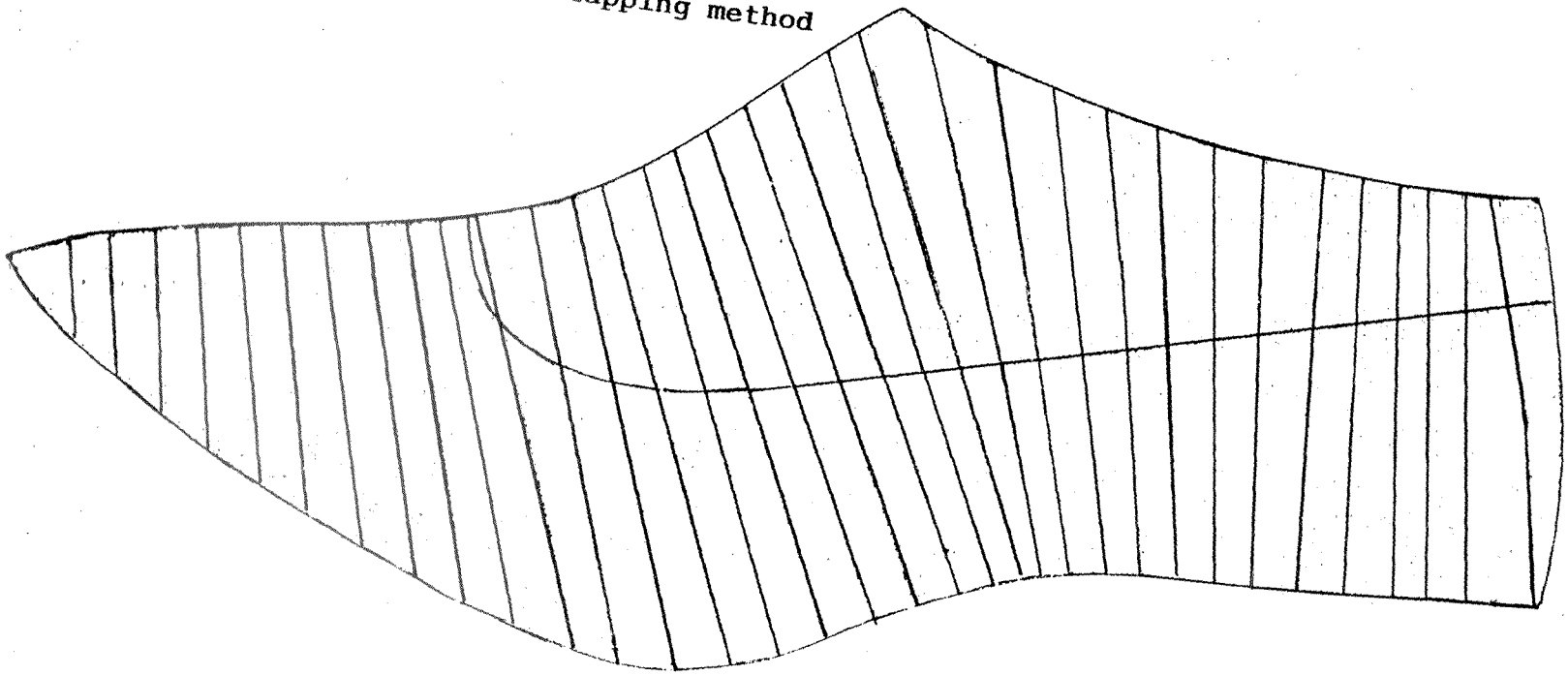
this diagram shows the development of standard components - lining - toe cap - counter from a standard plan

LADIES SHOE - OTHER COMPONENTS

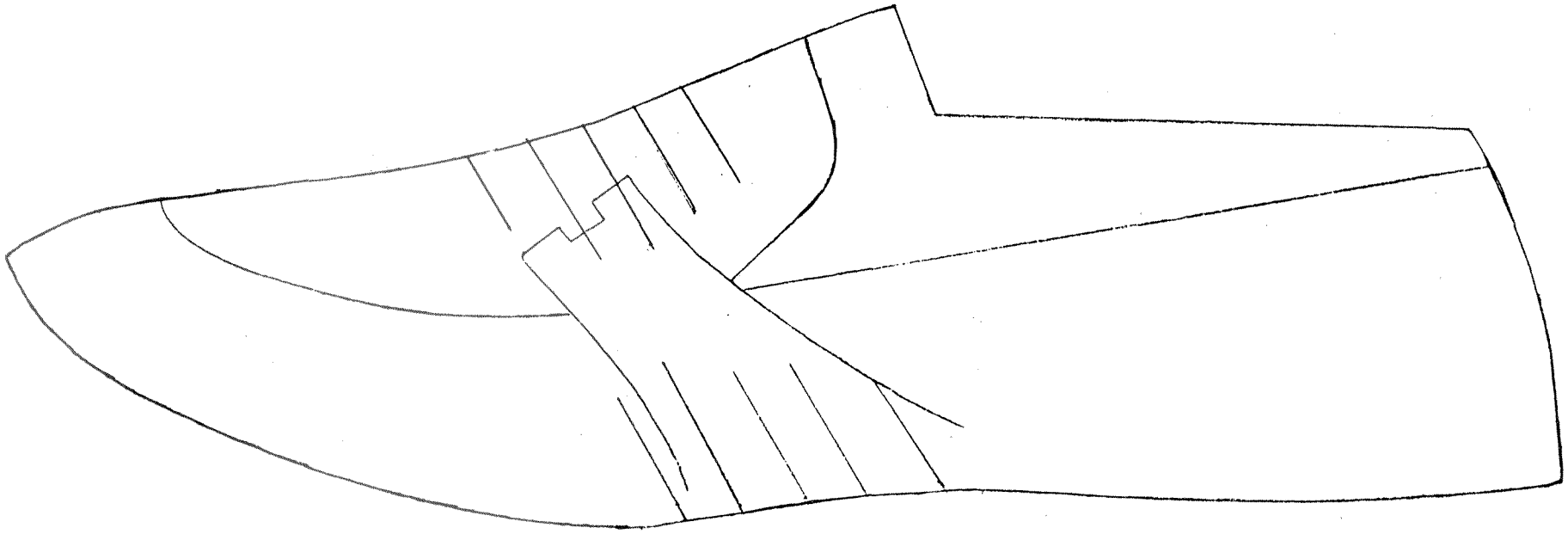


LAST COPY WITH MODEL DRAWING

tapping method

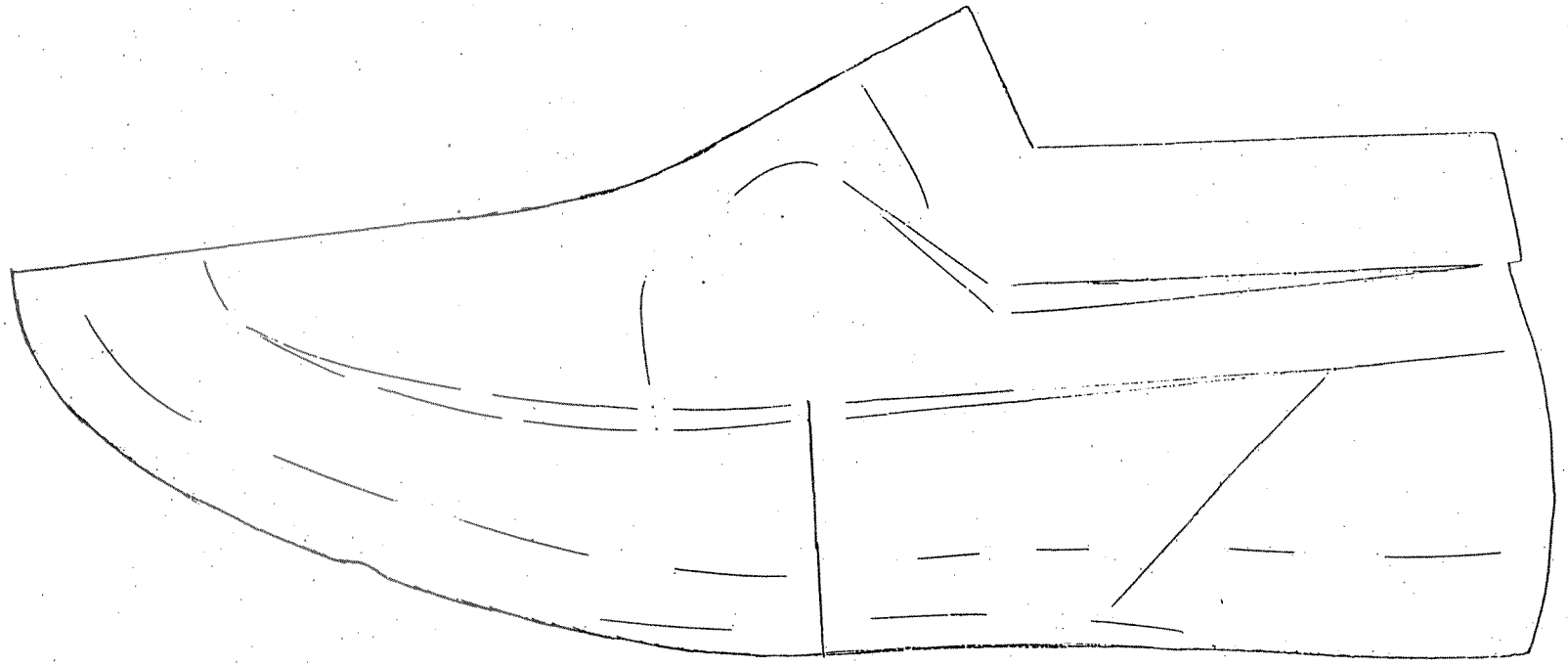


MODEL LINE TRANSFER



The model lines are transferred from the last to the standard plan using last copies made of tracing paper.

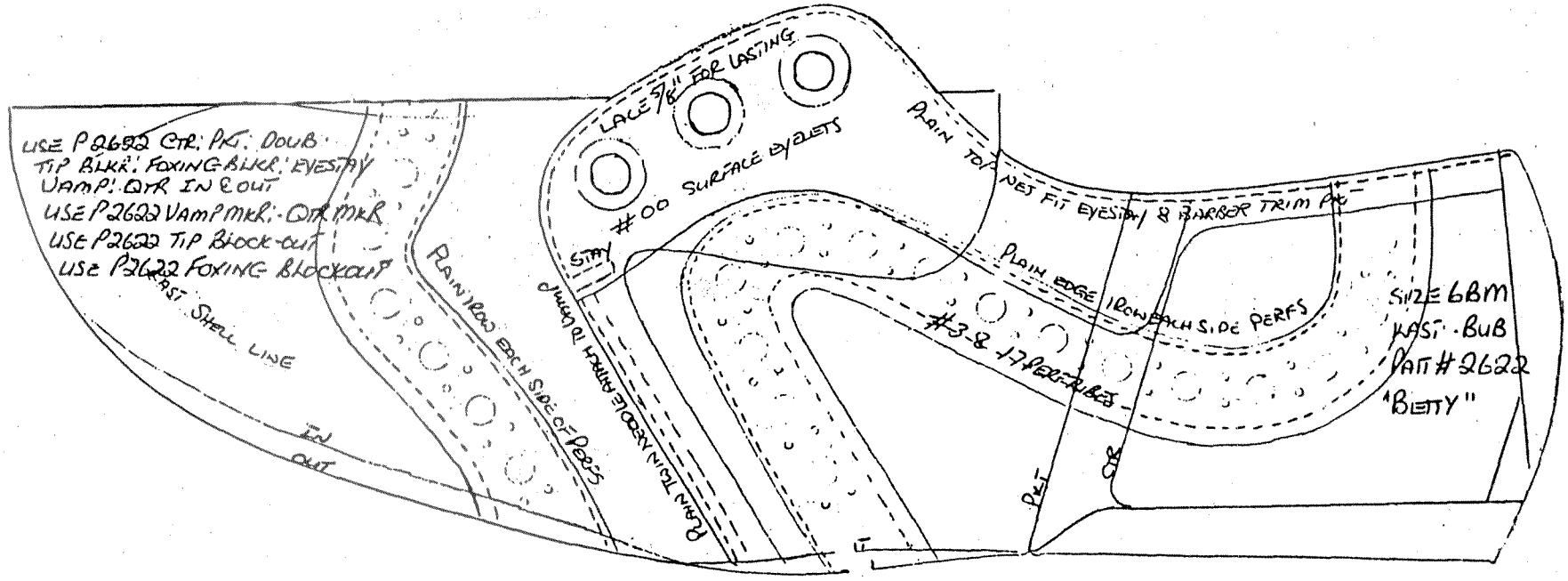
MEN'S SHOE - MODEL PLAN



- Model lines are cut in such a way that the plan still remains in one piece.
- The reporting of the lines to produce detail patterns is done with the blade of the kinfe passing thru each incision.

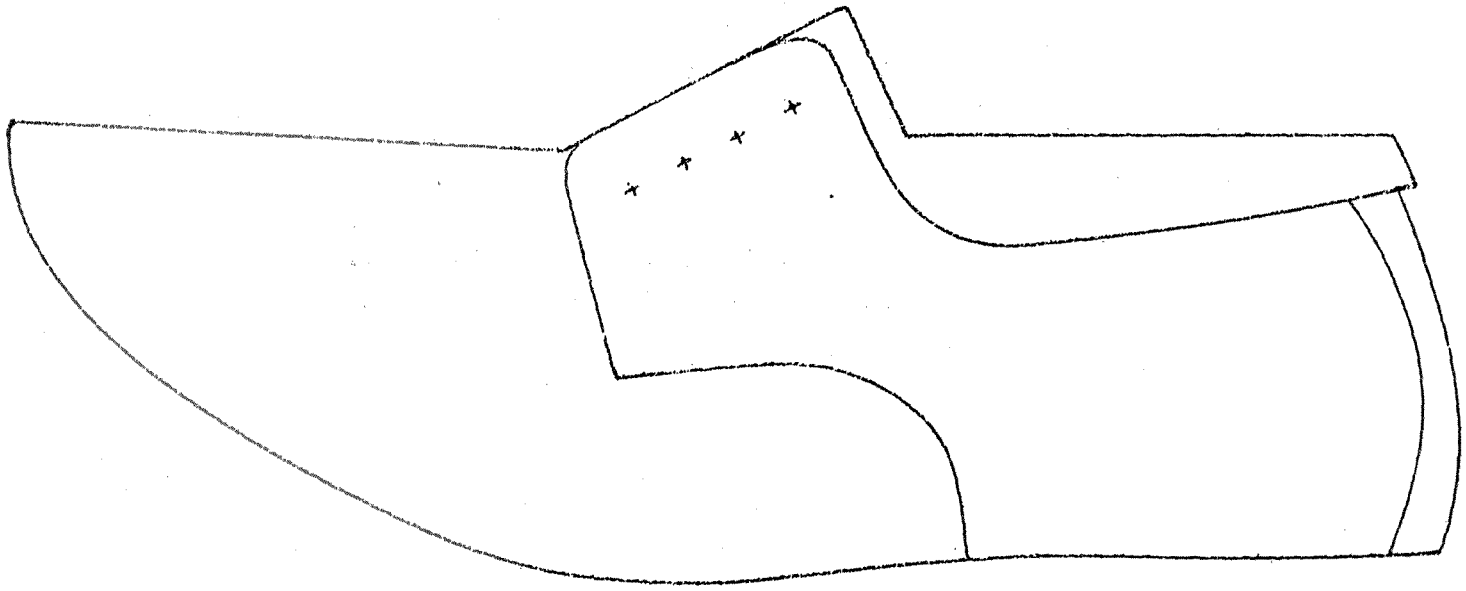
MODEL PLAN WITH SPECIFICATIONS

EXAMPLE OF SHELL LAYOUT FOR SAMPLE SHOE

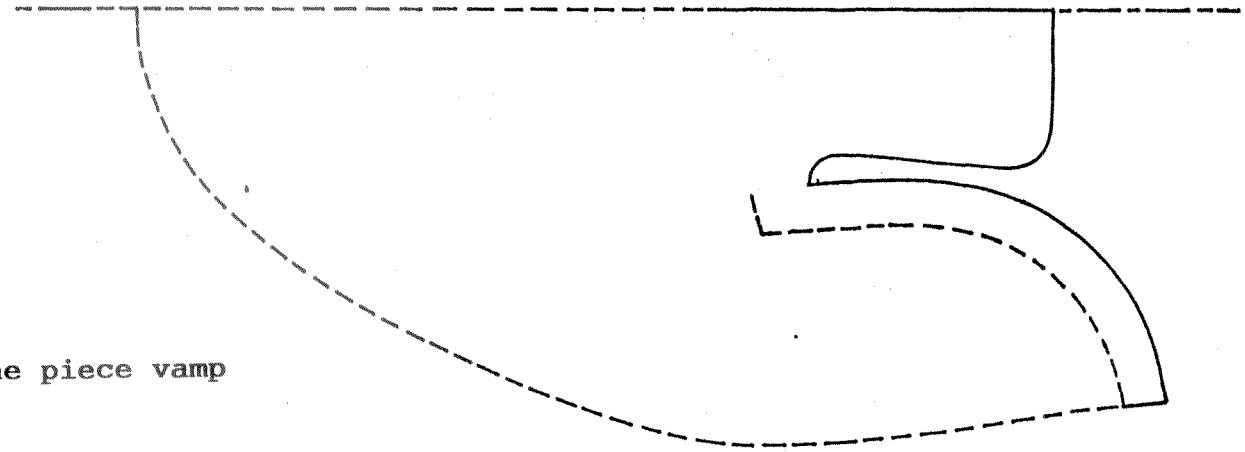


ALL PATTERNS ARE DISECTED FROM THIS MASTER SHELL

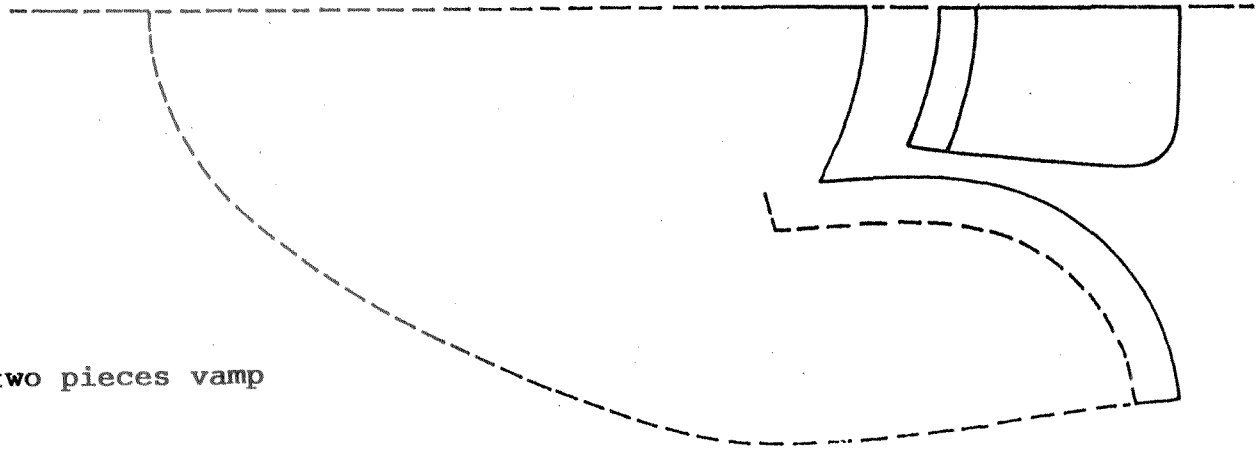
MEN'S DERBY SHOE - MODEL PLAN



MEN'S DERBY SHOE - DETAIL PATTERNS(UPPER)

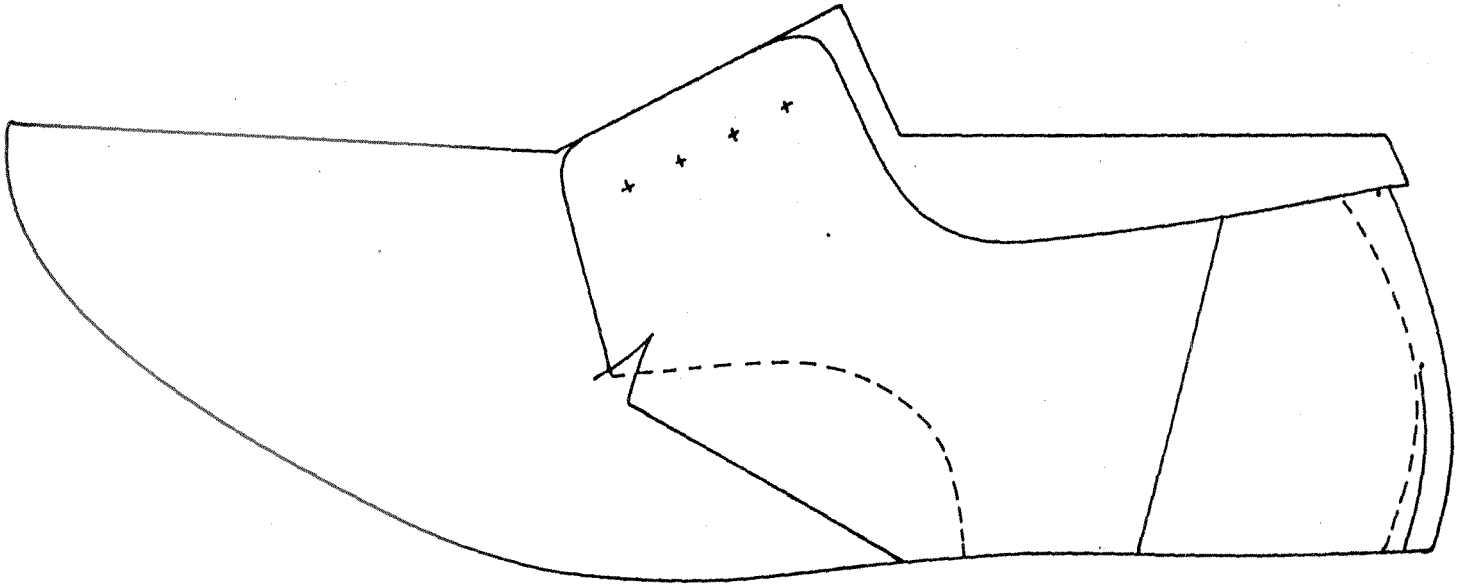


one piece vamp

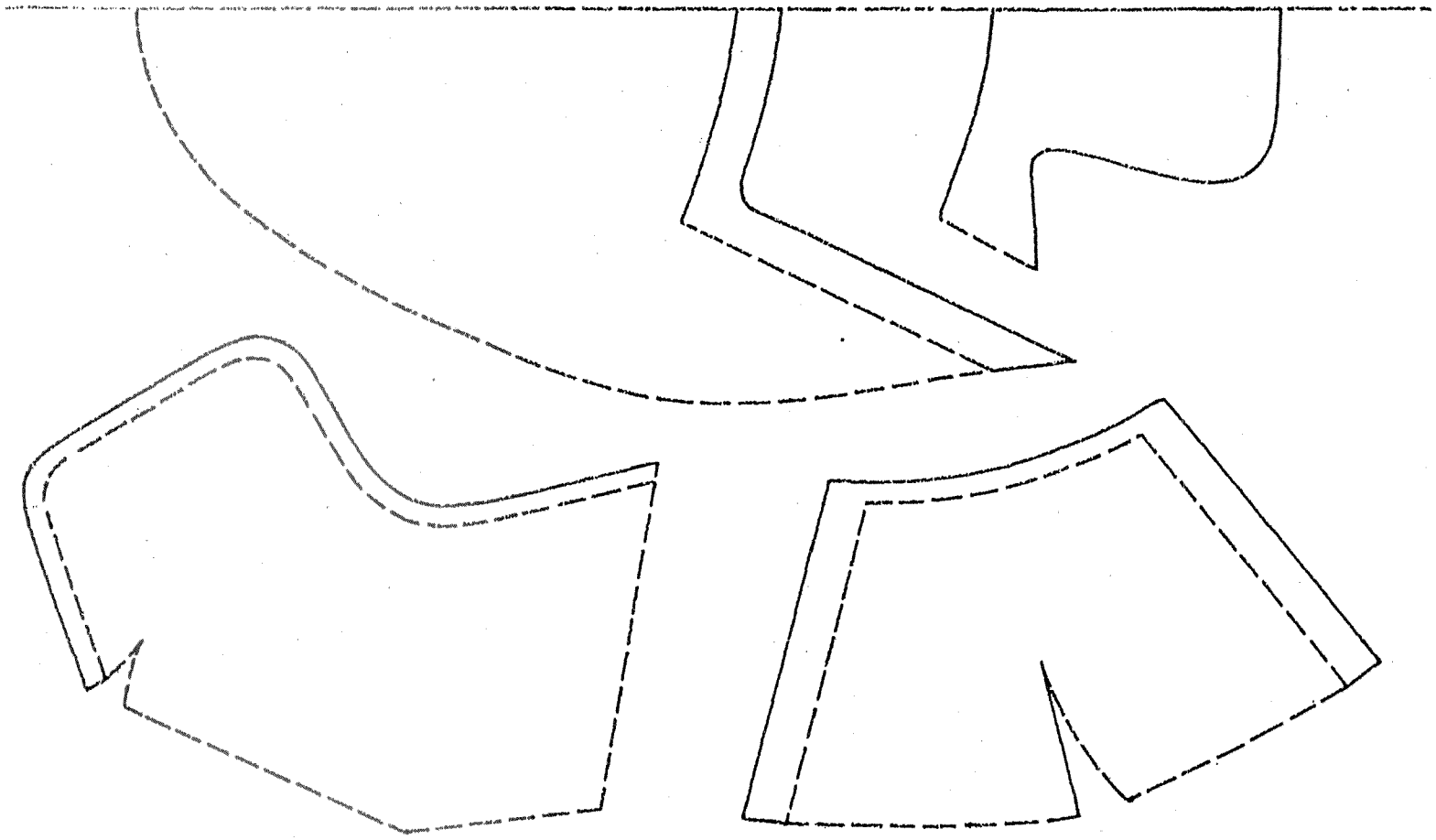


two pieces vamp

MEN'S DERBY SHOE - LINING PLAN

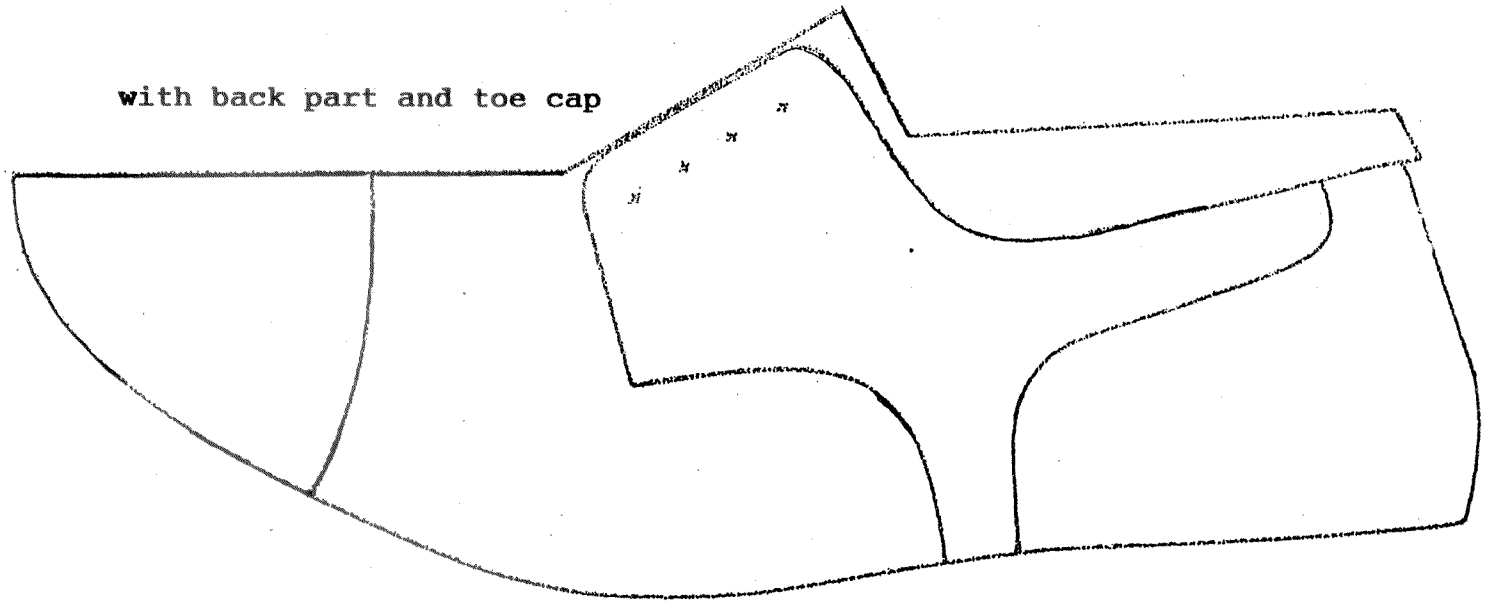


MEN'S DERBY SHOE - DETAIL PATTERNS (LINING)



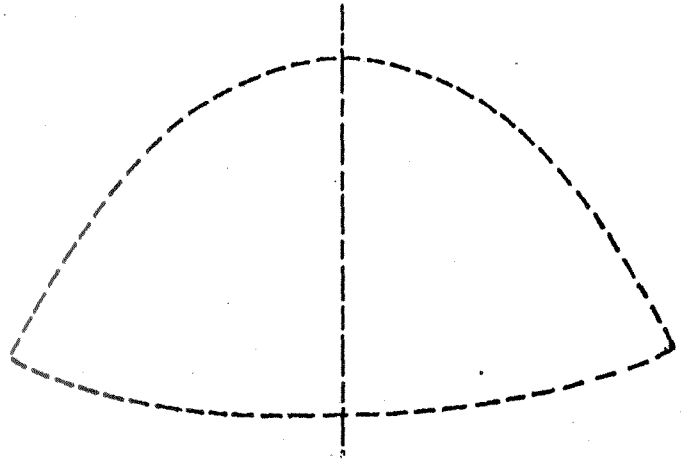
MEN'S DERBY SHOE - MODEL PLAN

with back part and toe cap

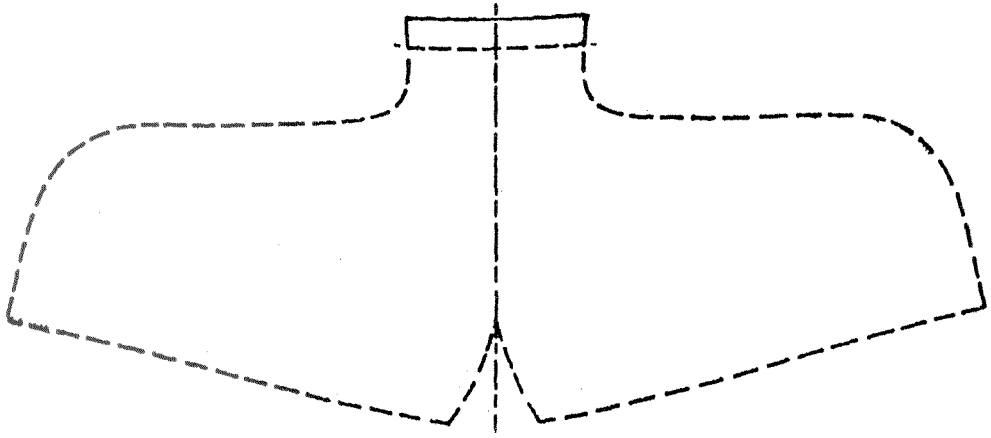


MEN'S DERBY SHOE - DETAIL PATTERNS

toe cap

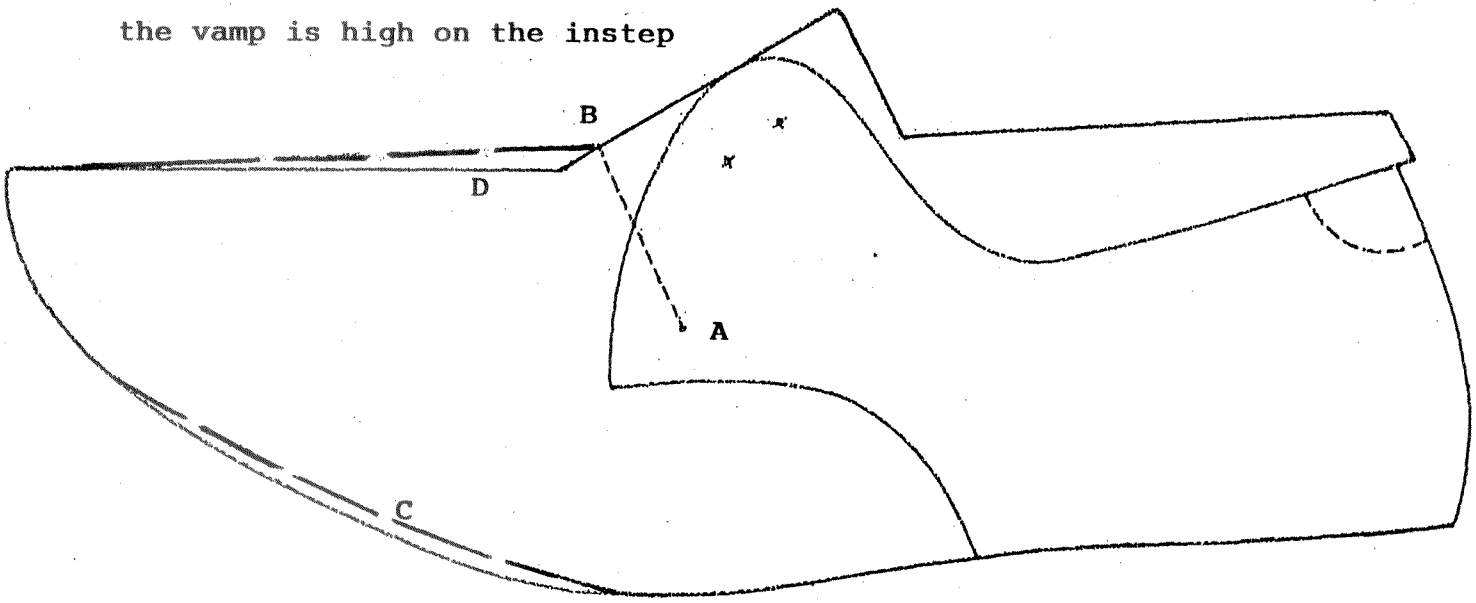


back part



DERBY SHOE - VAMP POINT HIGHER

the vamp is high on the instep

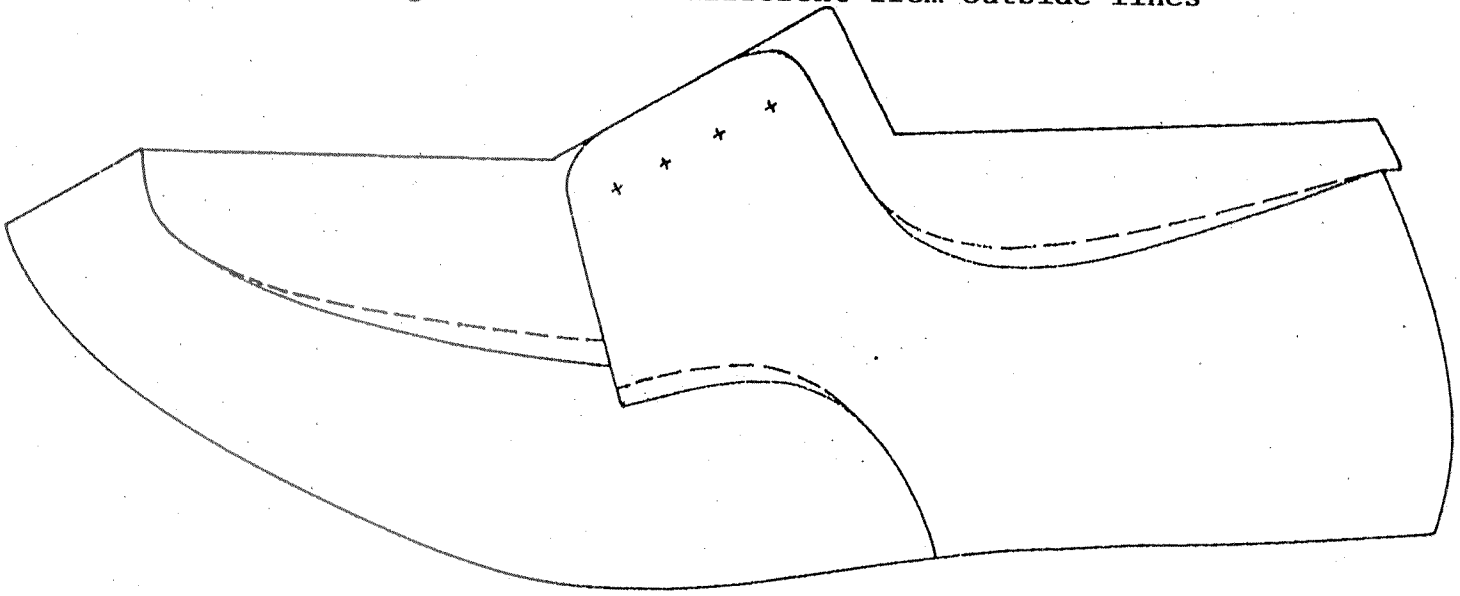


If the vamp point is situated high on the instep line the standard plan has to be modified to provide enough space/materials between the two quarters (doted line A-B)

i) from the vamp opening point (A) draw a line perpendicular to the instep line
ii) from the lines intersections (B) draw a new standard front line
iii) modify the bottom C to compensate for excess of material D

DERBY WITH APRON - MODEL PLAN

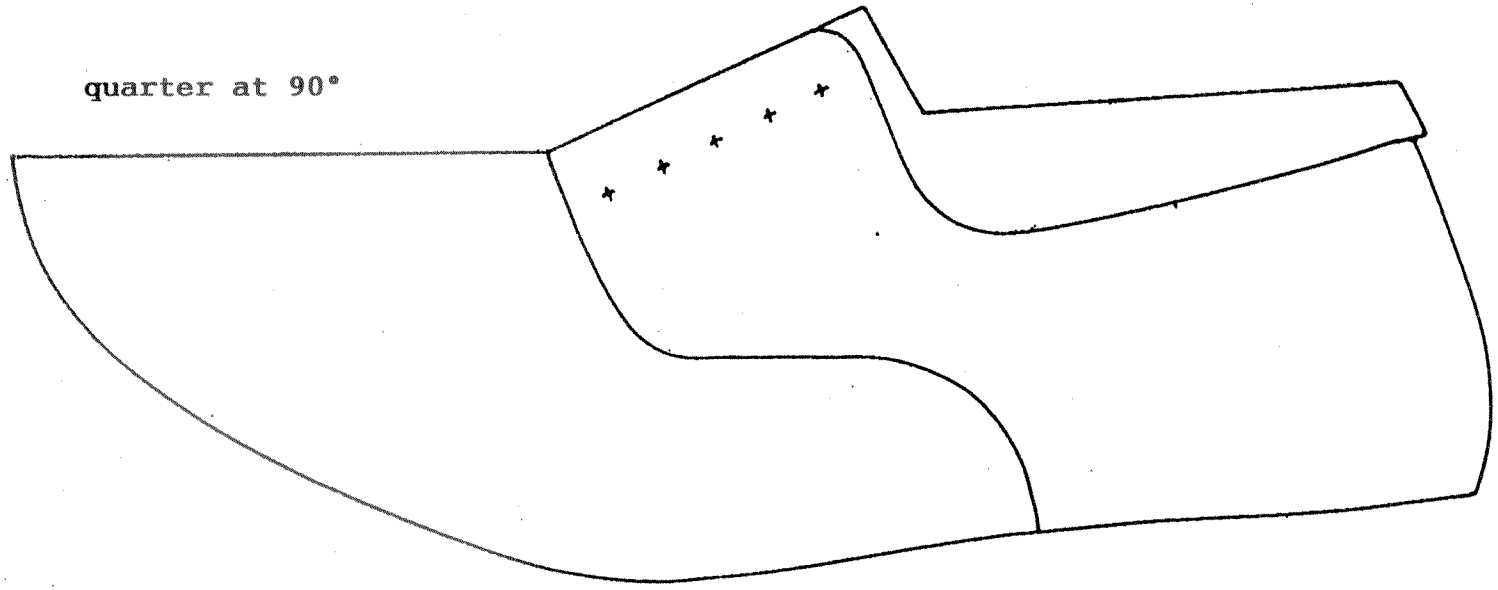
Plan showing inside lines different from outside lines



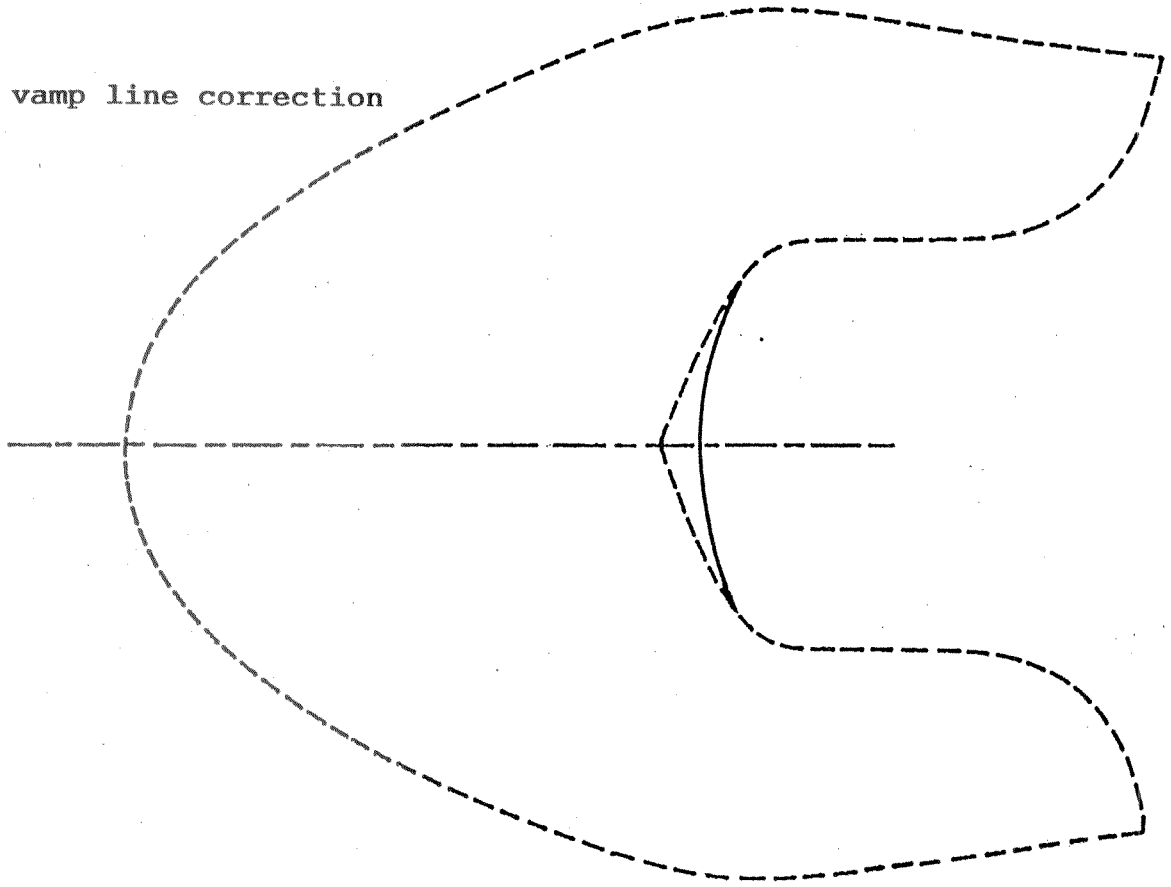
- - - - inside line

——— outside line

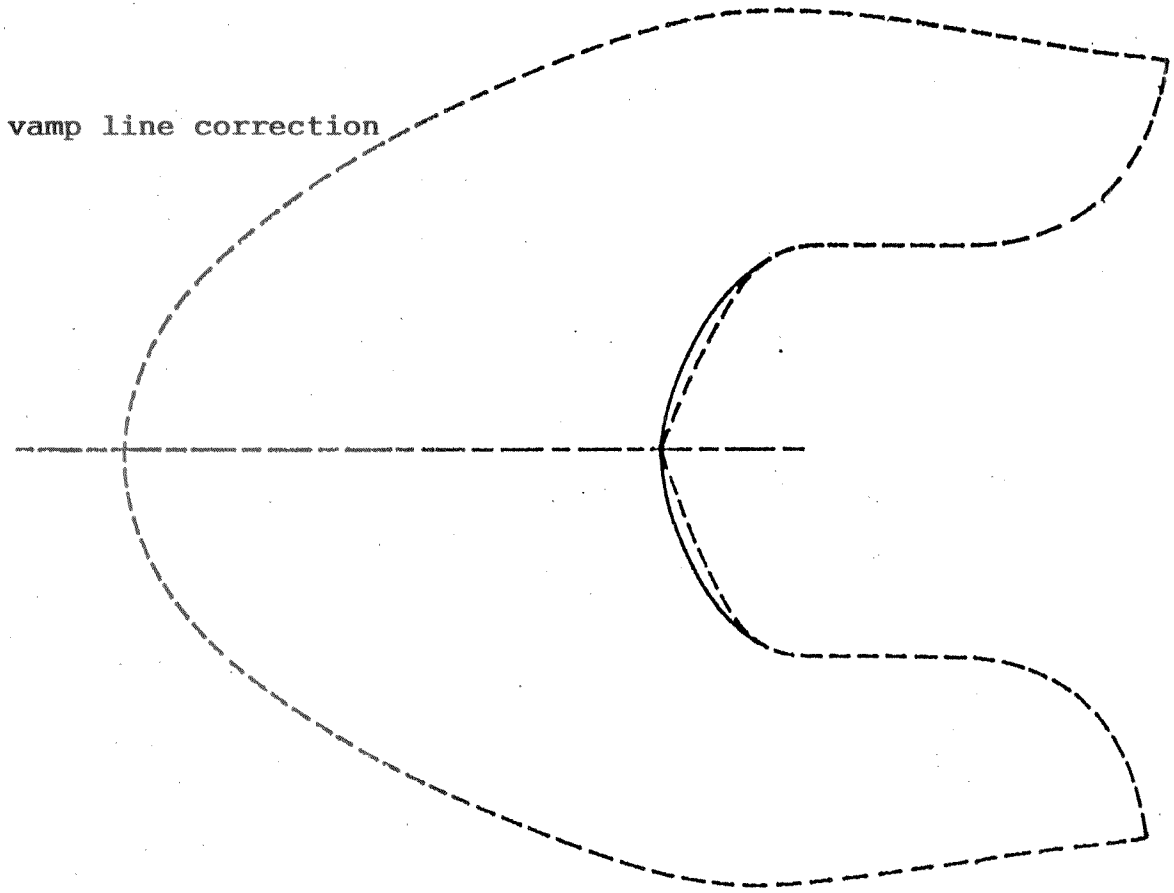
MEN'S OXFORD SHOE - MODEL PLAN



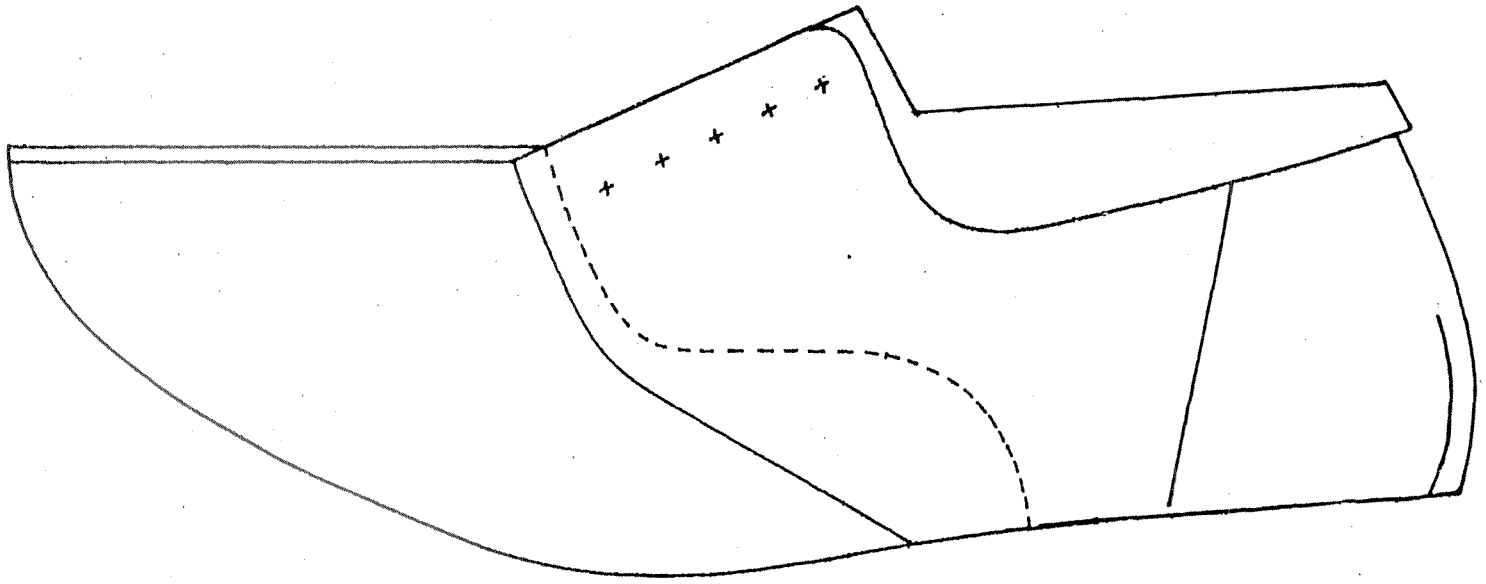
MEN'S OXFORD SHOE - DETAIL PATTERN (UPPER)



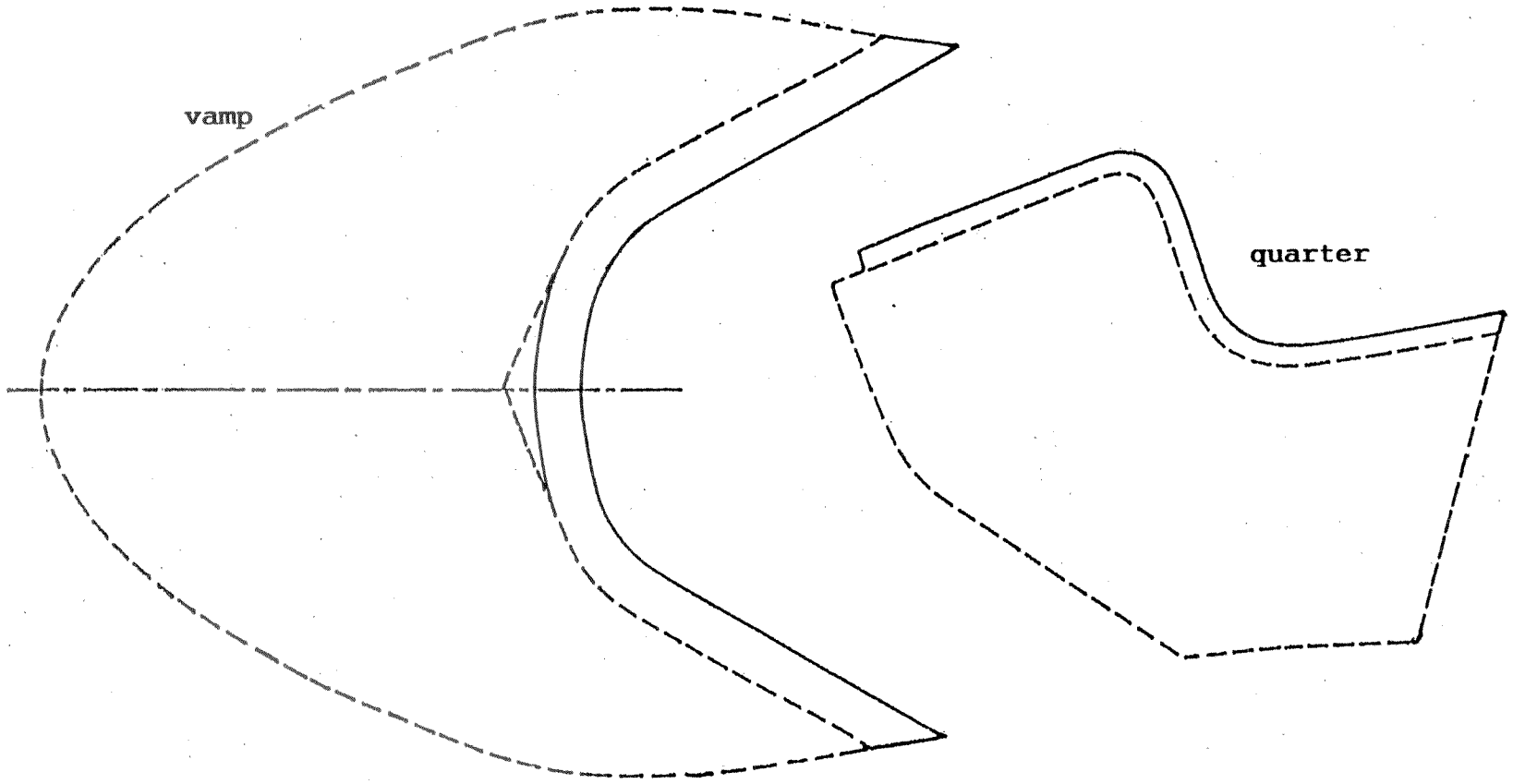
MEN'S OXFORD SHOE - DETAIL PATTERN (UPPER)



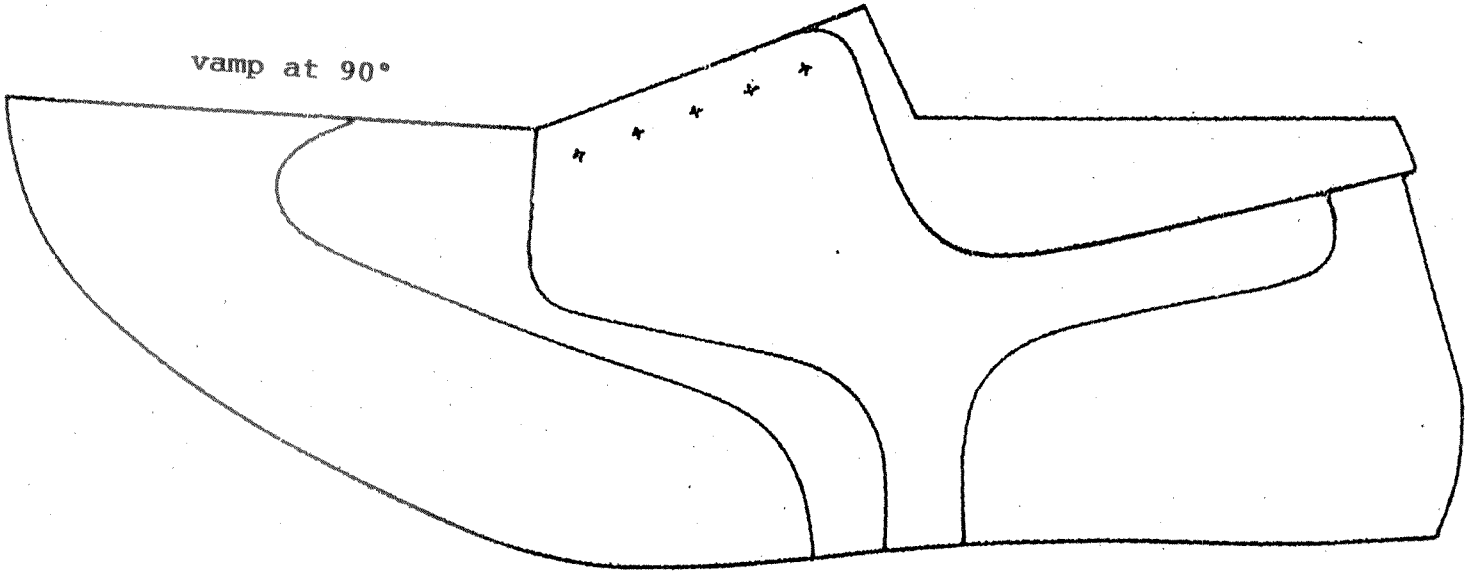
MEN'S OXFORD SHOE - LINING PLAN



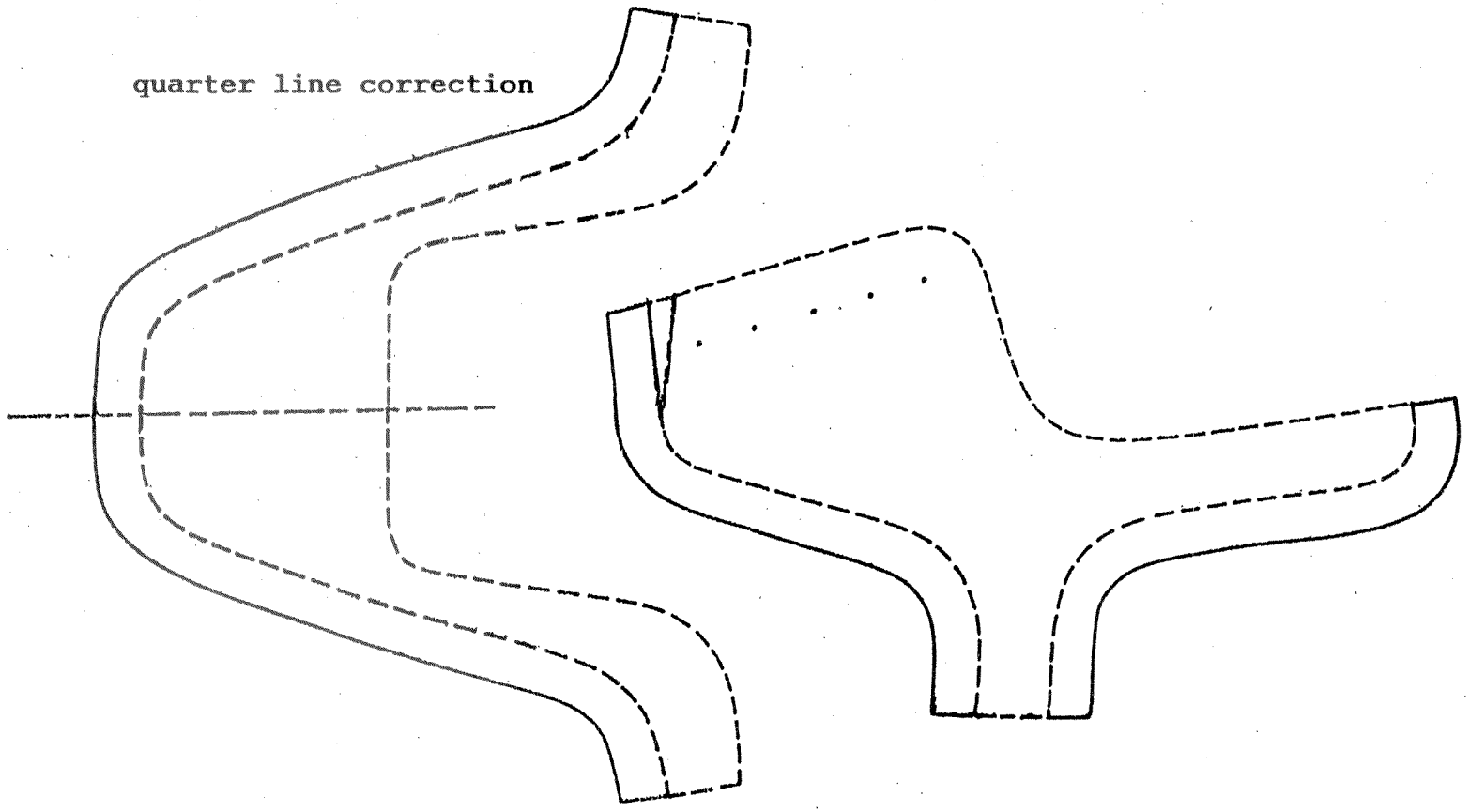
MEN'S OXFORD SHOE - DETAIL PATTERNS (LINING)



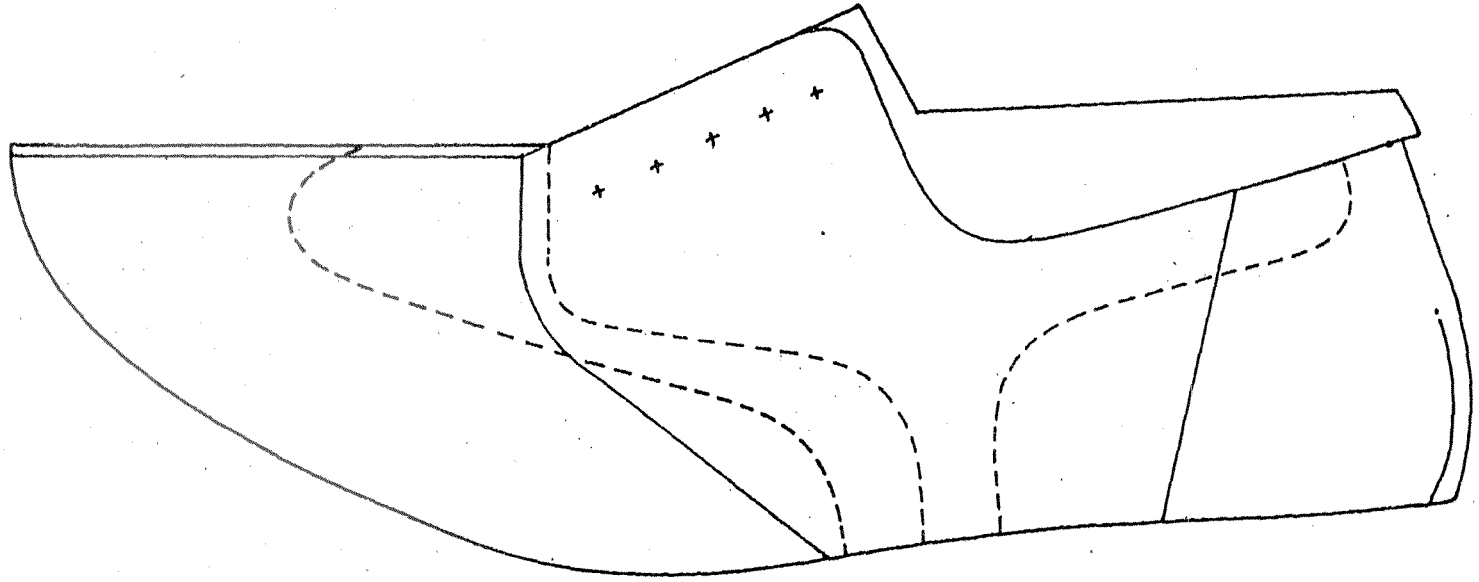
MEN'S BROGUE GIBSON SHOE - MODEL PLAN



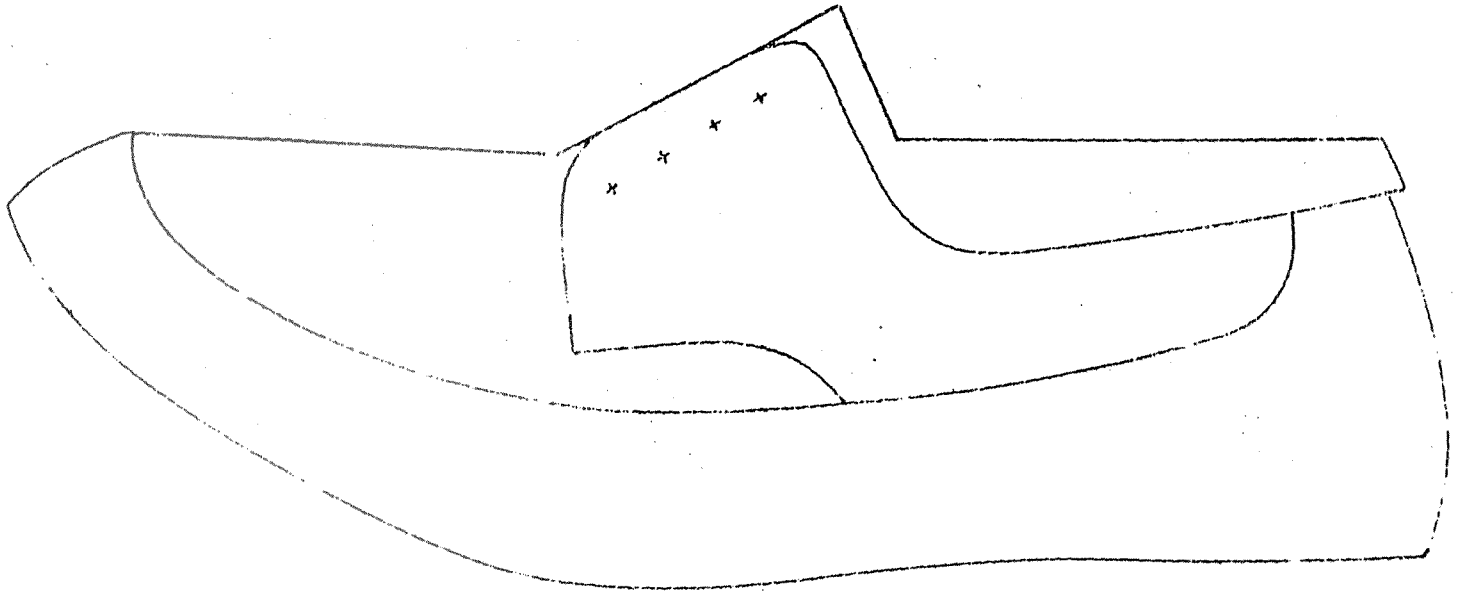
MEN'S BROGUE GIBSON SHOE - DETAIL PATTERNS (UPPER)



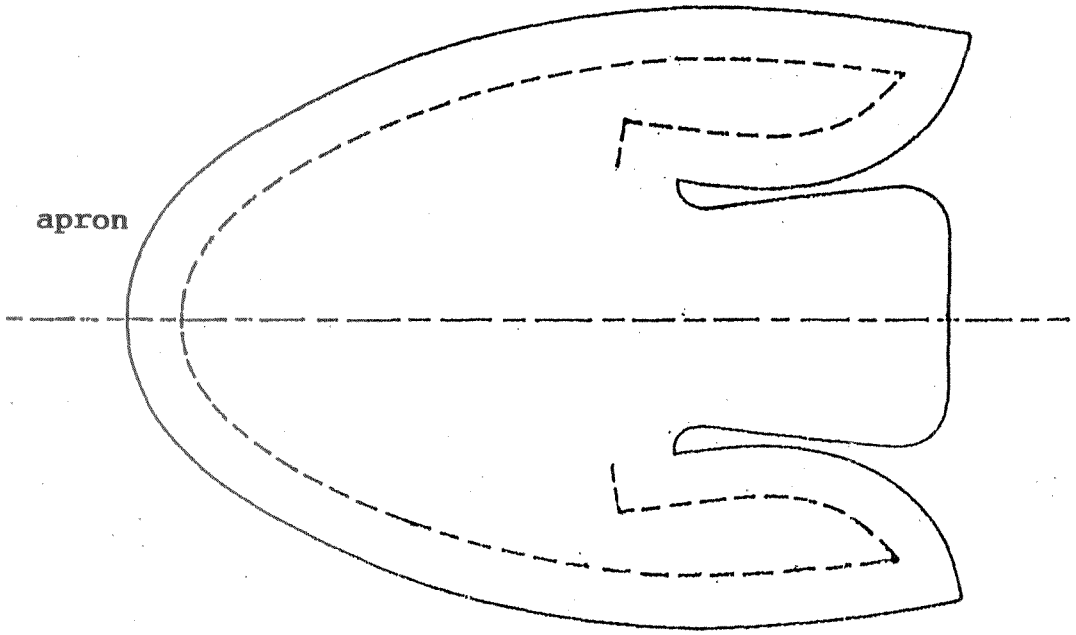
MEN'S BROGUE GIBSON SHOE - LINING PLAN



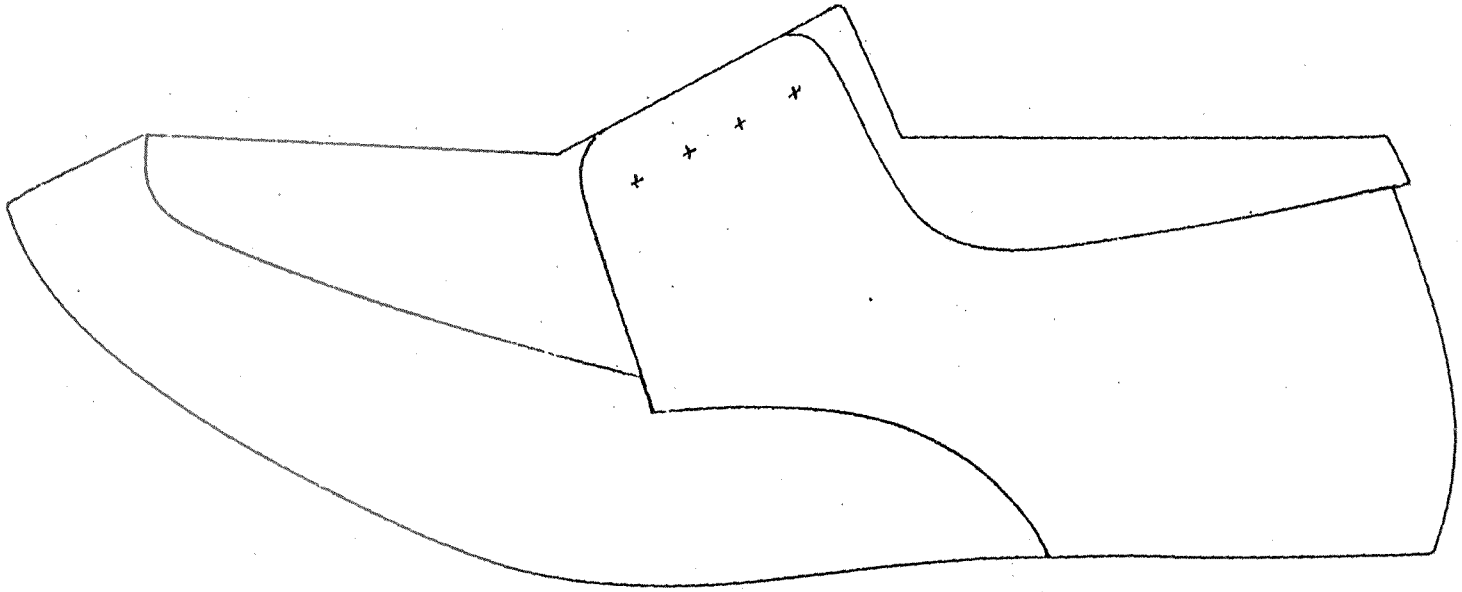
MEN'S AND GENTS STYLE (A) MODEL PLAN



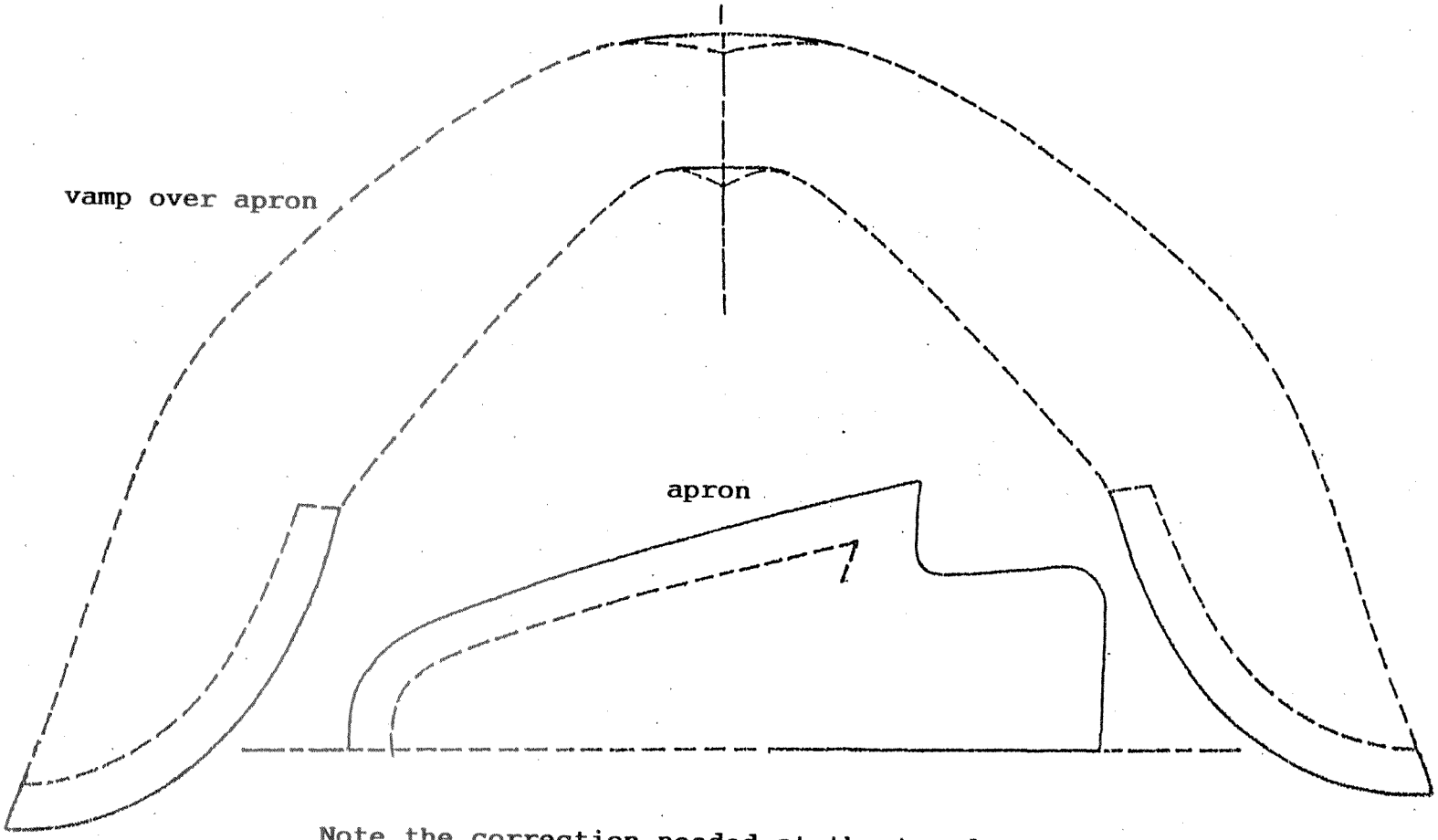
MEN'S AND GENTS STYLE (A) DETAIL PATTERN



MEN'S AND GENTS STYLE (B) MODEL PLAN

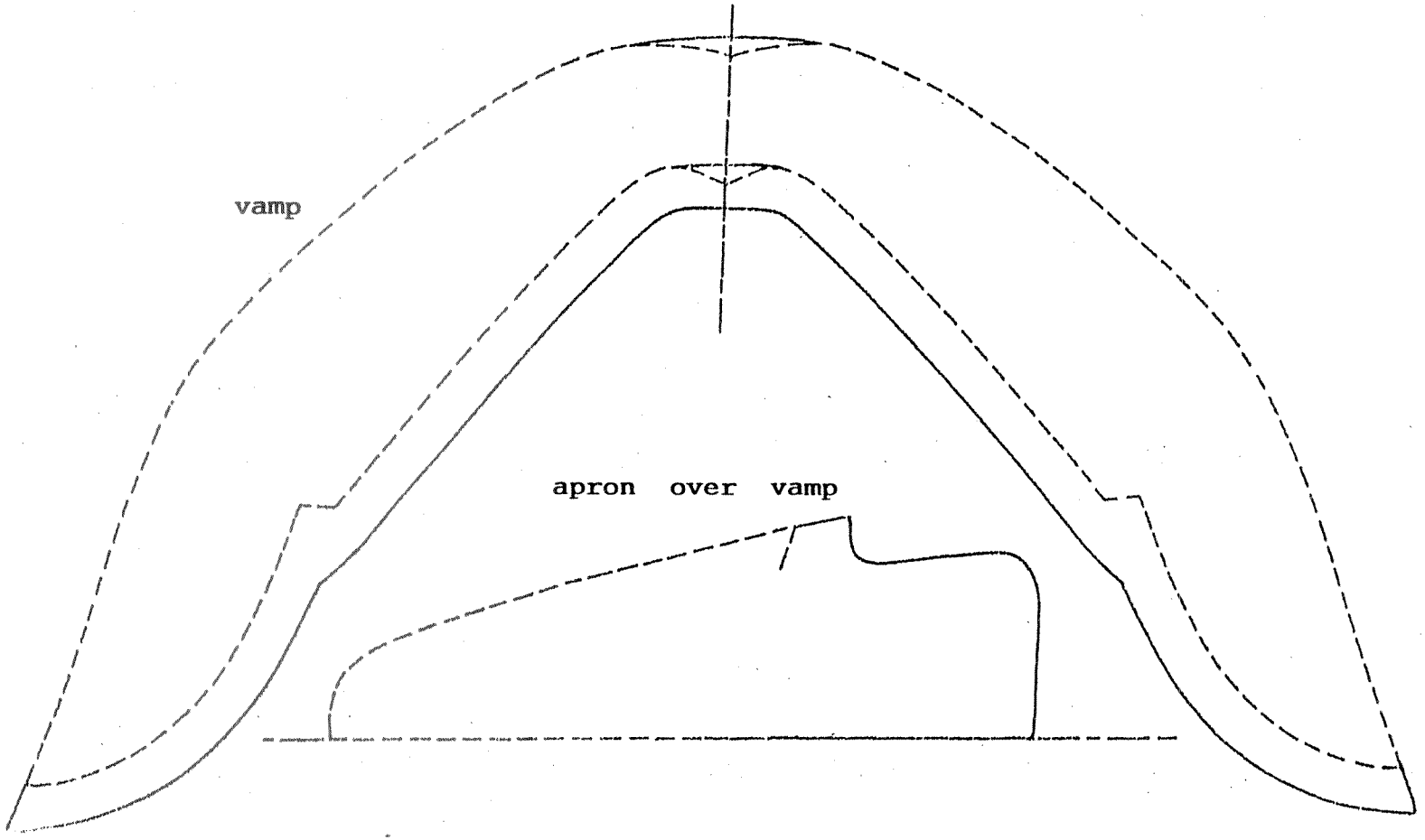


MEN'S AND GENTS STYLE (B) DETAIL PATTERN



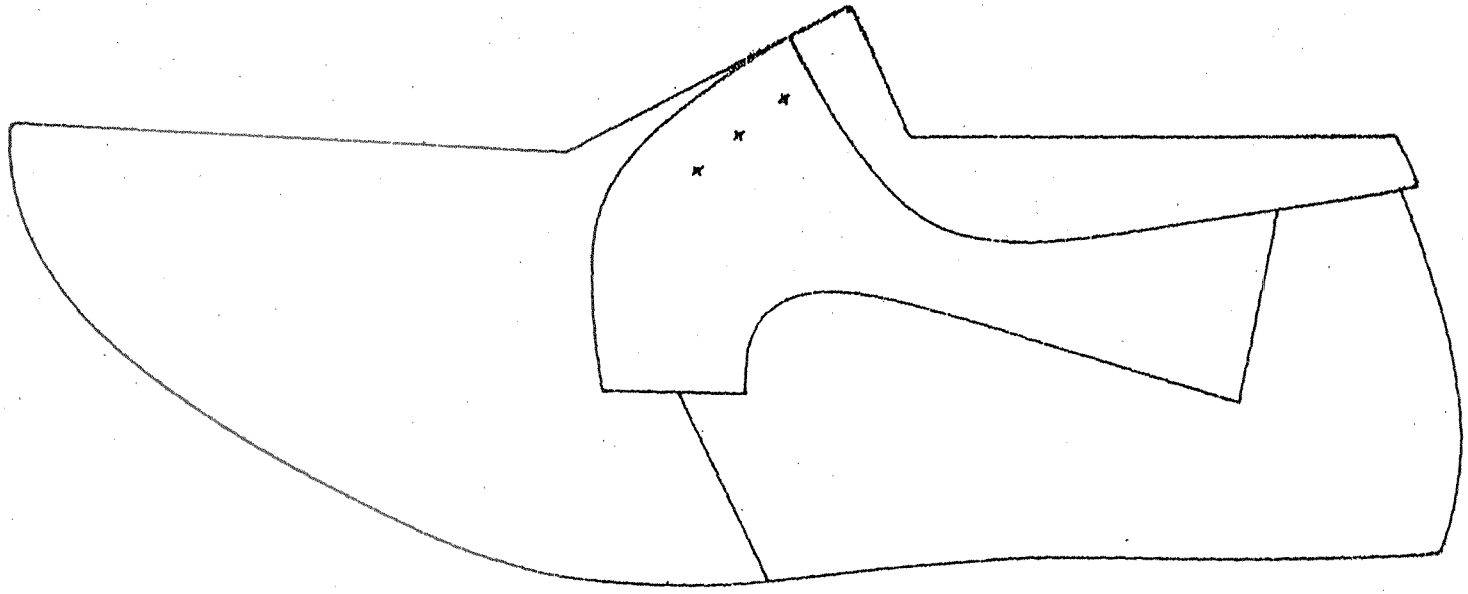
Note the correction needed at the toe due to the opening of the vamp

MEN'S AND GENTS STYLE (B) DETAIL PATTERN

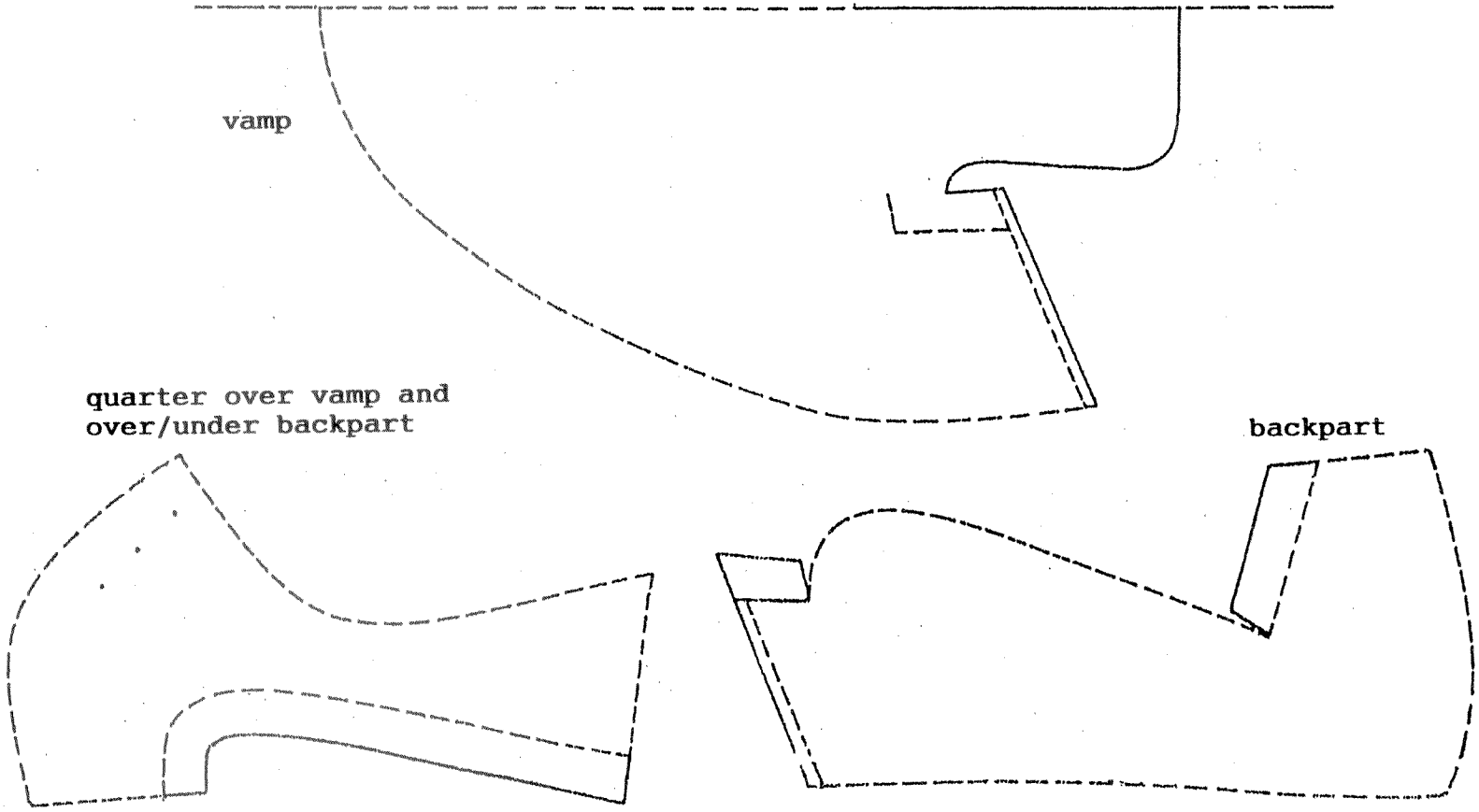


Note the correction needed at the toe due to the opening of the vamp

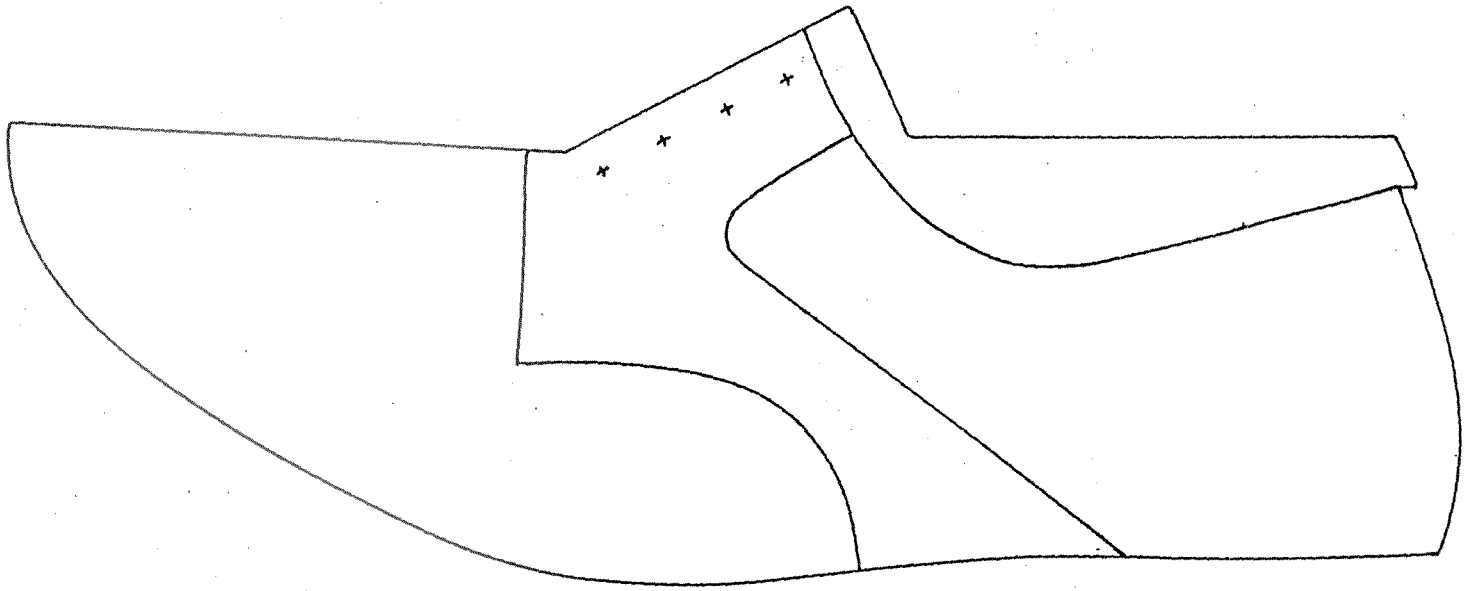
MEN'S AND GENTS STYLE (C) MODEL PLAN



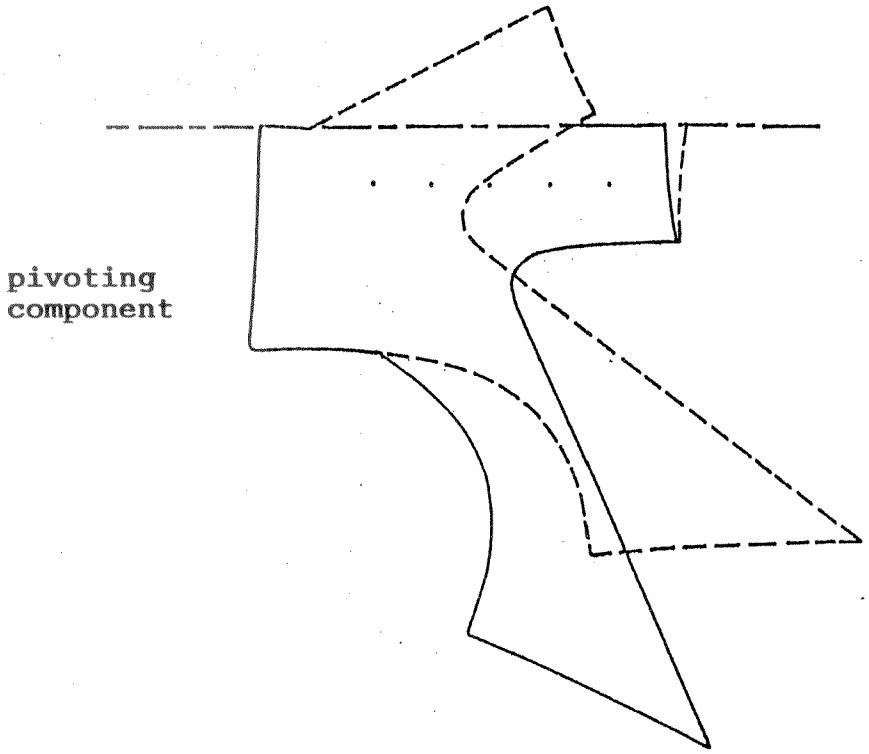
MEN'S AND GENTS STYLE (C) DETAIL PATTERN



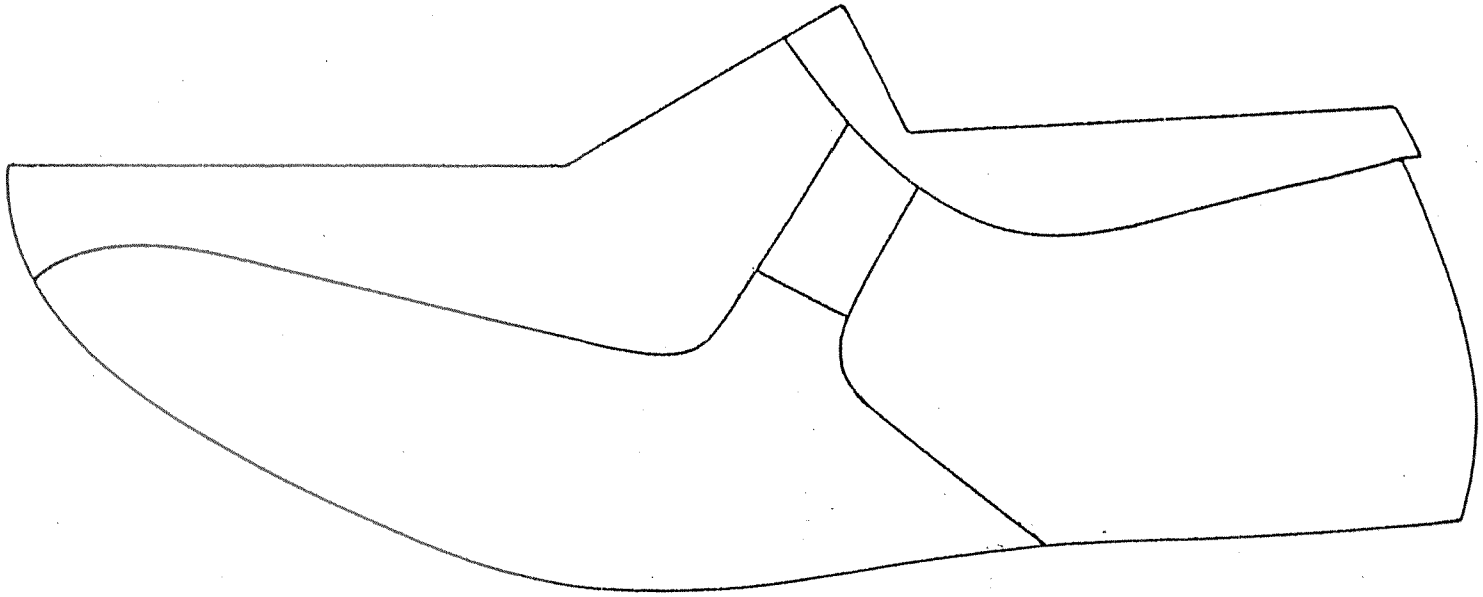
MEN'S AND GENTS STYLE (D) MODEL PLAN



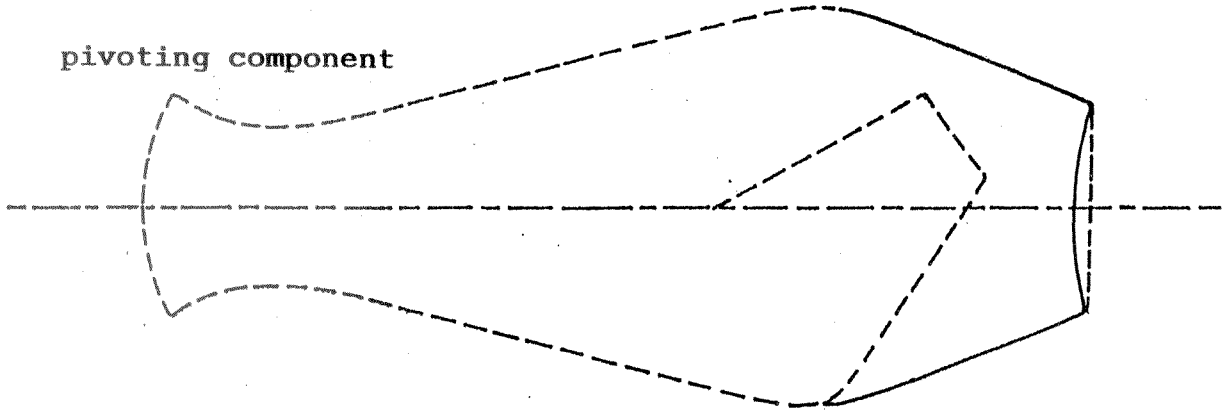
MEN'S AND GENTS STYLE (D) **DETAIL PATTERN**



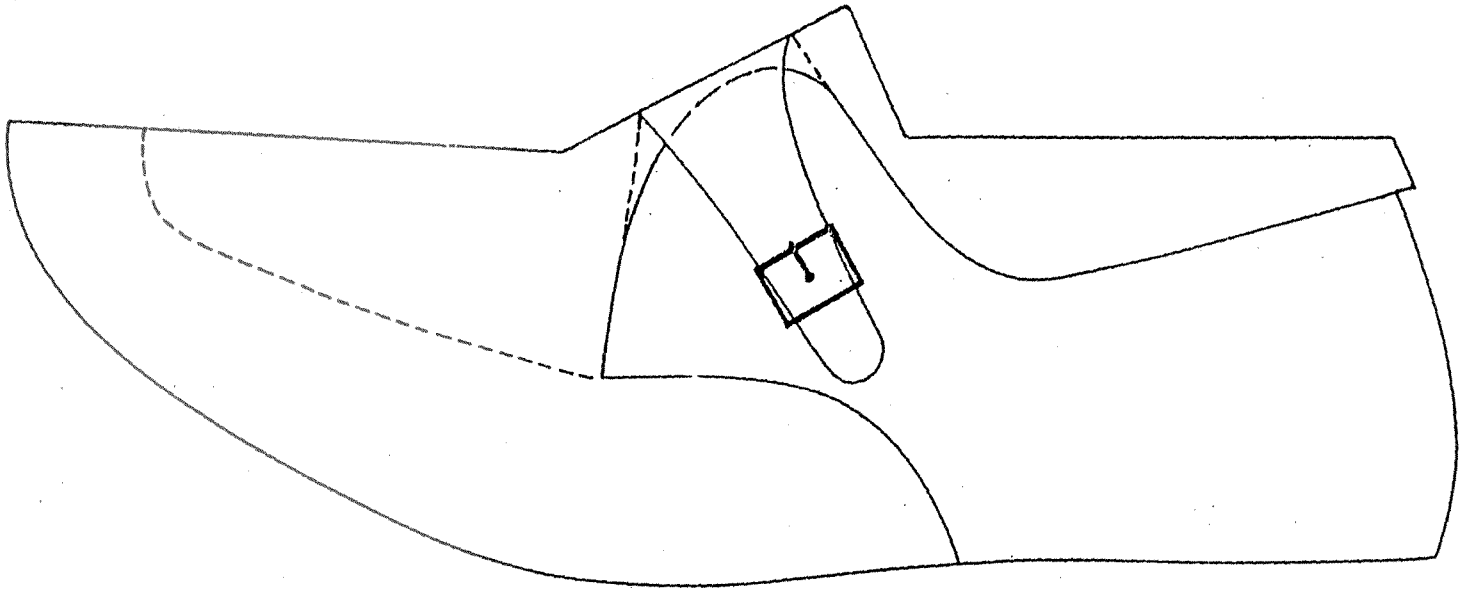
MEN'S AND GENTS STYLE (D) MODEL PLAN



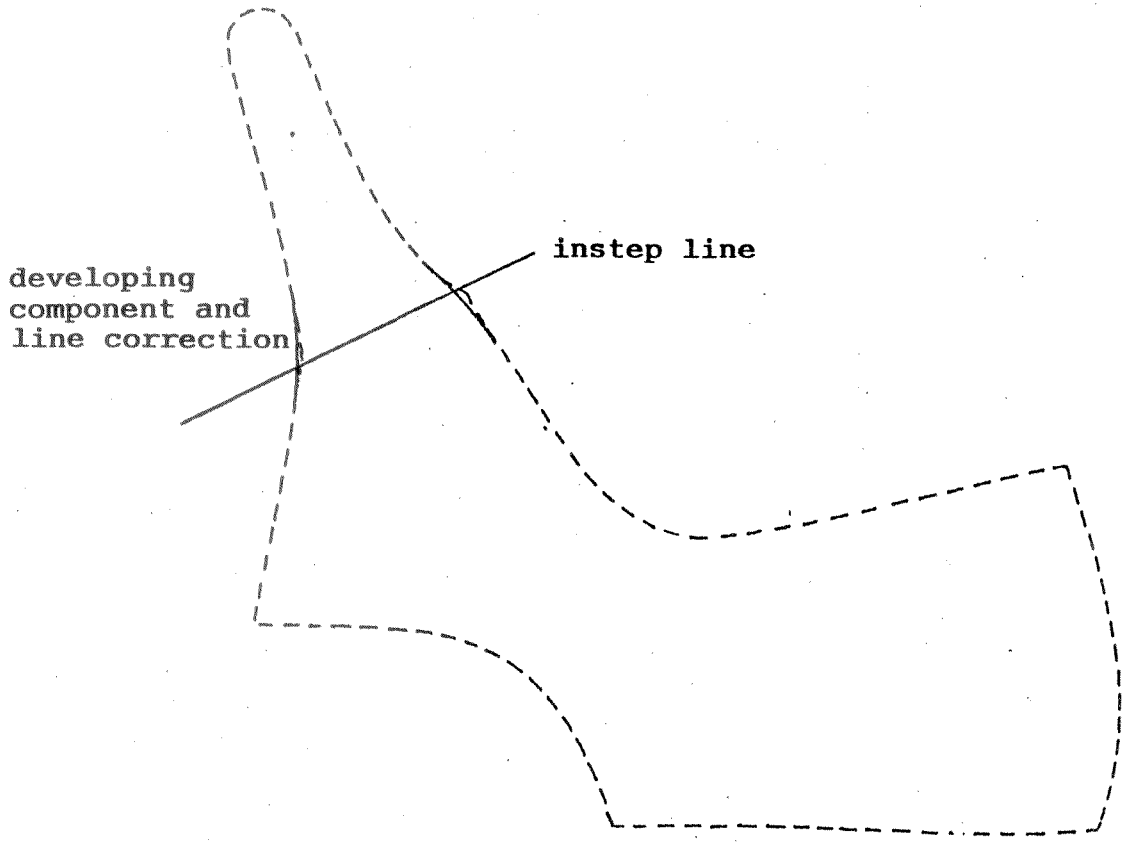
MEN'S AND GENTS STYLE (D) DETAIL PATTERN



MEN'S AND GENTS STYLE (F) MODEL PLAN

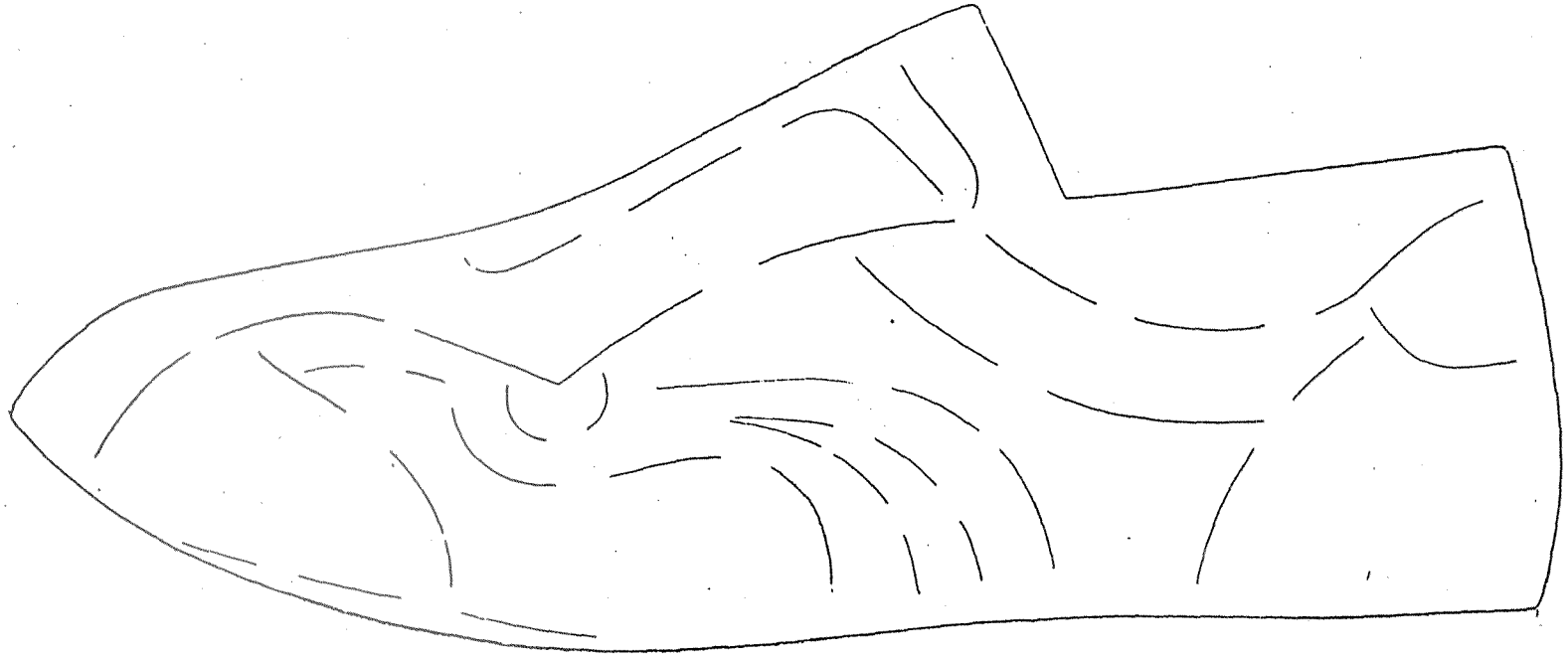


MEN'S AND GENTS STYLE (F) DETAIL PATTERN

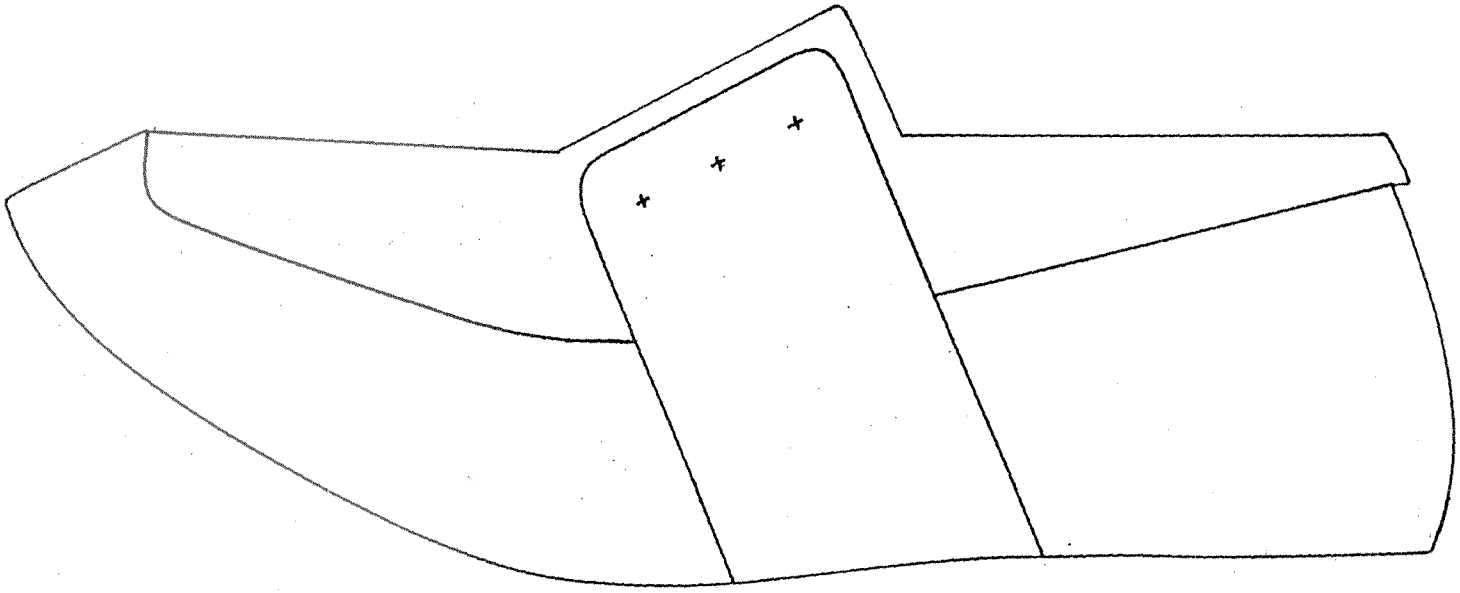


MEN'S AND GENTS STYLE (G) MODEL PLAN

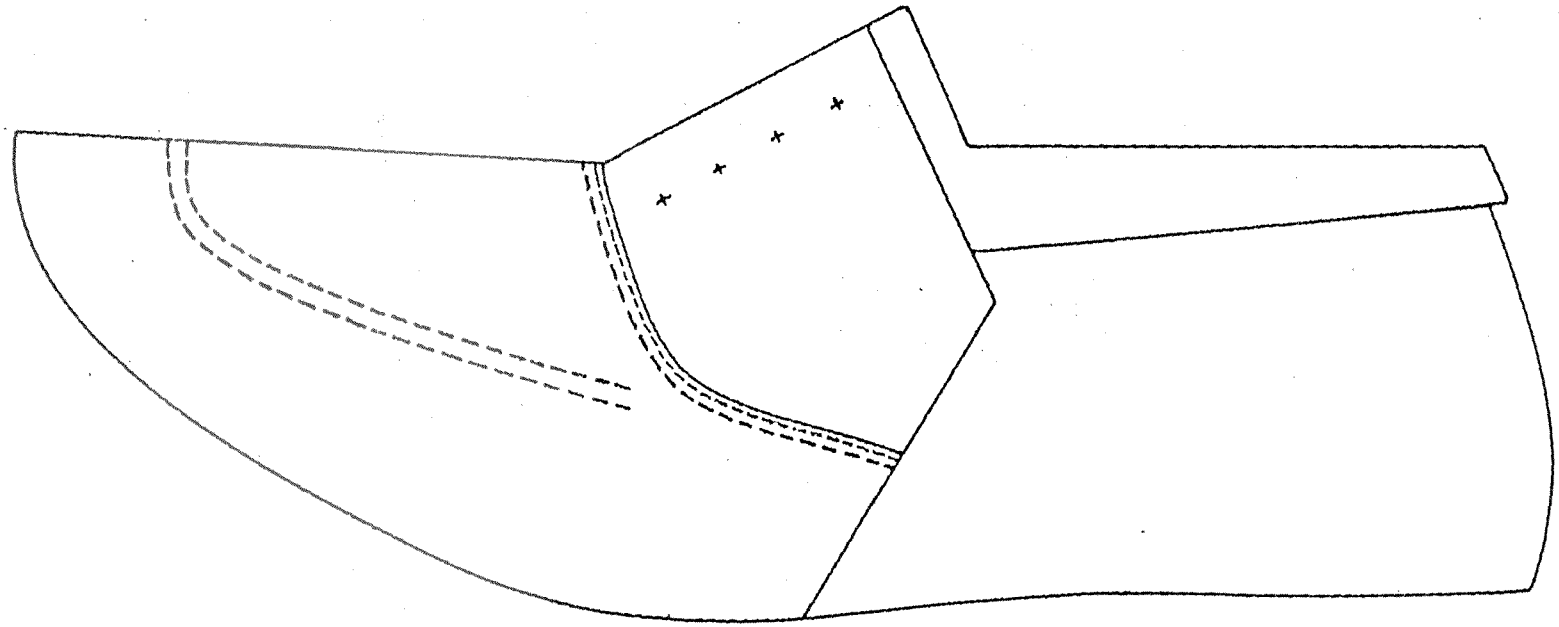
SPORT SHOE - STANDARD PLAN



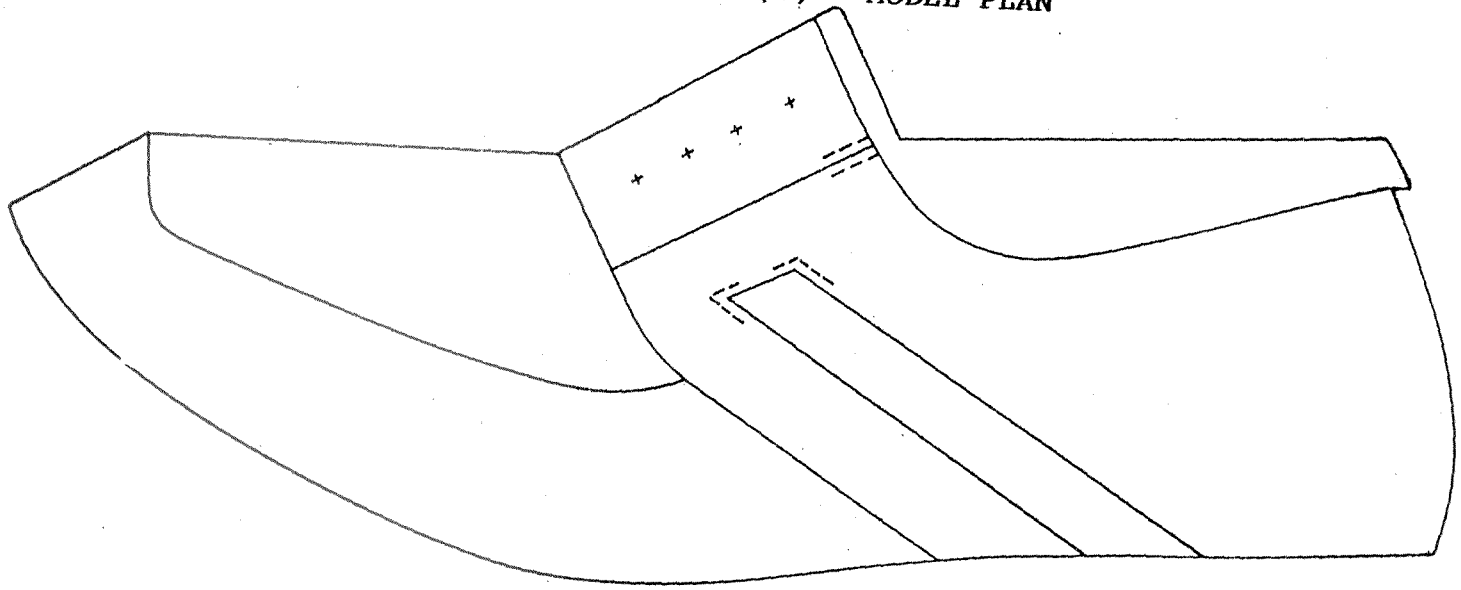
MEN'S AND GENTS STYLE (H) MODEL PLAN



MEN'S AND GENTS STYLE (I) MODEL PLAN



MEN'S AND GENTS TYLE (J) MODEL PLAN



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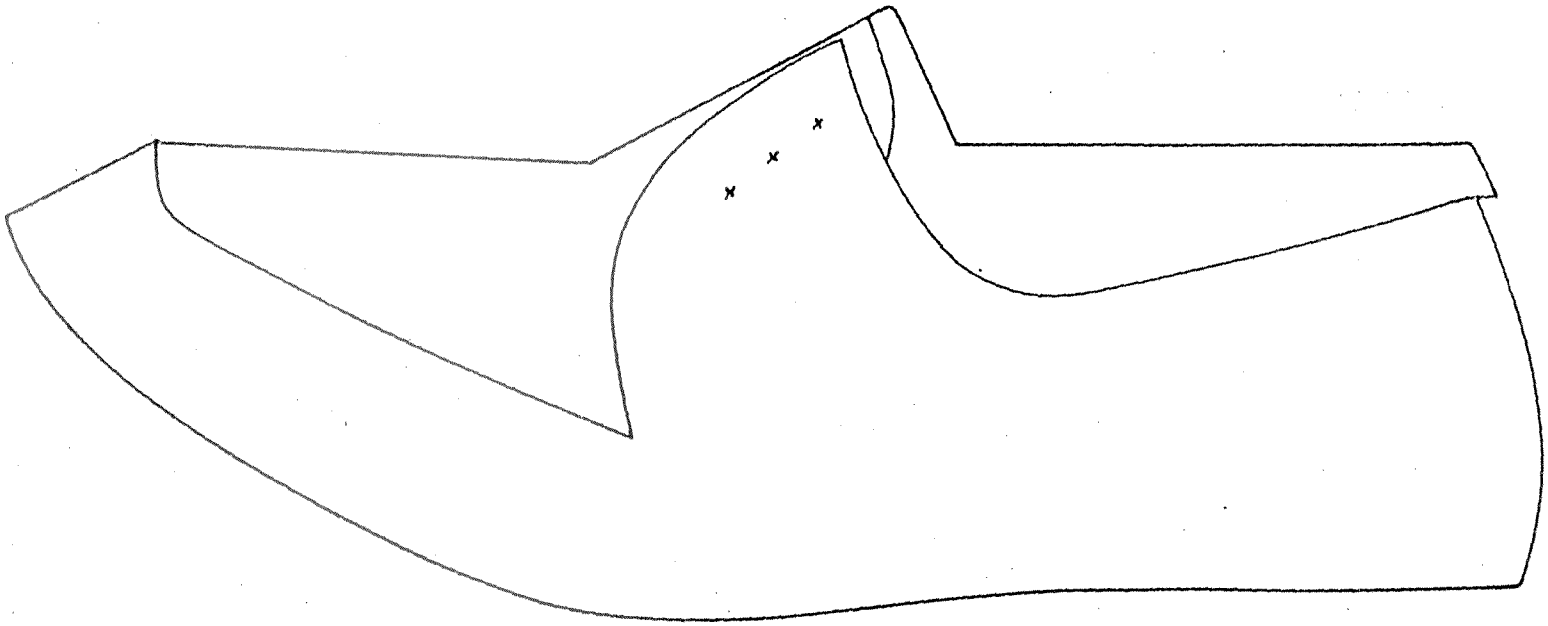
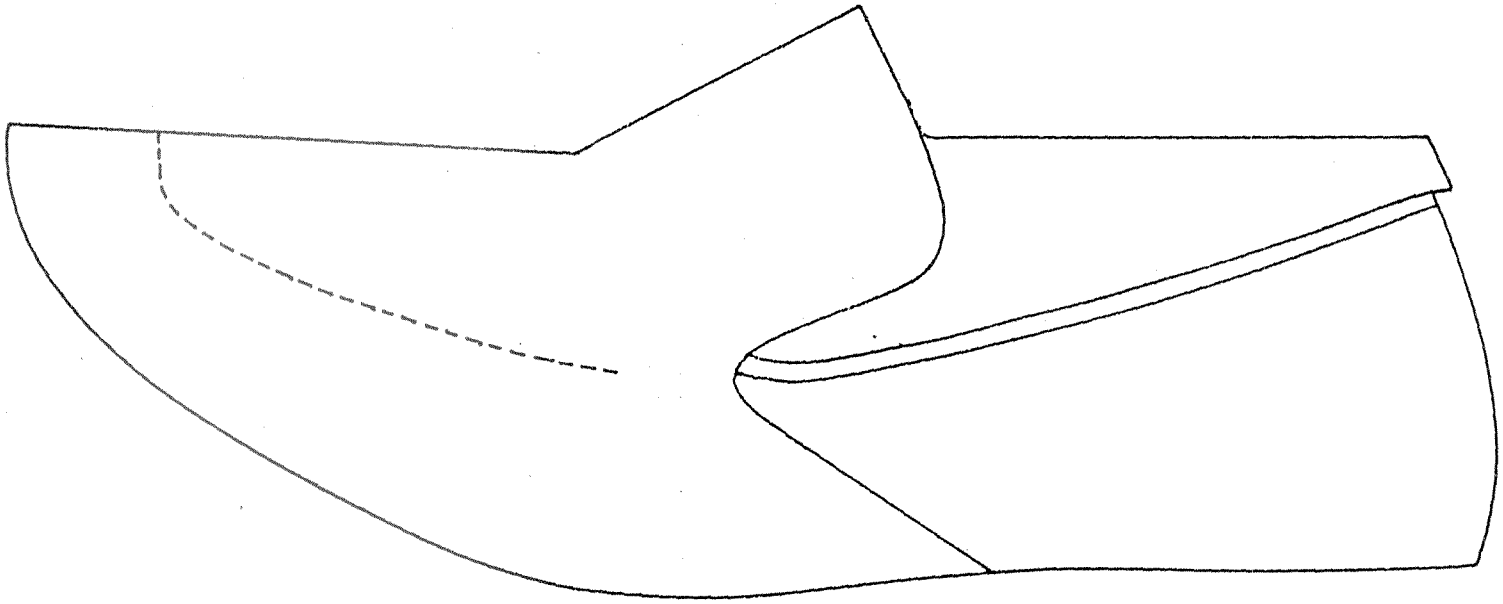
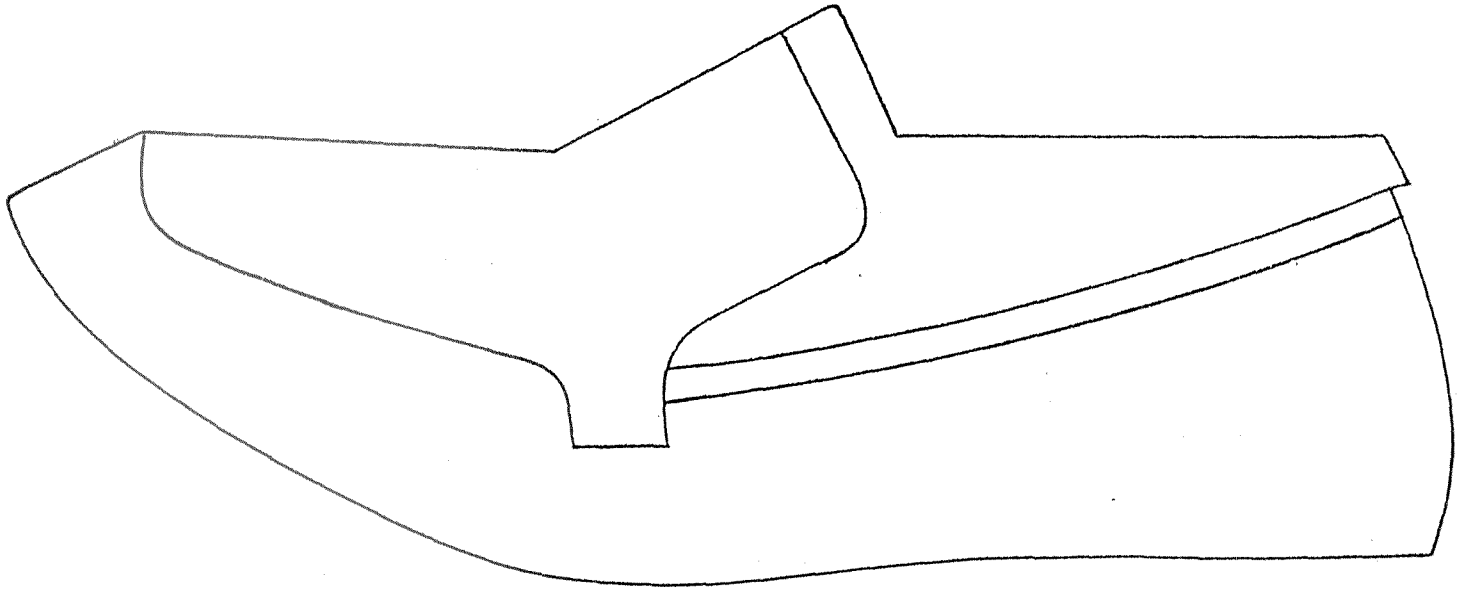


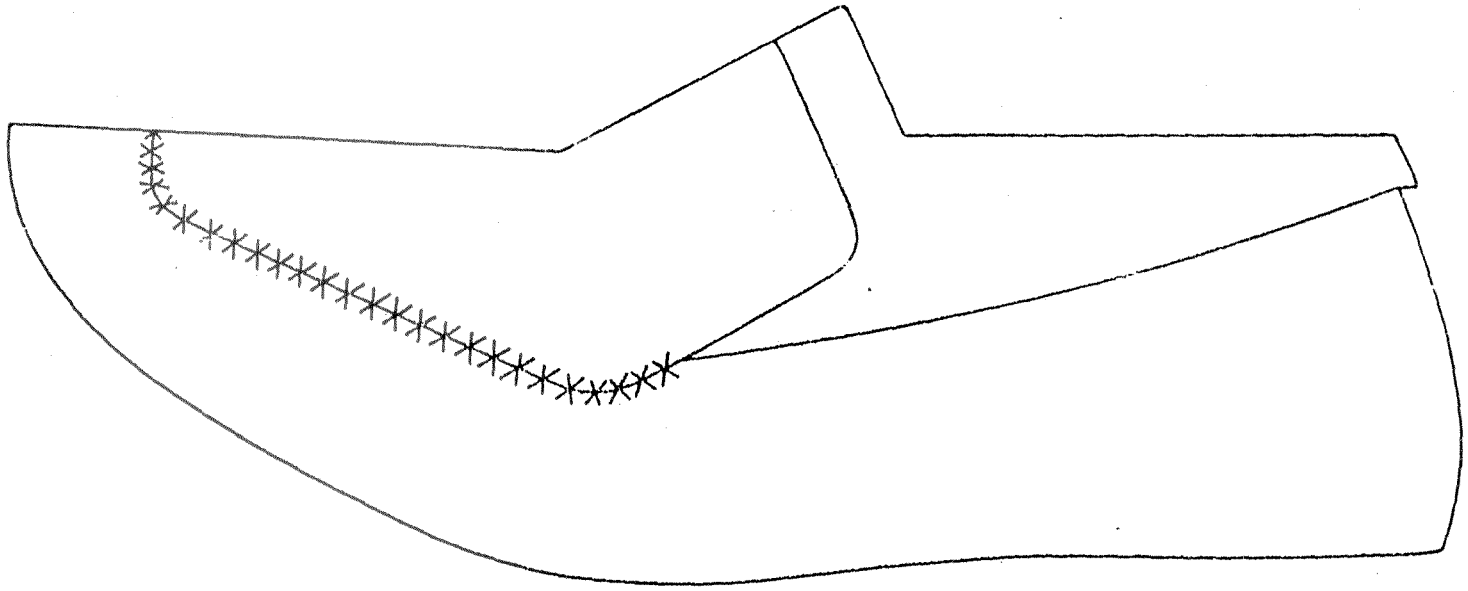
MEN'S AND GENTS STYLE (L) MODEL PLAN



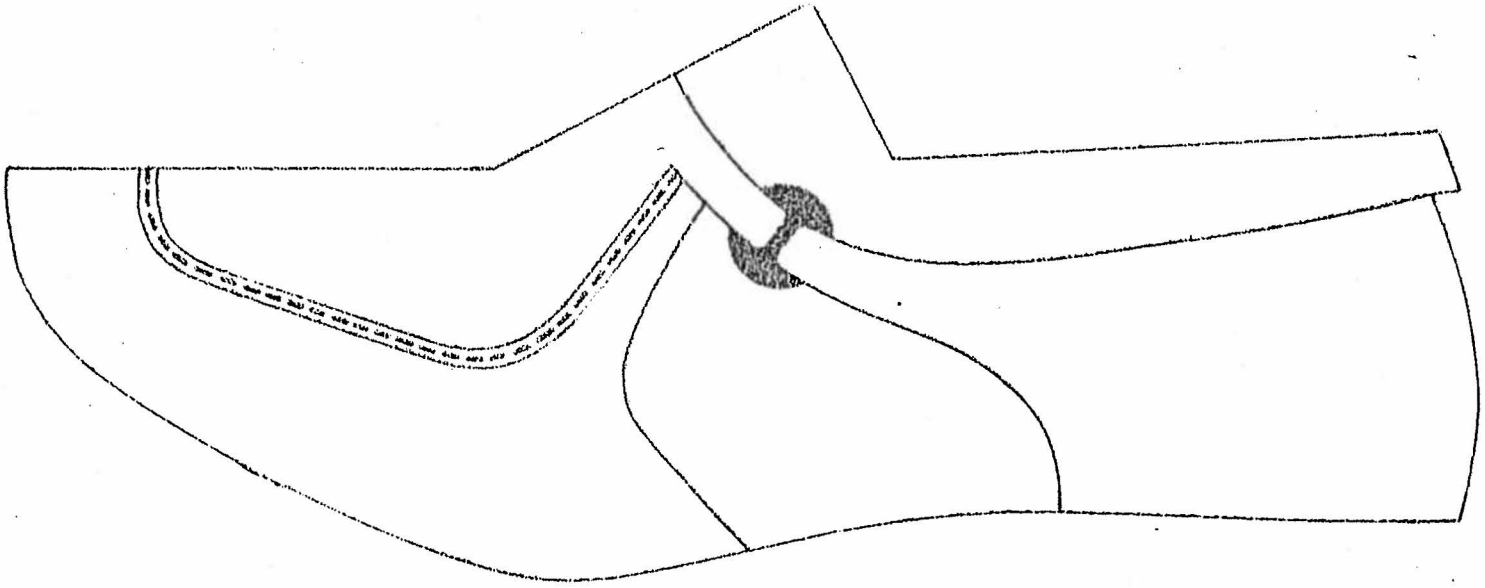
MEN'S AND GENTS STYLE (M) MODEL PLAN



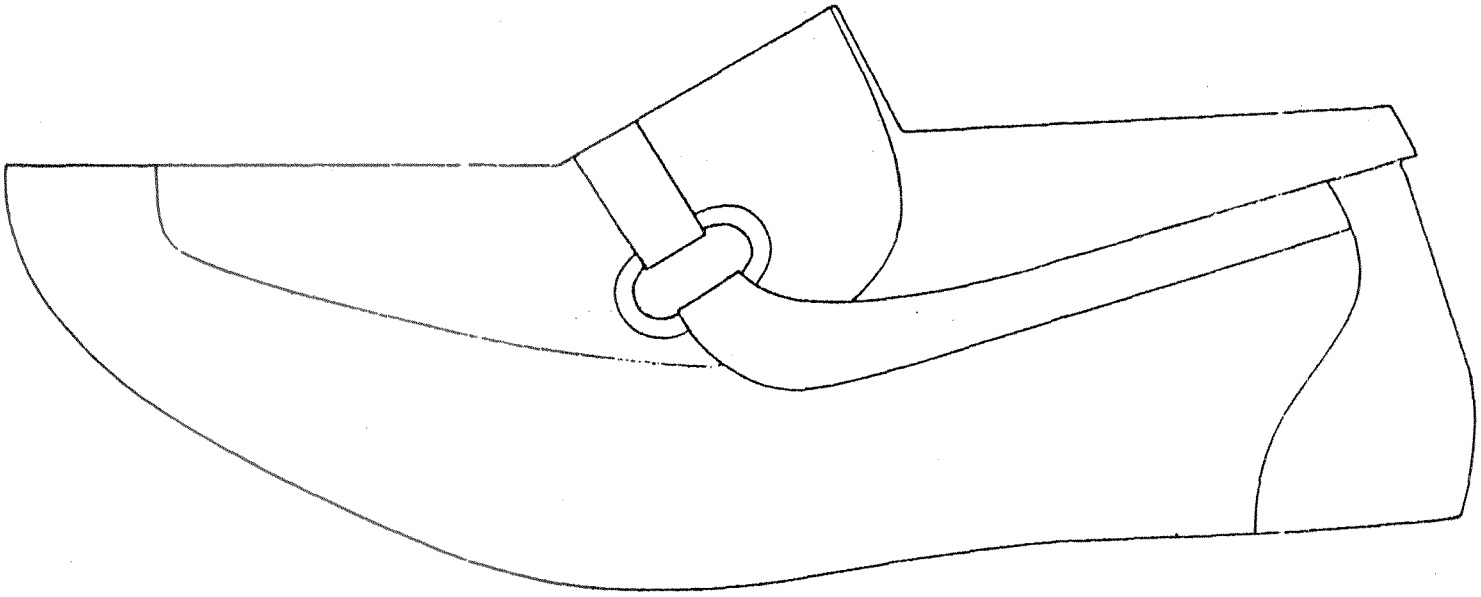
MEN'S AND GENTS STYLE (N) MODEL PLAN



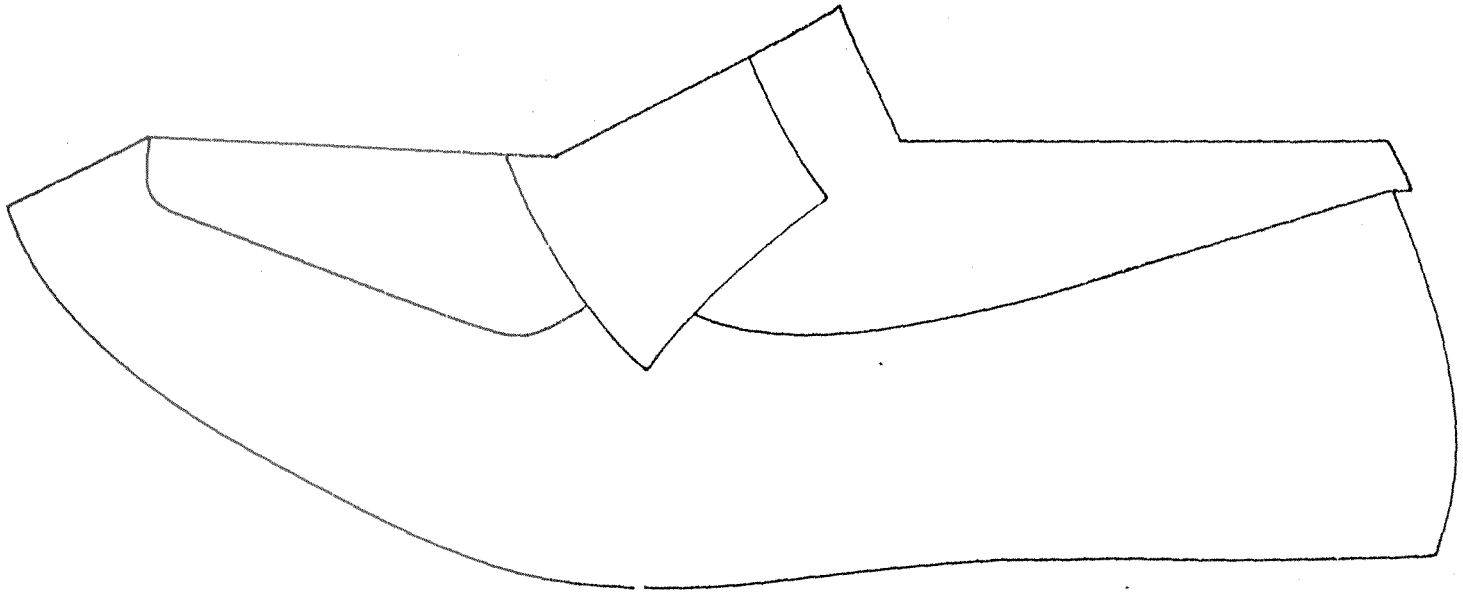
MEN'S AND GENTS STYLE (O) MODEL PLAN



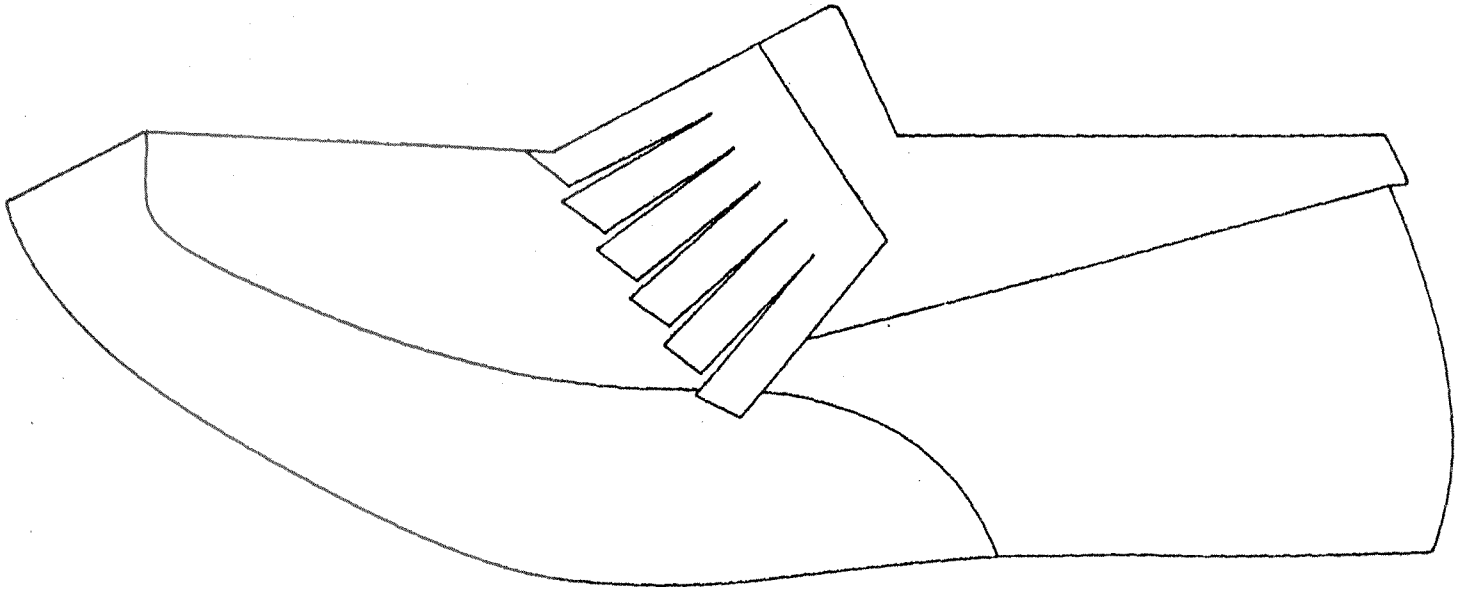
MEN'S AND GENTS STYLE (P) MODEL PLAN



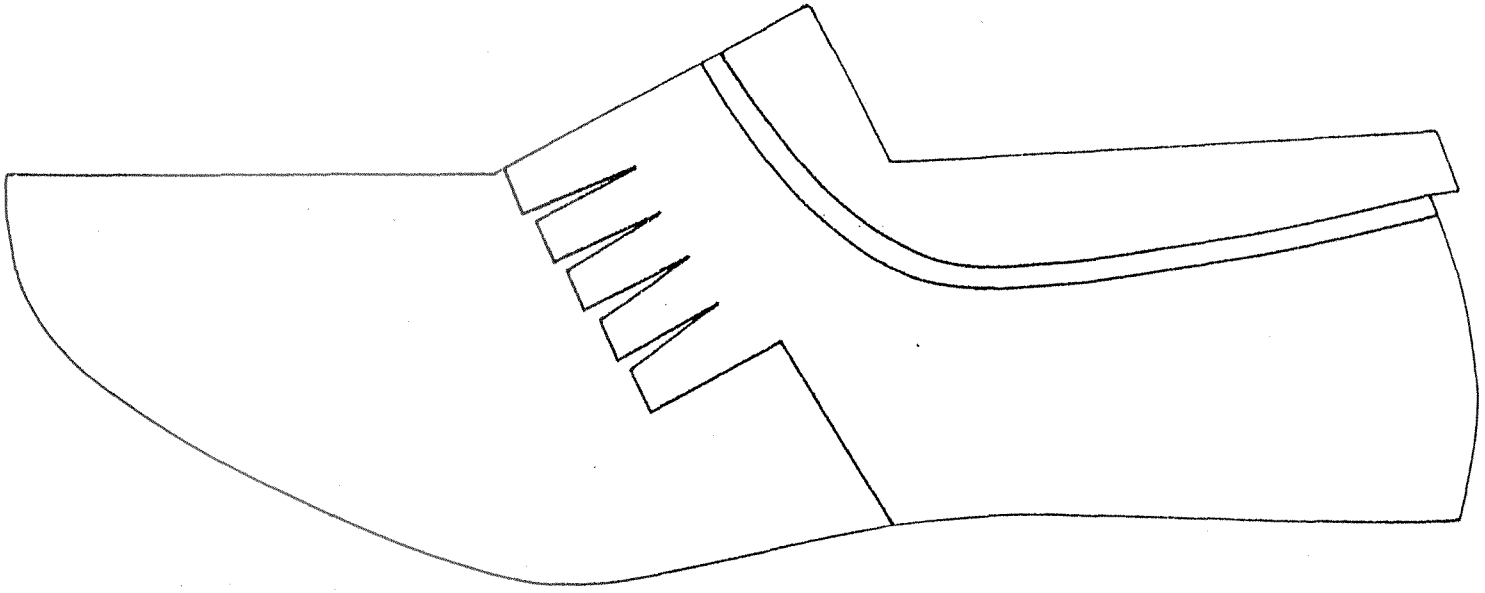
MEN'S AND GENTS STYLE (Q) MODEL PLAN



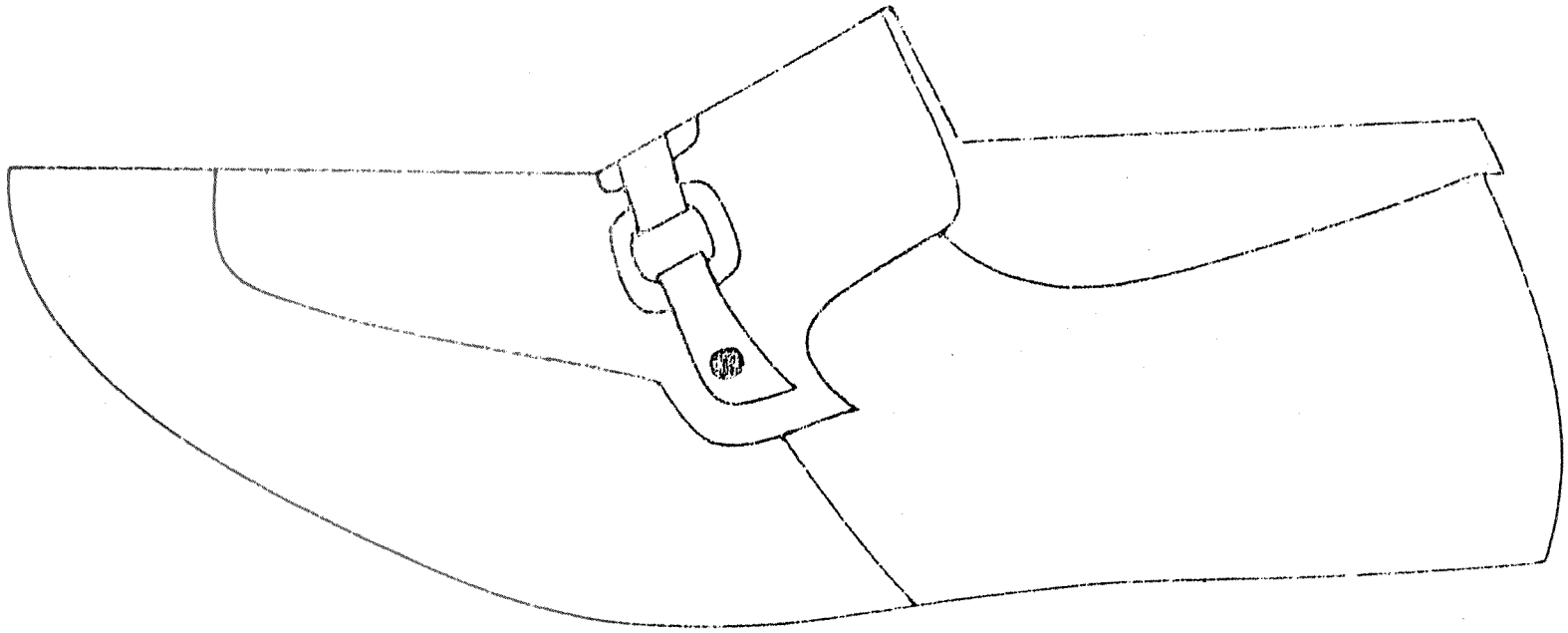
MEN'S AND GENTS STYLE (R) MODEL PLAN



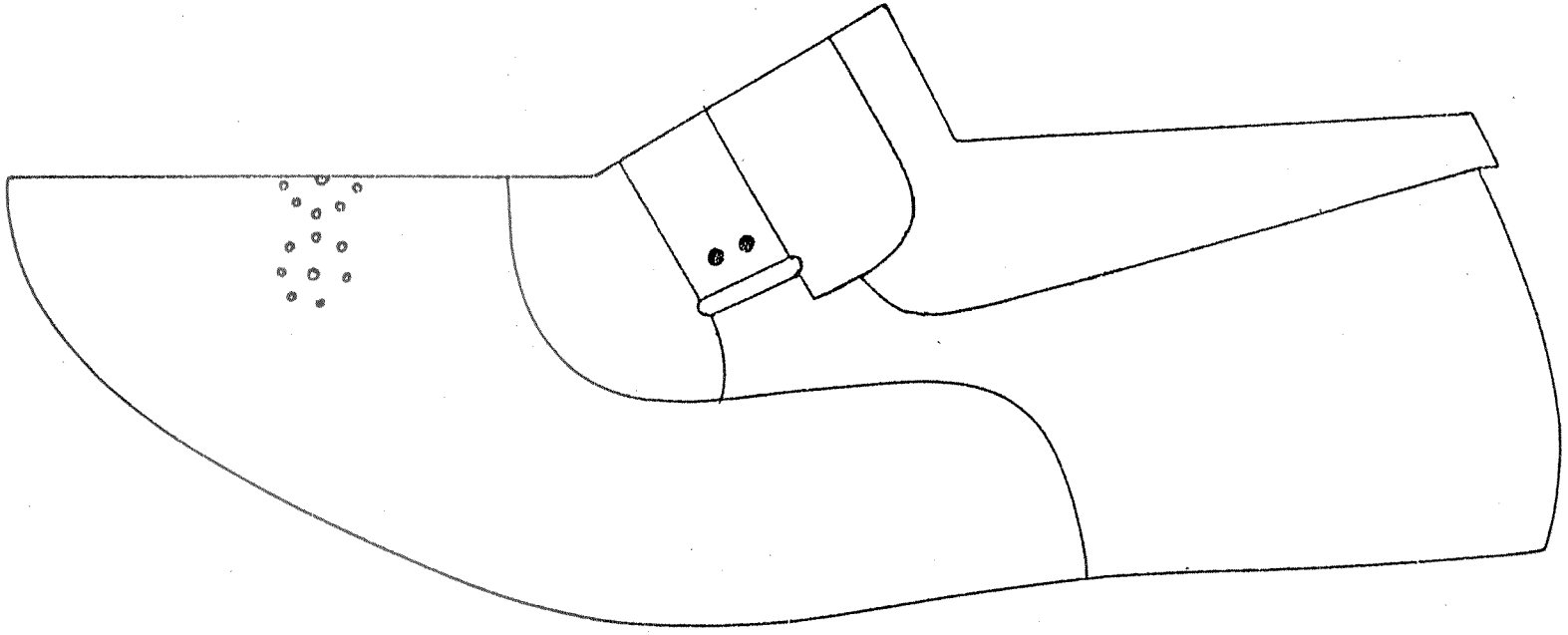
MEN'S AND GENTS STYLE (S) MODEL PLAN



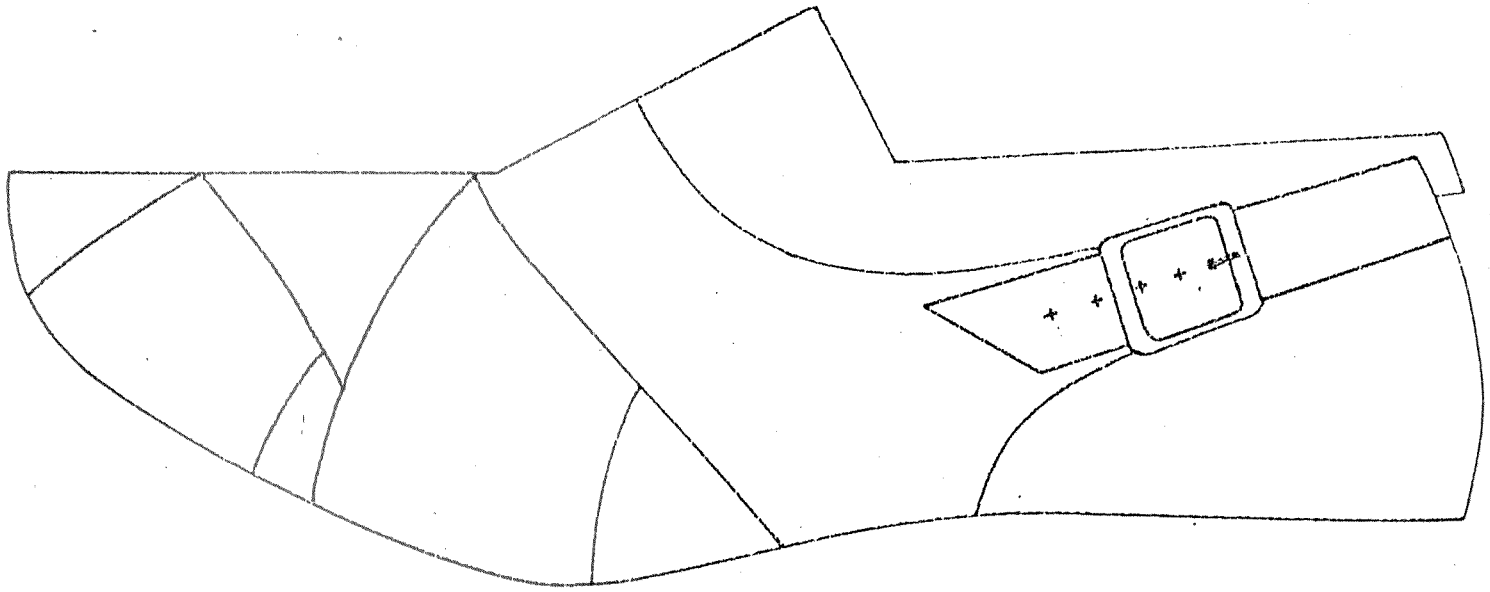
MEN'S AND GENTS STYLE (T) MODEL PLAN



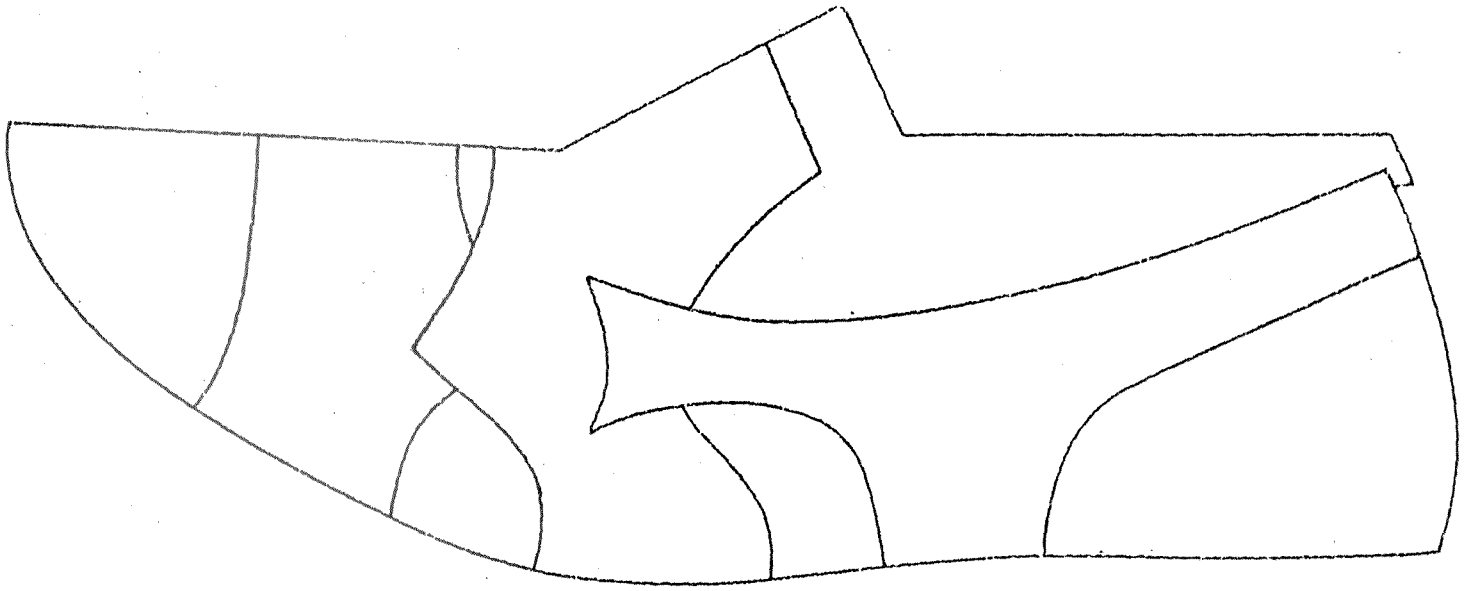
MEN'S AND GENTS STYLE (U) MODEL PLAN



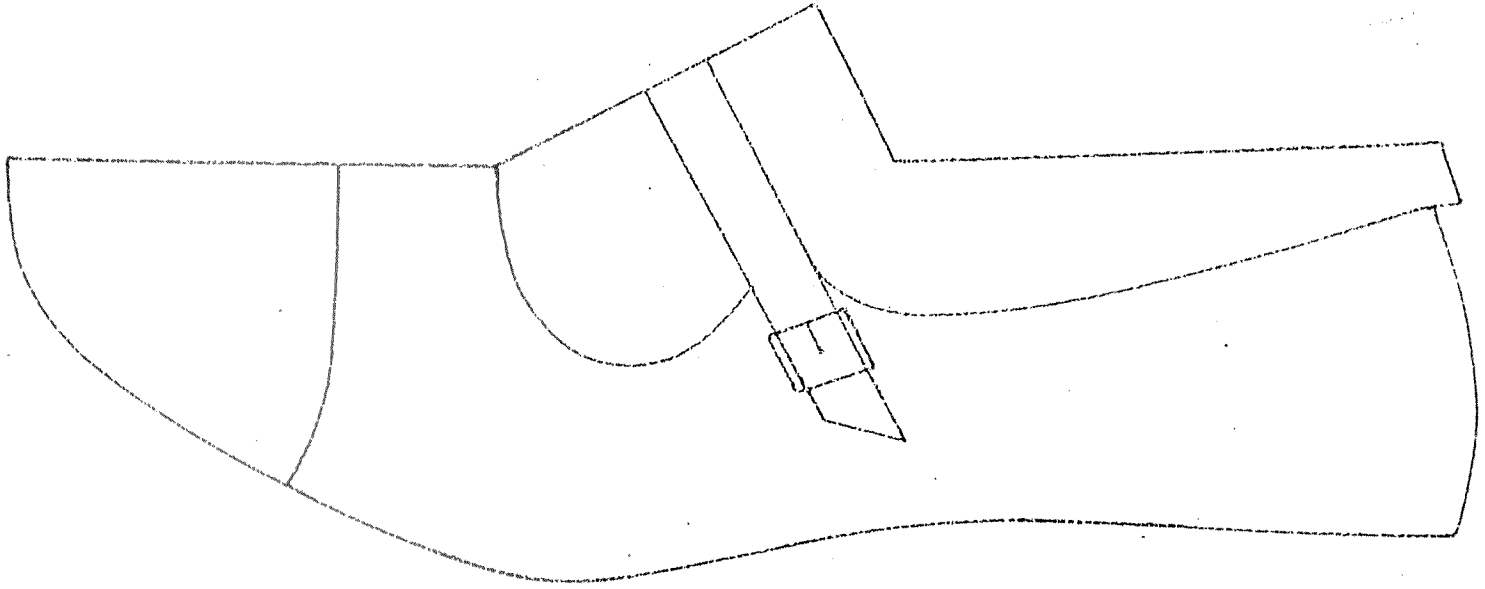
SANDAL TYPE SHOE STYLE A MODEL PLAN



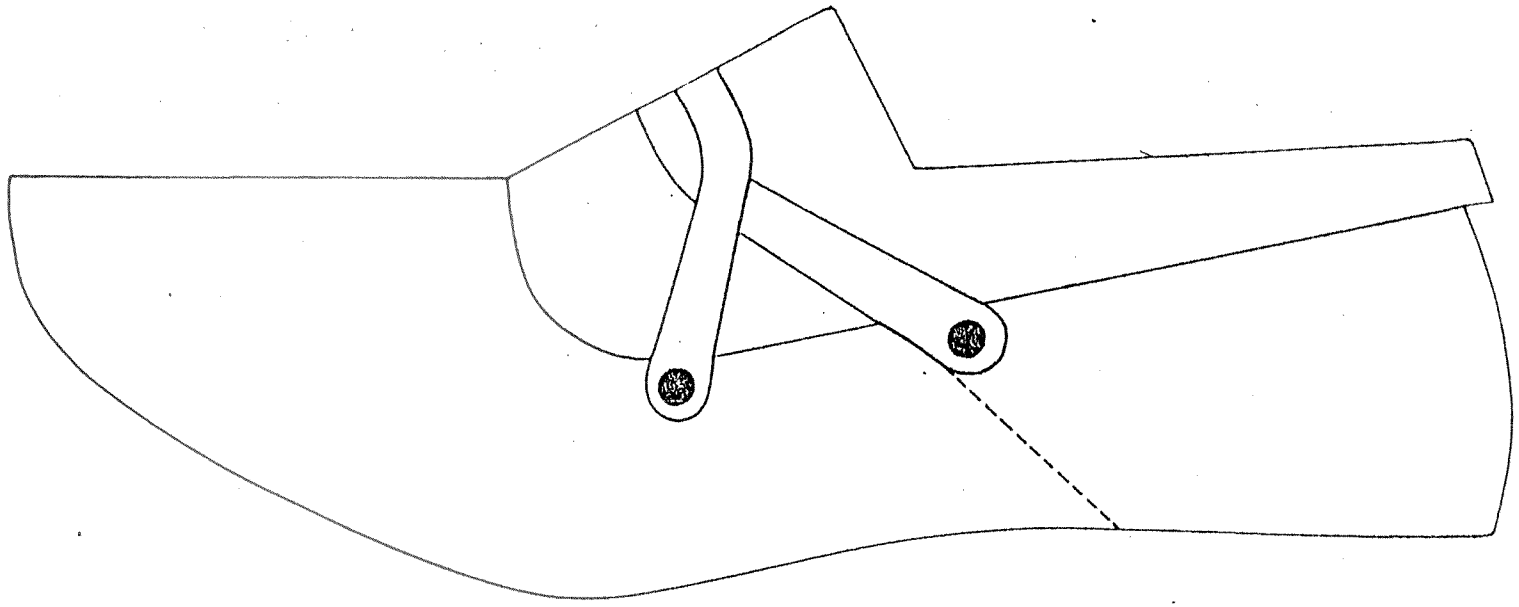
SANDAL TYPE SHOE STYLE B MODEL PLAN



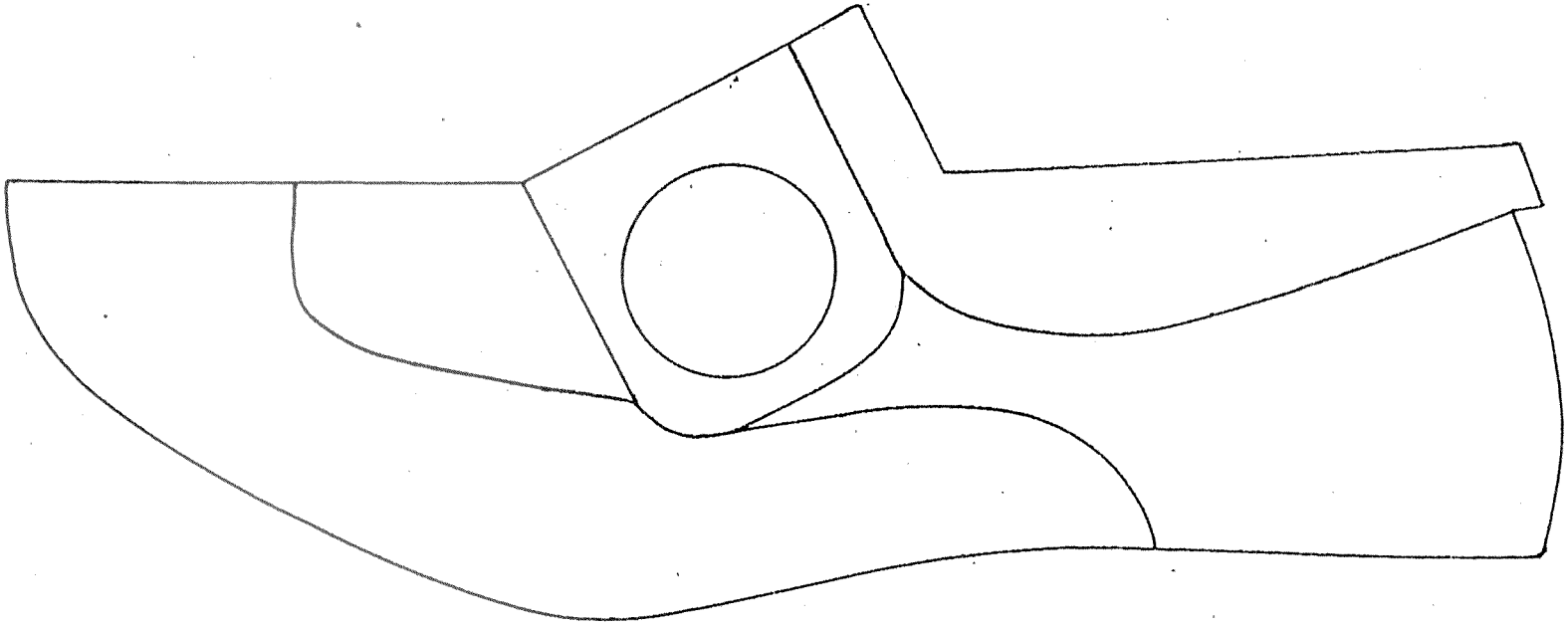
LADIES SHOE STYLE A MODEL PLAN



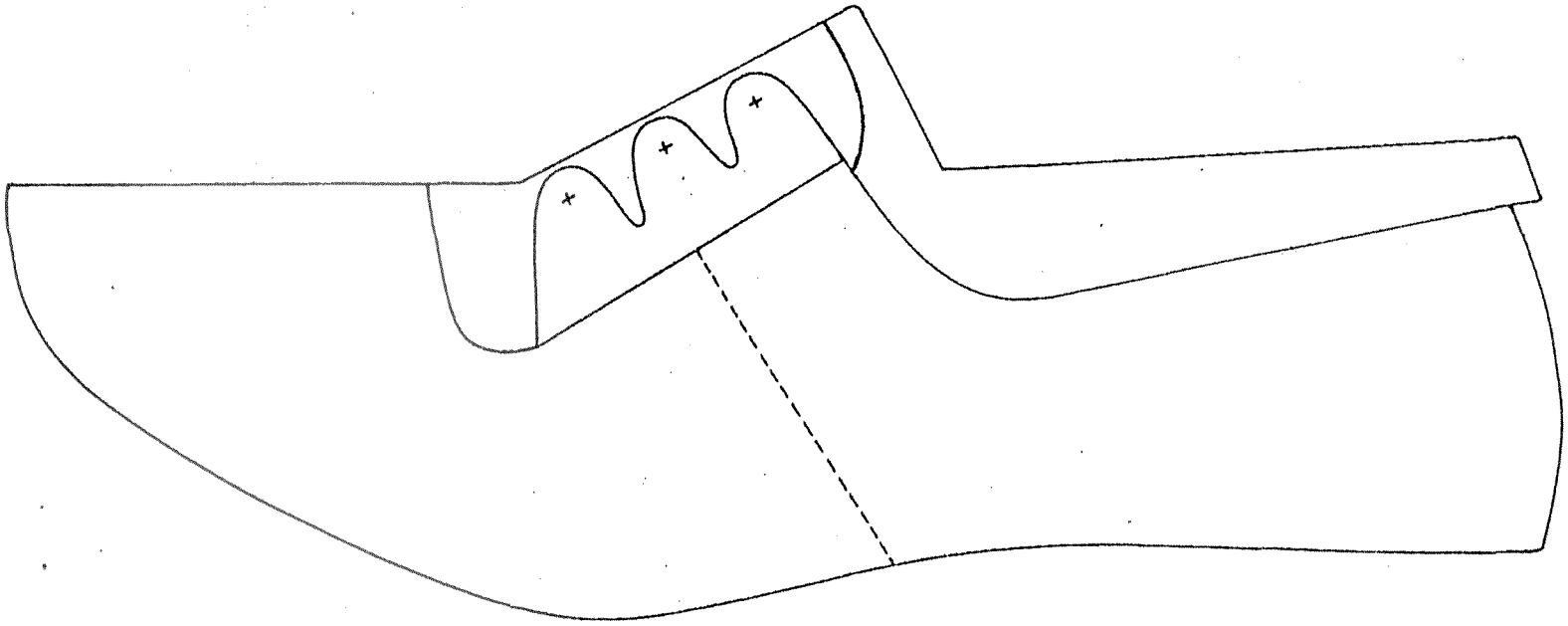
LADIES SHOE STYLE B MODEL PLAN



LADIES SHOE STYLE C MODEL PLAN

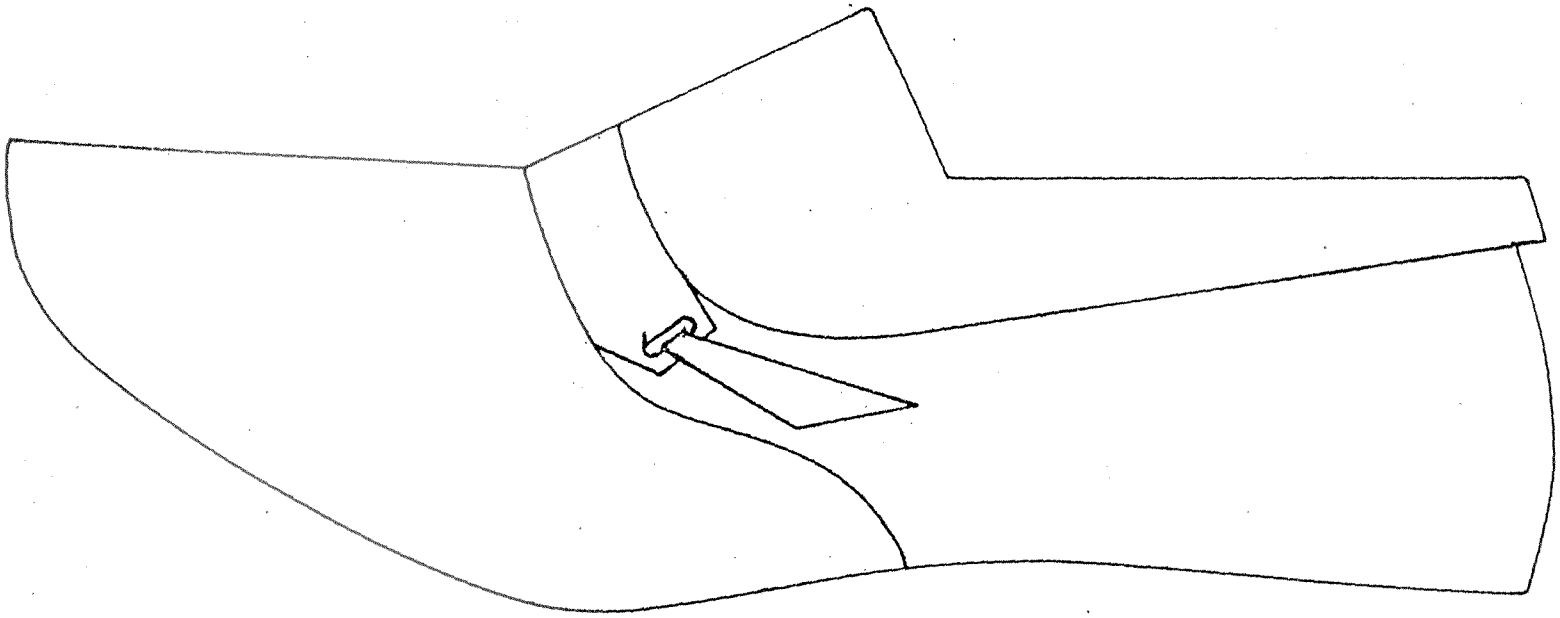


LADIES SHOE STYLE D MODEL PLAN

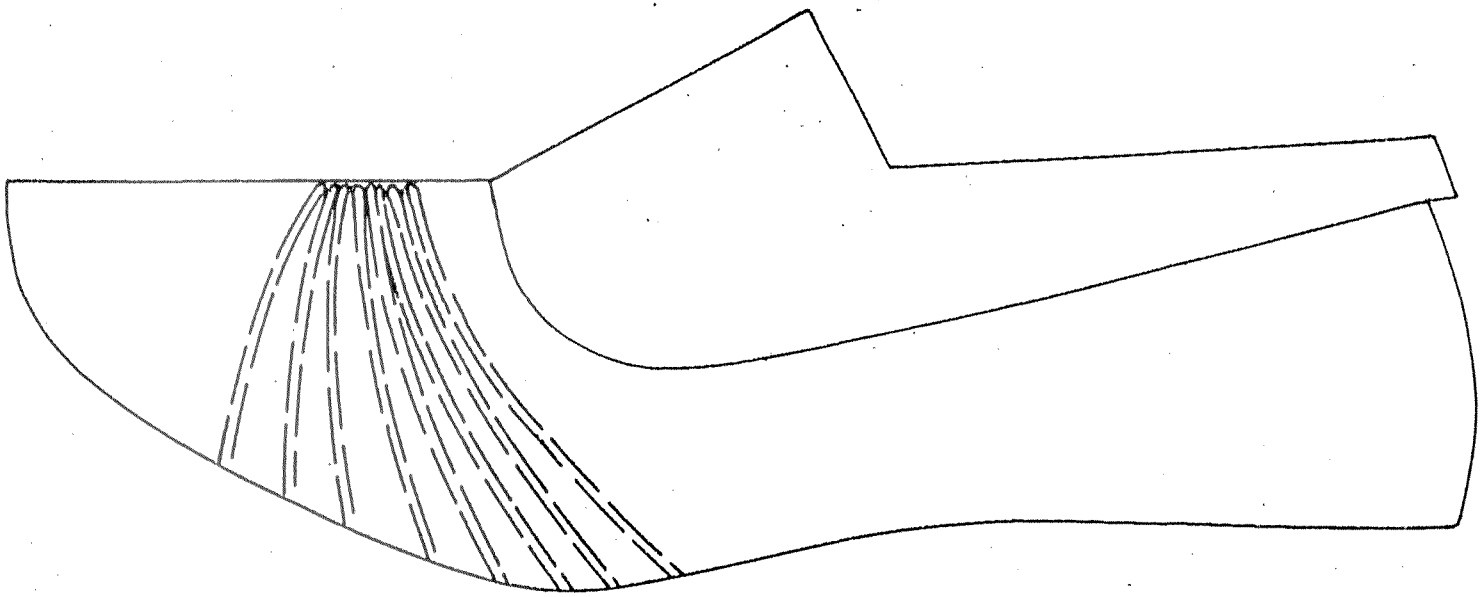


LADIES SHOE STYLE E

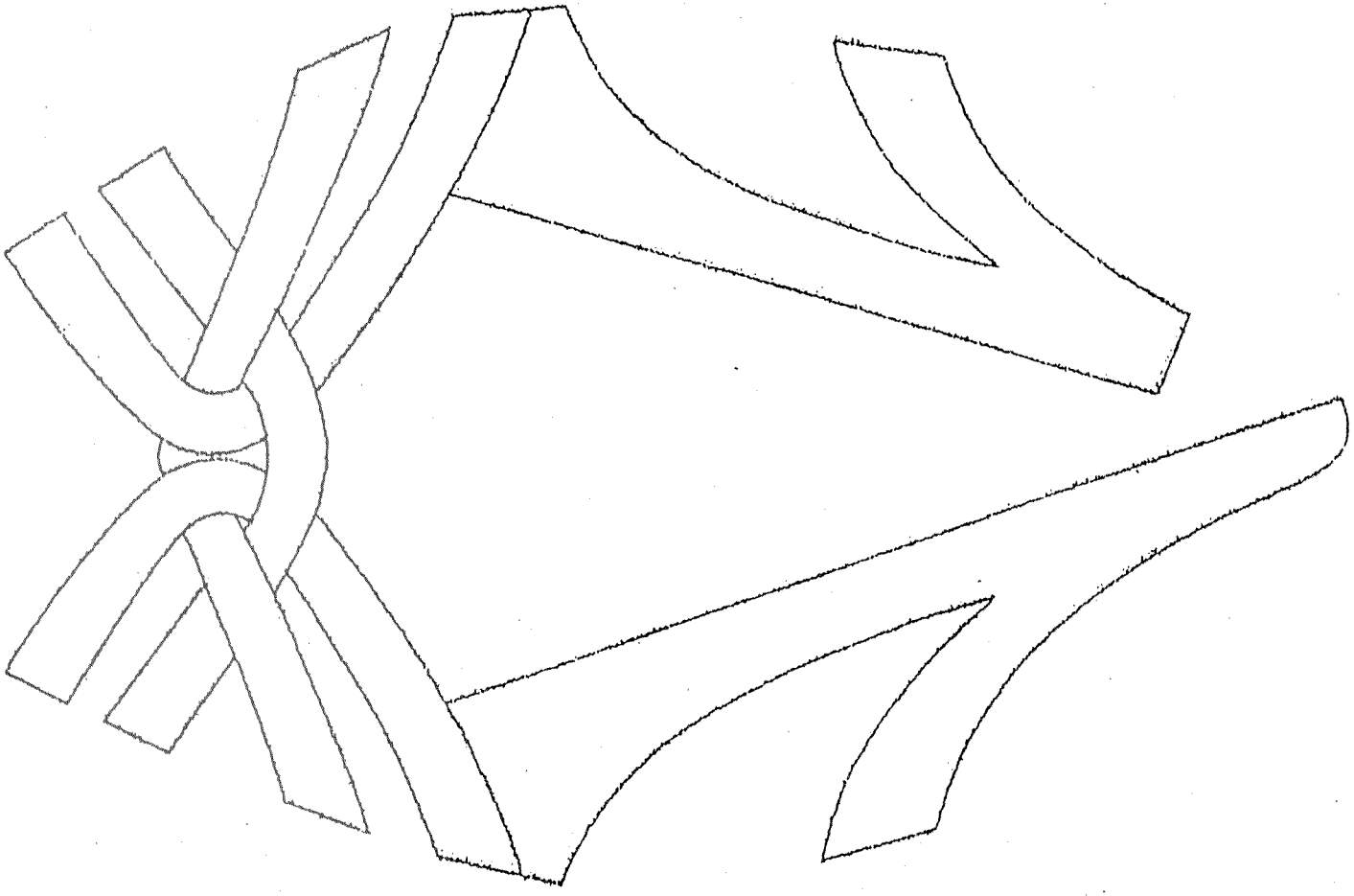
MODEL PLAN



LADIES SHOE STYLE F MODEL PLAN

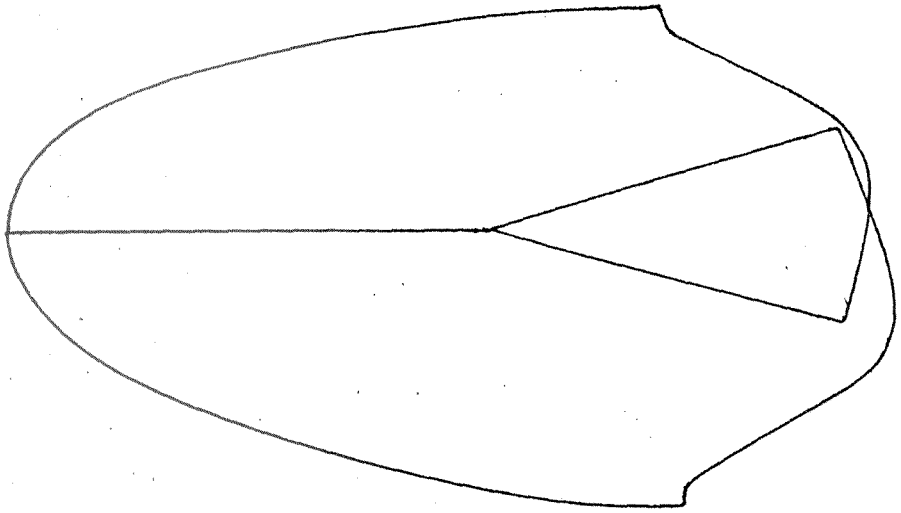


LADIES' SHOE STYLE G - SANDAL

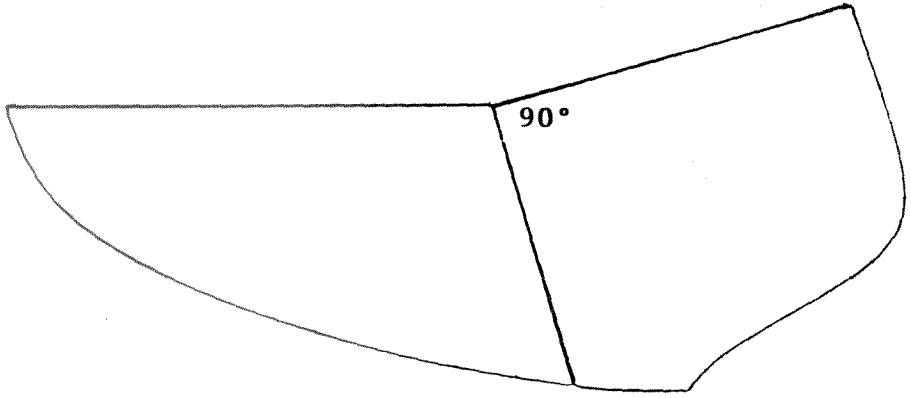


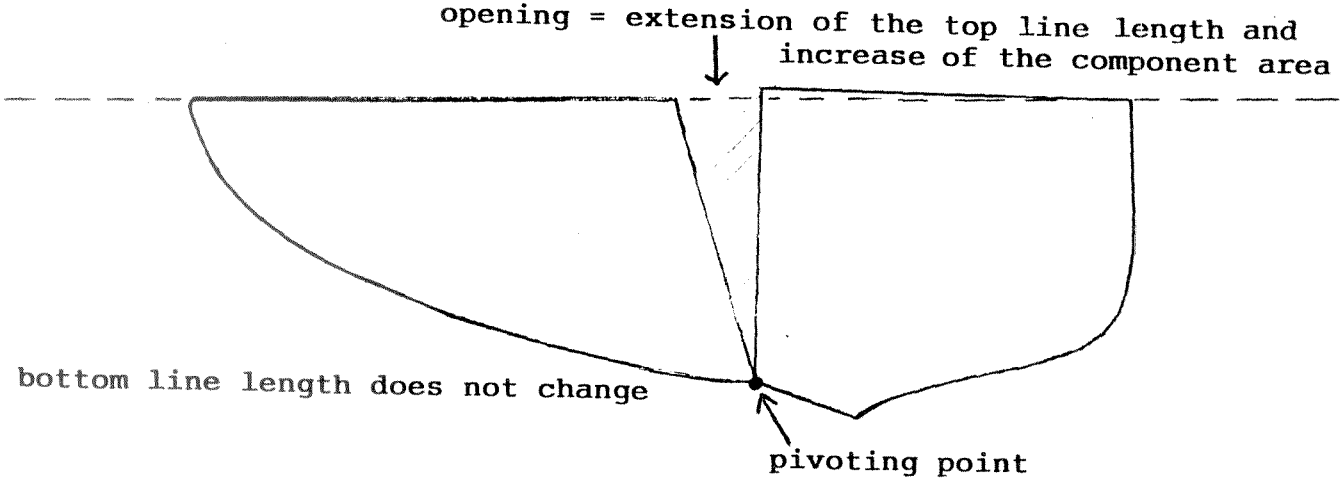
PIVOTING PROCESS - ORIGINAL PATTERN

the two sides of the apron overlap
when positioned side by side

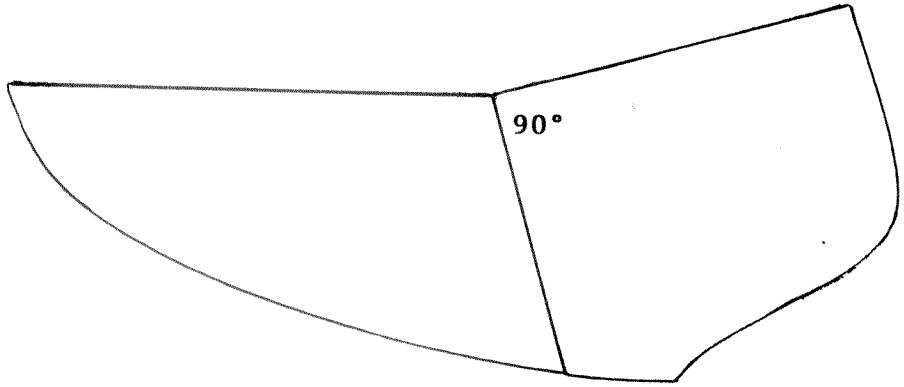


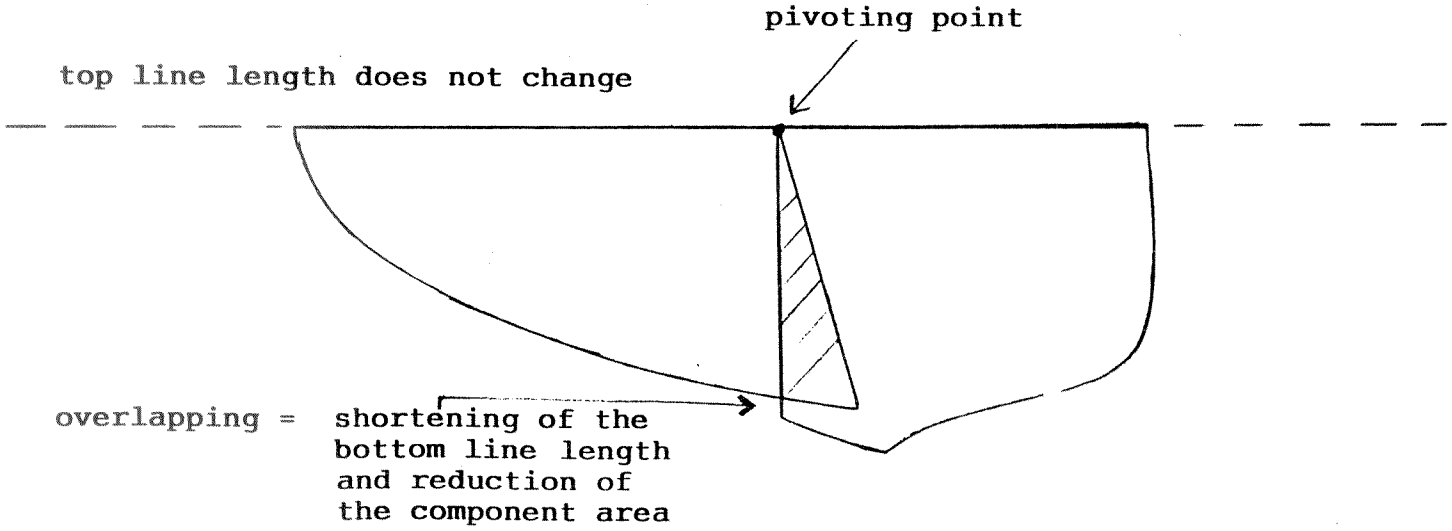
PIVOTING PROCESS EXAMPLE A



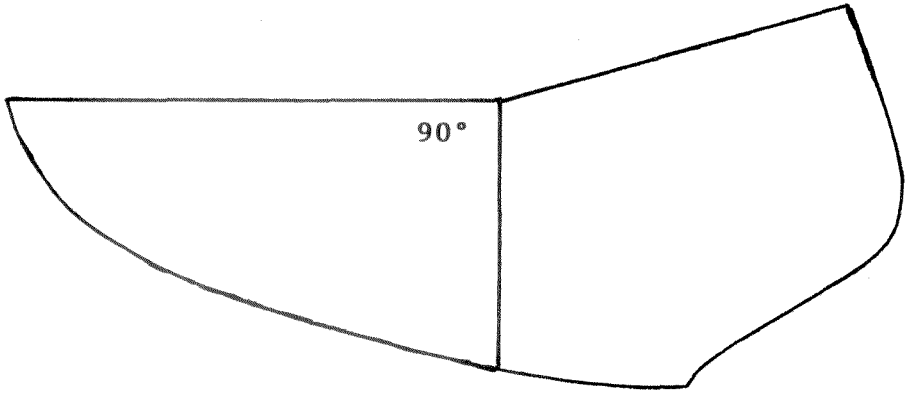


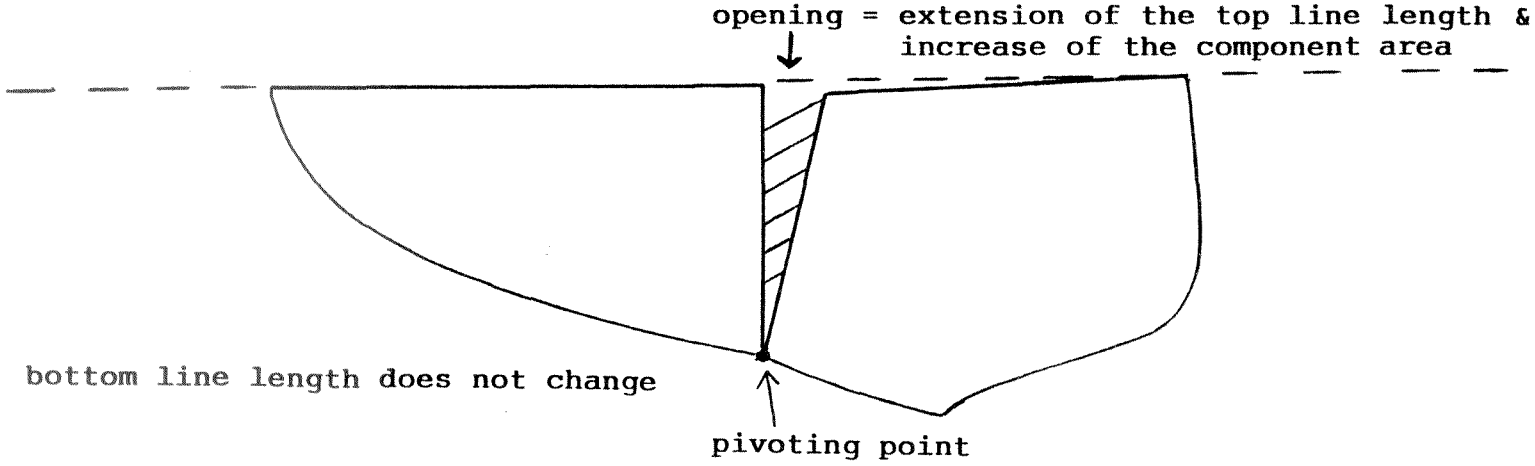
PIVOTING PROCESS EXAMPLE B



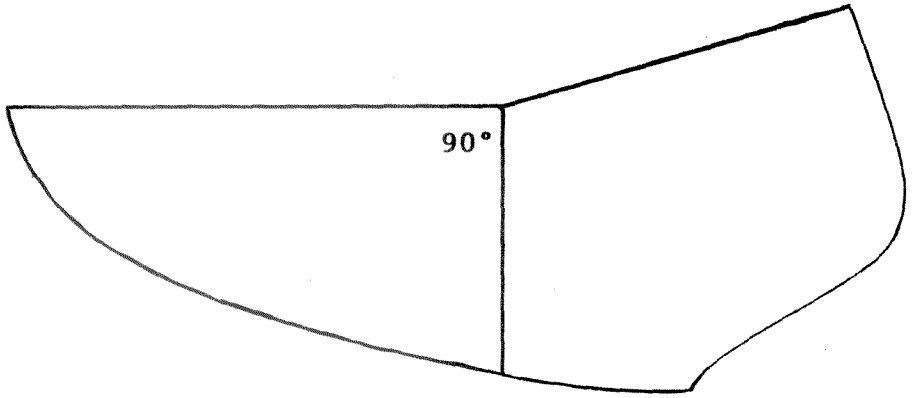


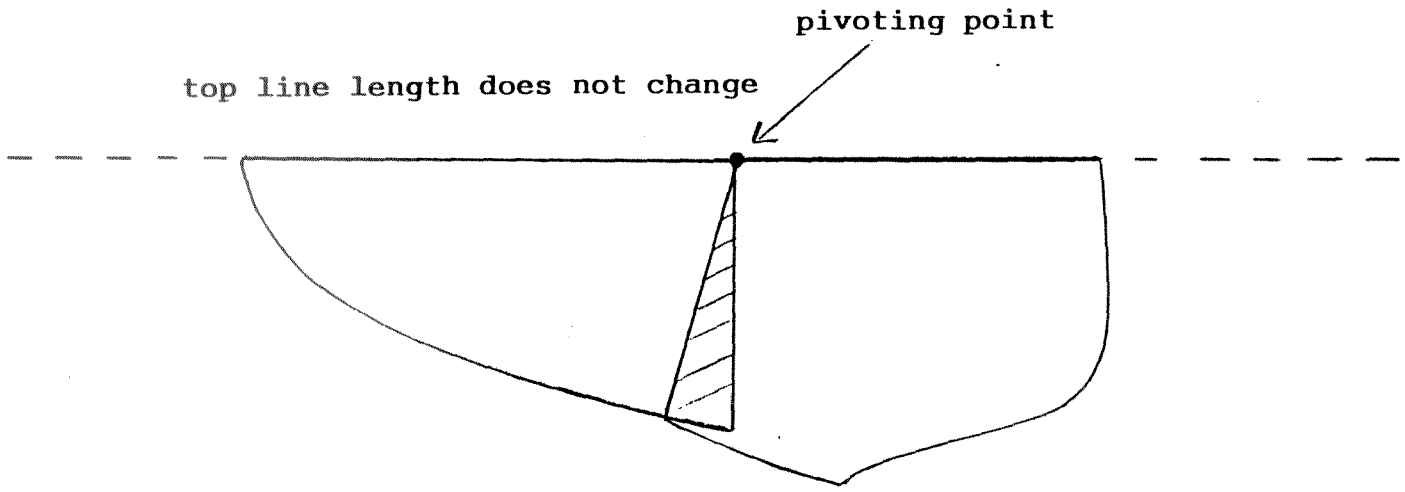
PIVOTING PROCESS EXAMPLE C





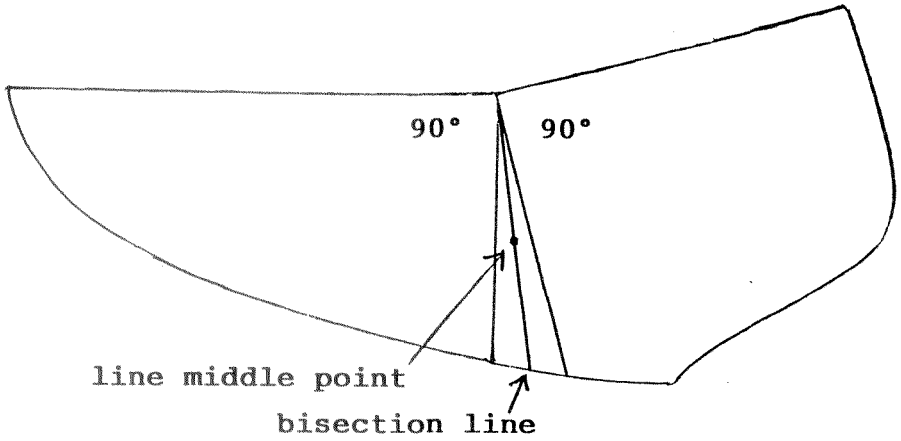
PIVOTING PROCESS EXAMPLE D



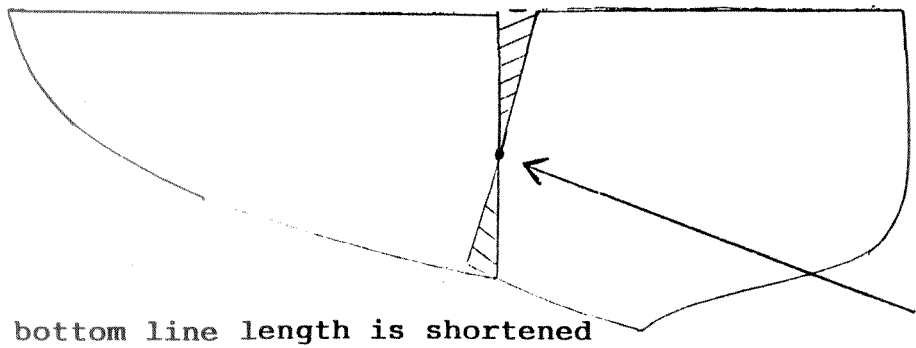


overlapping = shortening of the bottom line length and reduction of the component area

PIVOTING PROCESS EXAMPLE E



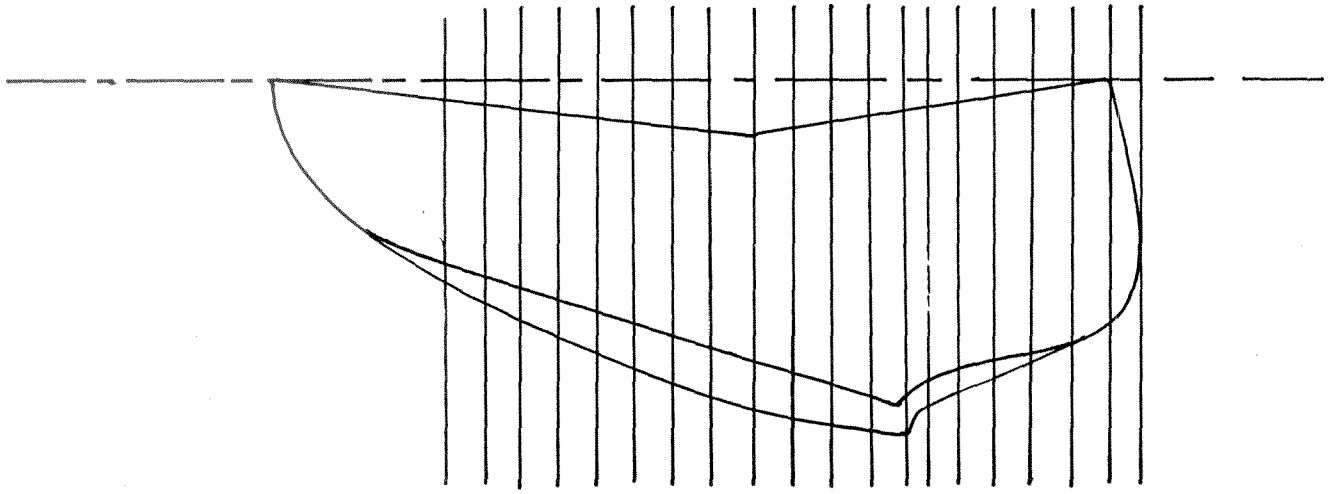
the top line length is extended



- the bottom line length is shortened
- the component area is about the same

PIVOTING PROCESS EXAMPLE F

another technique to solve some pivoting problems



BOOTS STANDARD PLAN CONSTRUCTION

- When high upper shoes and boots of all kinds have to be developed the last copies are not sufficient to produce the standard and model Plans. There is need to design a geometrical construction to be used as a base to develop the patterns of the upper top. Several methods exist to design these constructions.

- The most rational way to develop Boots Standard Plans is to choose one of the available methods and develop a first Plan. This Plan shall be tested thru actual sample production and trial. The Plan shall be modified as necessary till it gives entire satisfaction on both the aesthetics and fitting aspects. The standard plan thus developed shall then be used for all models and styles it would be suitable for without any more pre occupation for geometrical construction.

- It is obvious that specific standard plans have to be produced for different lasts, heel heights and Boot styles.

- A certain number of important factors have to be considered when preparing Standard Plans for Boots.

  1) the verticality of the top part of the upper whatever might be the height of the heel

  2) the correct localization of the leg axis which shall be the base for the Standard Plan Construction

  3) the correct determination of the long heel girth line

  4) the correct positioning of the geometrical construction in relation to the last copy

  5) the height of the upper which shall have some repercussions on the aesthetics of the product and on its comfort (particularly for what concerns the ankle for low boots and the articulation of the knee for high boots)

  6) the minimal measurement requirement for the passage of the foot when the boot is not provided with a fastening system (riding boot for example)

  7) the direction and curve of the front and back lines which shall not provoke any discomfort while walking

  8) the nature of materials to be used which would modify the fitting and comfort properties of the finished product

METHOD OF CONSTRUCTION

1) Determine the distance between the back line and the leg axis
   - i) on the last bottom trace the symmetry axis of the back part
   - ii) on this axis, from the last back part, mark a point representing 23% of the last size expressed in mm
   - iii) project that distance on both side of the last by tracing a line perpendicular to the axis
   - iv) measure the distance between the two points around the bottom last
   - v) divide this measure by 2

2) Measure the last heel height at the back part

3) Design the geometrical construction as follows:
   - a) trace a horizontal line X representing the floor/ground
   - b) trace Y perpendicular to X
   - c) on Y mark 1 - 0 = heel height (2 above)
   - d) position the mean form in such a way that the bottom coincides with 0 at the back and is tangent to X in the front
   - e) trace the mean form contour
   - f) on X mark 1 - 2 = distance between the back line and the leg axis (1.v above) increased by 2 mm for each cm of heel height
   - g) from 2 trace the leg axis B perpendicular to X and cutting the mean form at 3
   - h) from O draw a line passing by 3
   - i) Draw O D, the long heel girth line, making with O 3 an angle of 40° reduced by 1° for each cm of heel height
   - j) on O D mark 0 - 4 = 50% of long heel girth [long heel girth is approximately 150% of the joint girth]
   - k) on B mark 3 - 5 = ankle height (approximately 45% of the size expressed in mm)
   - l) at 5 draw G a line parallel to X
   - m) on G mark 7 - 8 = 50% of ankle girth distributed equally by half on each side of 5 [ankle girth is approximately = joint girth]
   - n) at 7 draw the front line J parallel to Y
   - o) draw the top line L parallel to X
     - i) the position of this line varies in relation to the style
     - ii) the final top line is seldom horizontal. For aesthetic reasons and sometimes for fitting purpose the top line is lower at the back than at the front

p) determine the width of the upper and draw the construction back lines. The construction of that back lines varies in relation with the following different possibilities:

- the upper is provided or not with an opening and a fastening system (zipper or log)
- the back line of the boot is straight or curved
- the upper top is very high or rather low

depending on the case the width is determined:

- either in relation to the measurement 7 - 8
- or in relation to the measurement 7 - 6

i) if 7 - 8 is used:

°on G from 8 mark 9 = 5 mm
(7 - 9 represents the width of the upper at ankle level)
°on L mark 10 - 11 = distance 7-8 increased by 2.5mm for each cm of height of the upper above the G line
(10-11 represent the width of the upper at its top level)
°trace the construction back line joining 0 - 9 - 11.

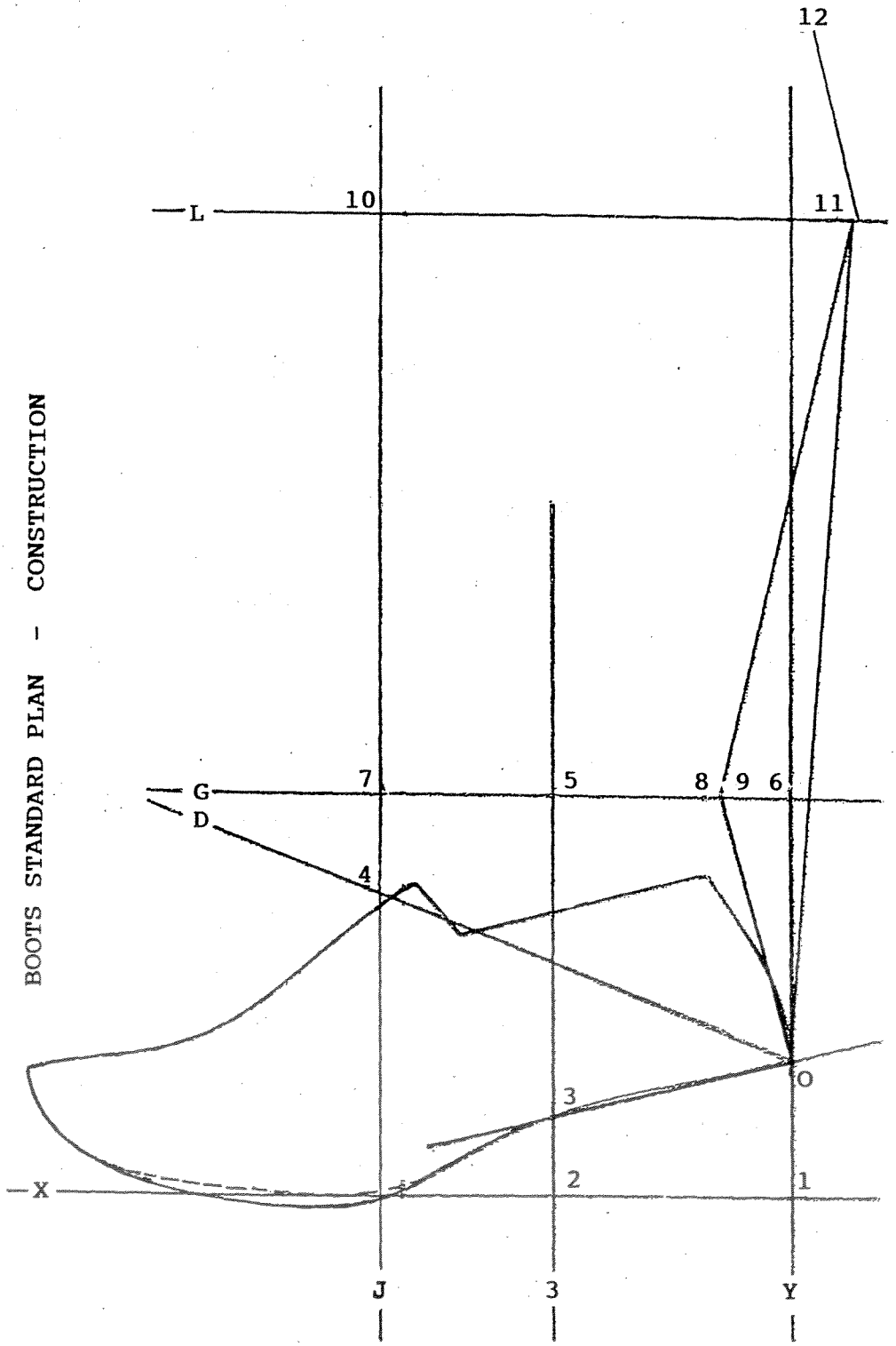
ii) if 7 - 6 is used:

°on L mark 10 - 11 = distance 7-6 increased by 1 mm for each cm of height of the upper above the G line
(10 - 10 represents the width of the upper at its top level)
°trace the construction back line joining 0 - 11
°if the upper top line is higher than the line, the upper width shall be reduced by approx. 1 mm for each centimeter of additional eight as shown between 11-12.

q) when the construction is finished it can be used to make the model plans as shown on diagram no.

Note: this is one method among others to enable the pattern maker to produce an example of standard pattern which need to be put to trial and corrected if necessary before being considered as the suitable standard pattern for a given last and a specific heel height.

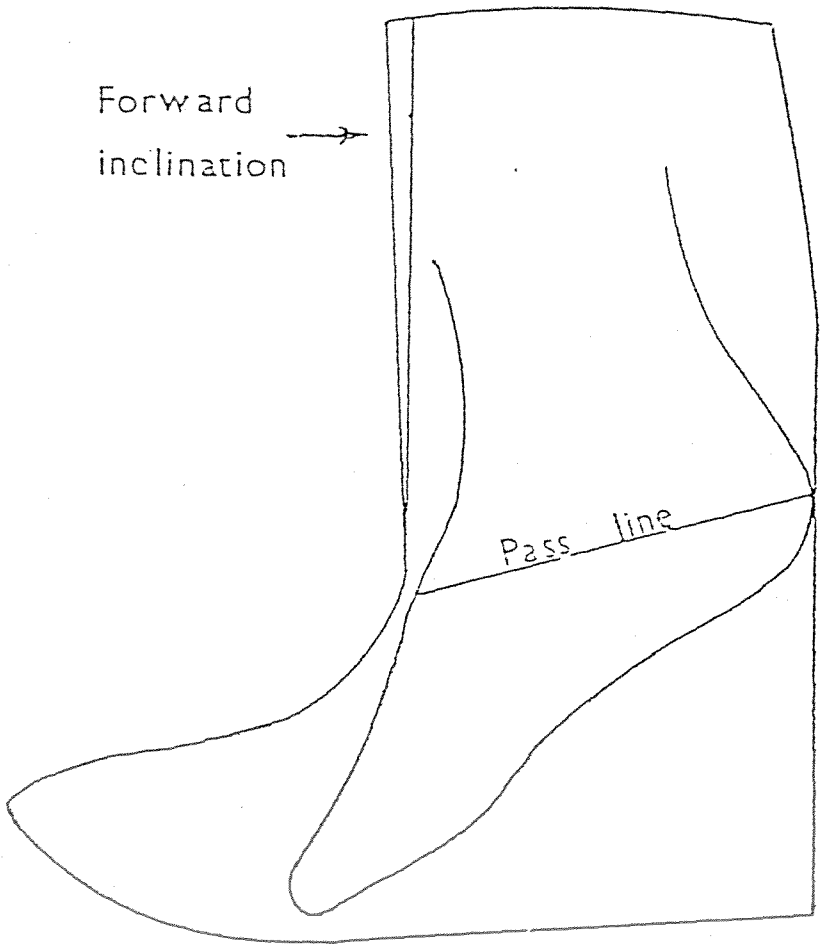
BOOTS STANDARD PLAN - CONSTRUCTION



see explanation pages 134 & 135

BOOT STANDARD PLAN CONSTRUCTION

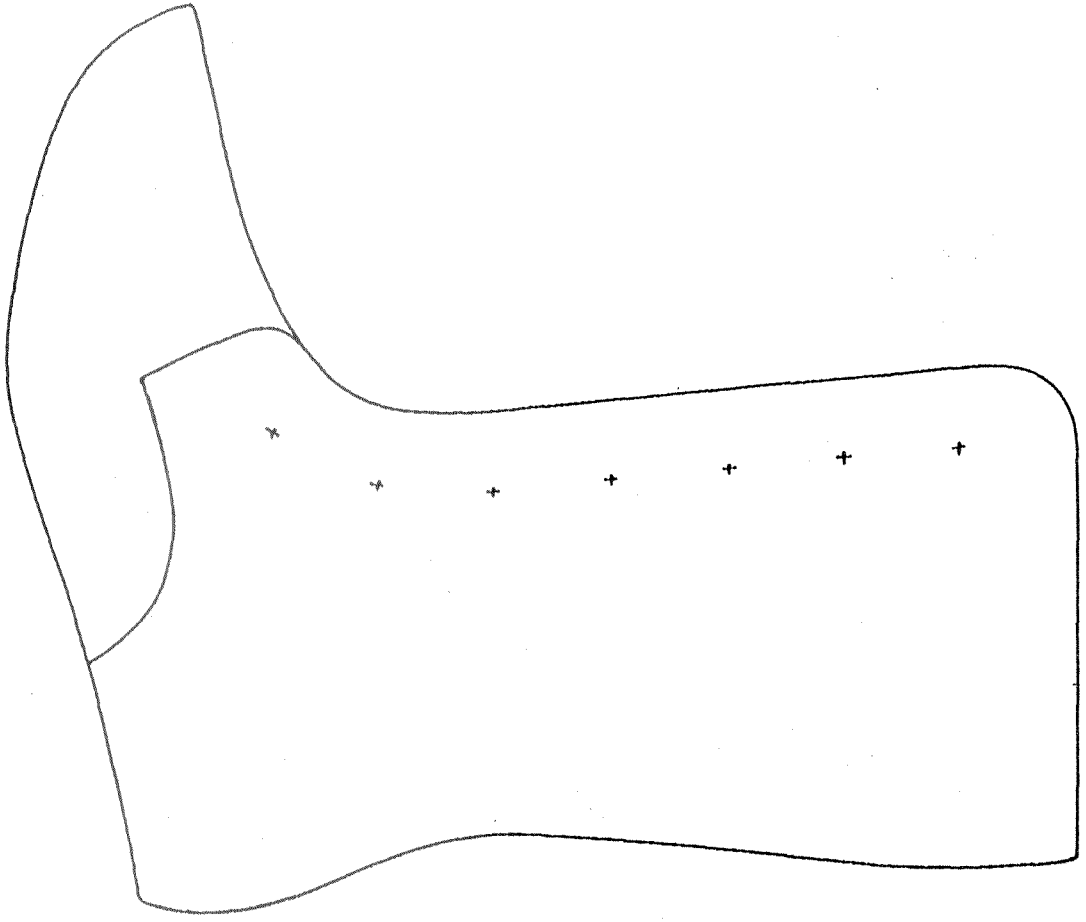
Pass line and front line inclination for riding boot



i) This diagram shows that the width of the upper shall be sufficient to permit the passage of the foot all the way down

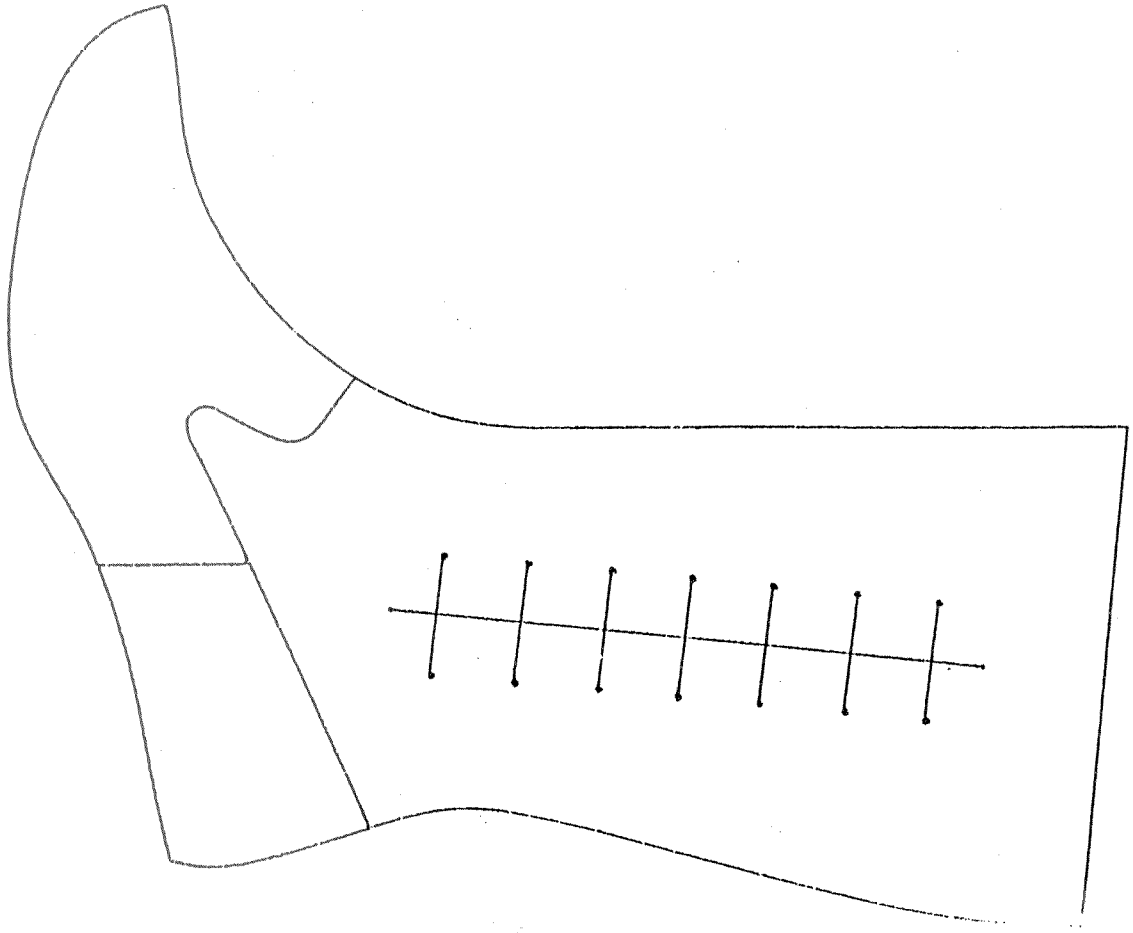
ii) Also the front line needs to be inclined forward as shown.

BOOT STYLE A MODEL PLAN



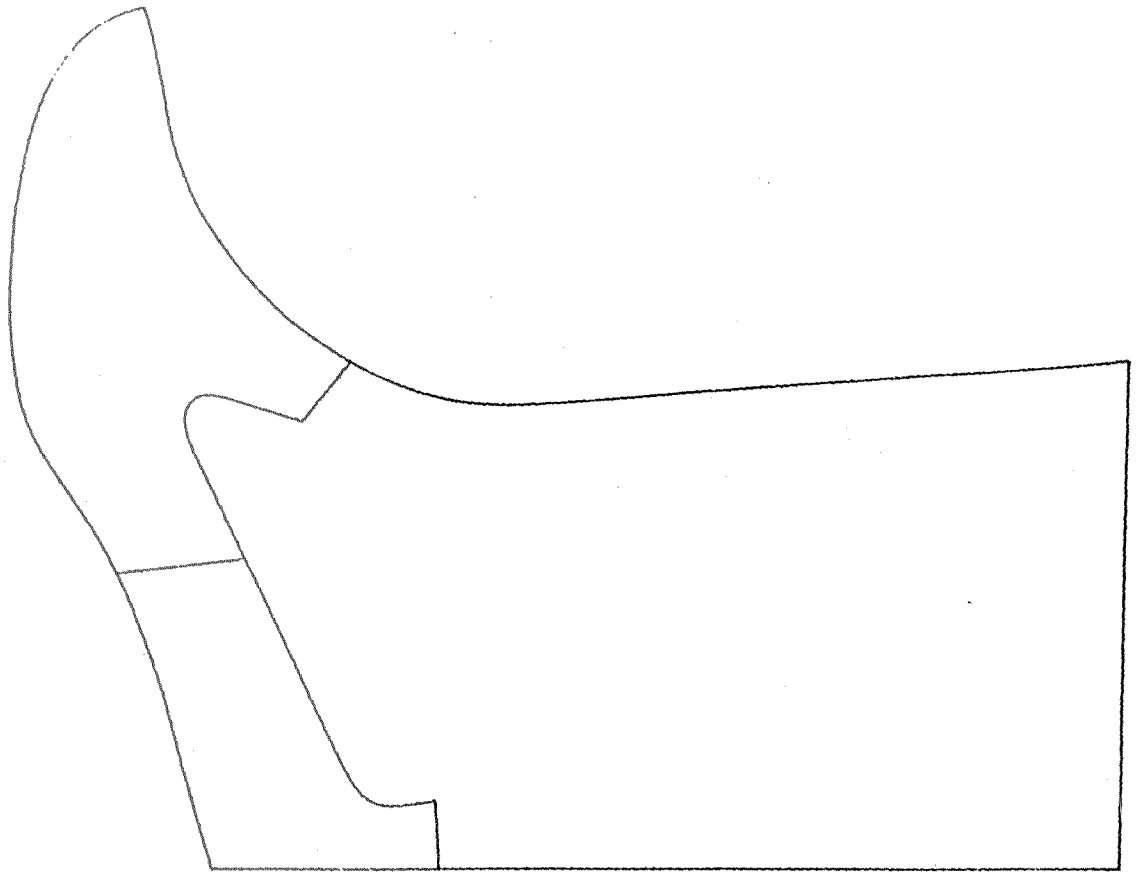
based on diagram p. 136

BOOT STYLE B MODEL PLAN



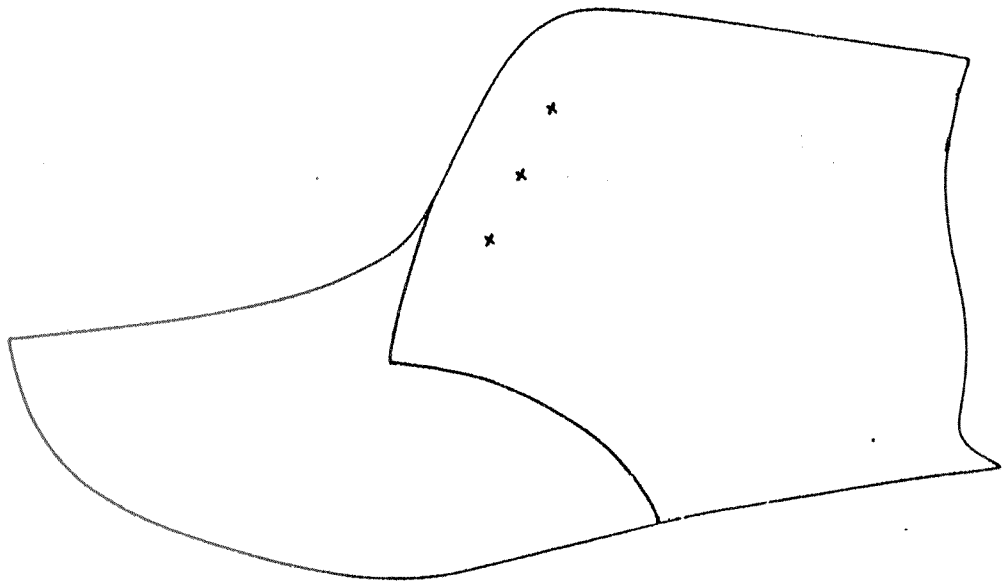
based on diagram p.136

BOOT STYLE C MODEL PLAN



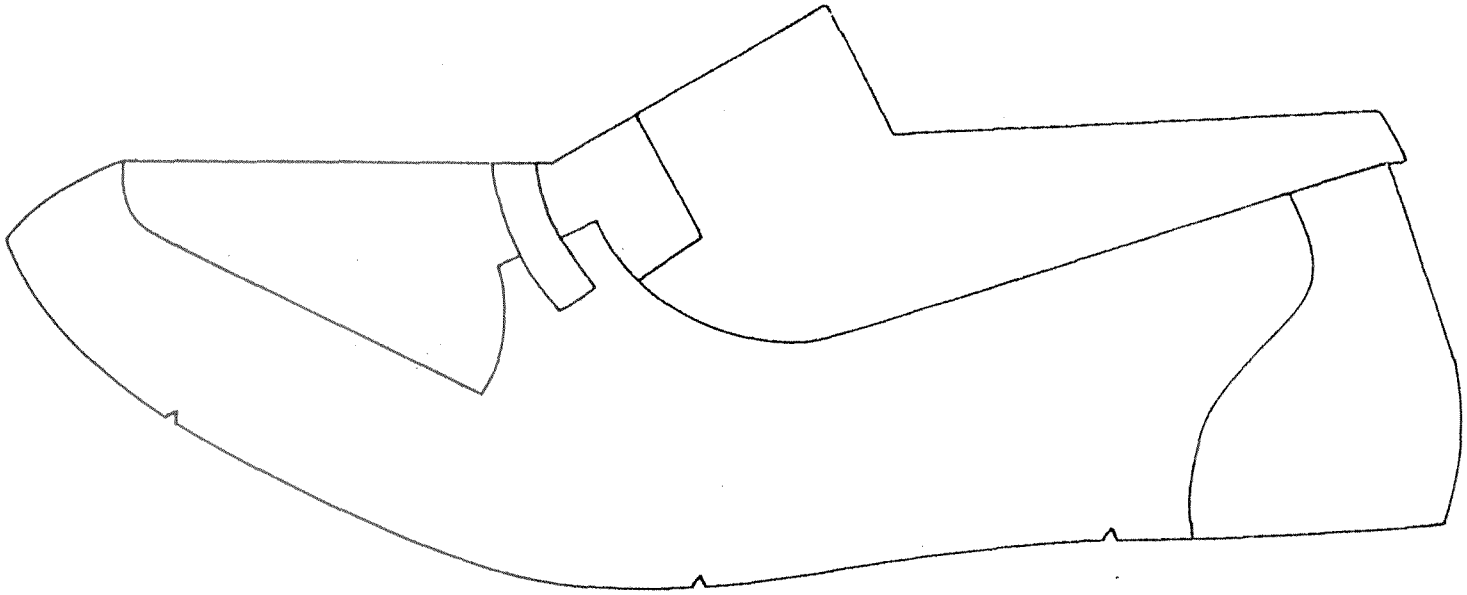
based on diagram p. 136

VELDTSCHOEN TYPE SHOE - MODEL PLAN



Note the outward direction of the lasting margin of the back part.

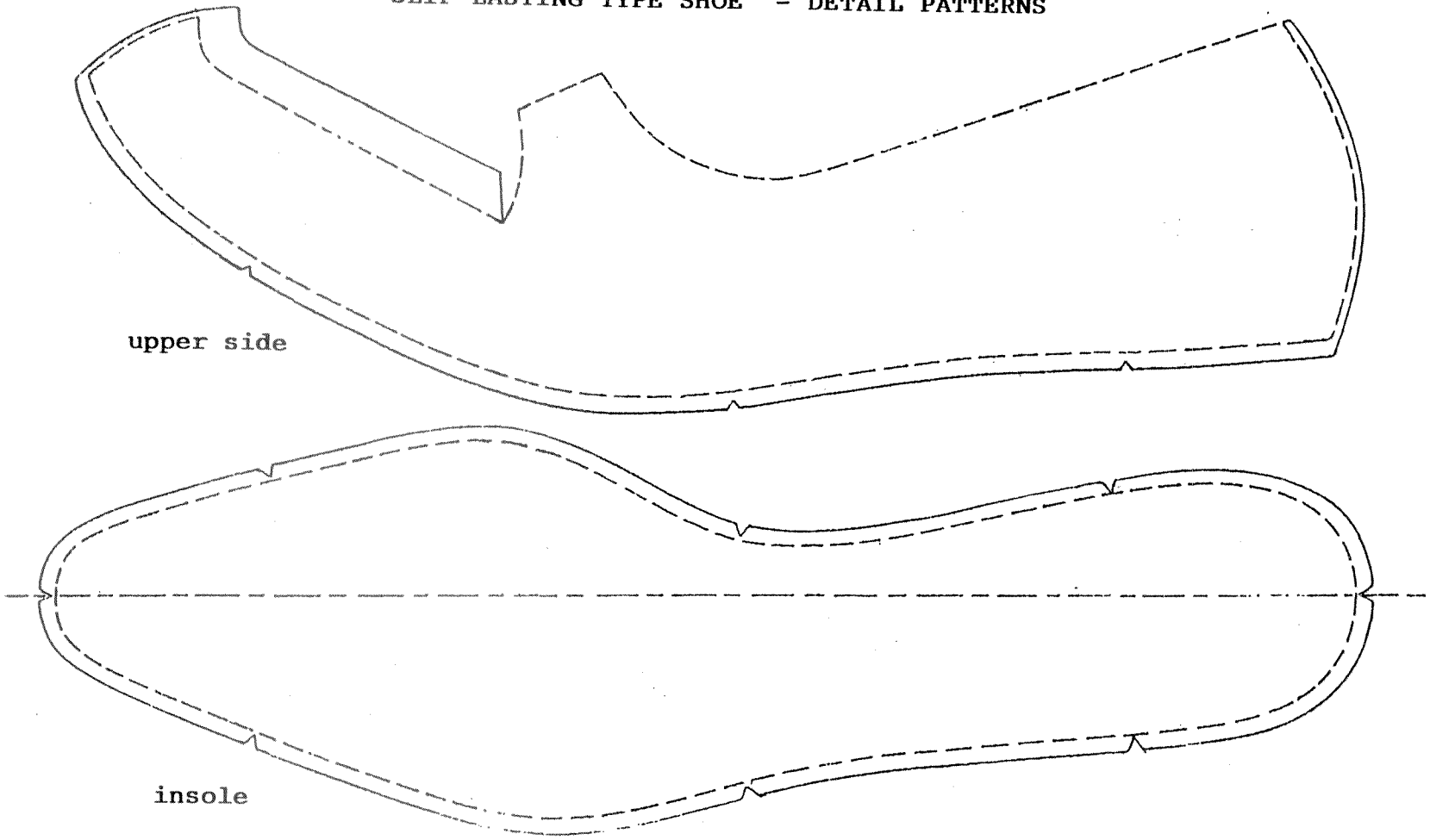
SLIP LASTING TYPE SHOE - **MODEL PLAN**
(california)



There is no lasting allowance but only a sewing allowance approx. 3 mm to stitch the upper on the insole.

The notches are meant to coincide with similar marks on the insole during assembling.

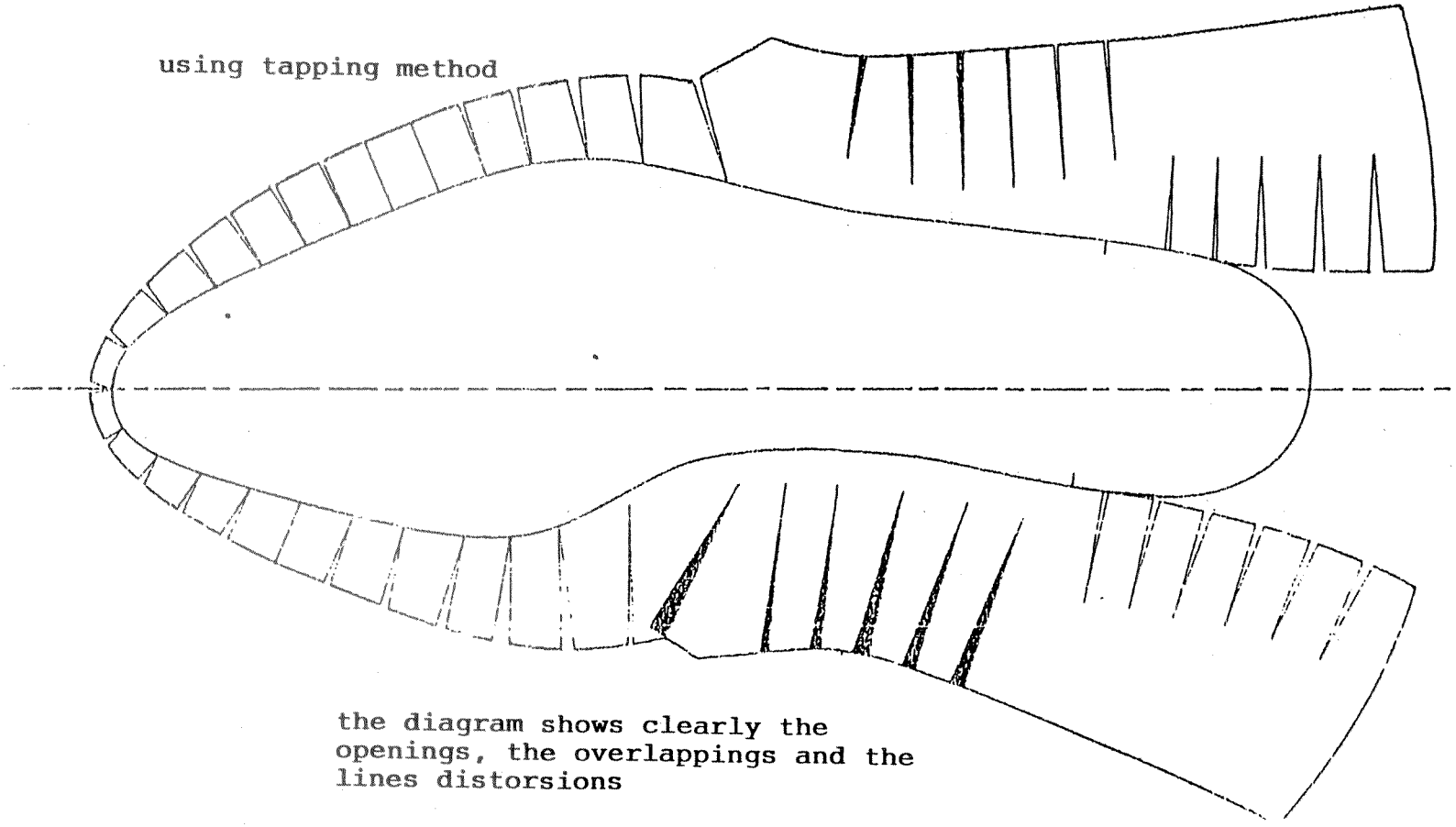
SLIP LASTING TYPE SHOE - DETAIL PATTERNS



The notches on both the upper and the insole are meant to coincide during the assembling operation.

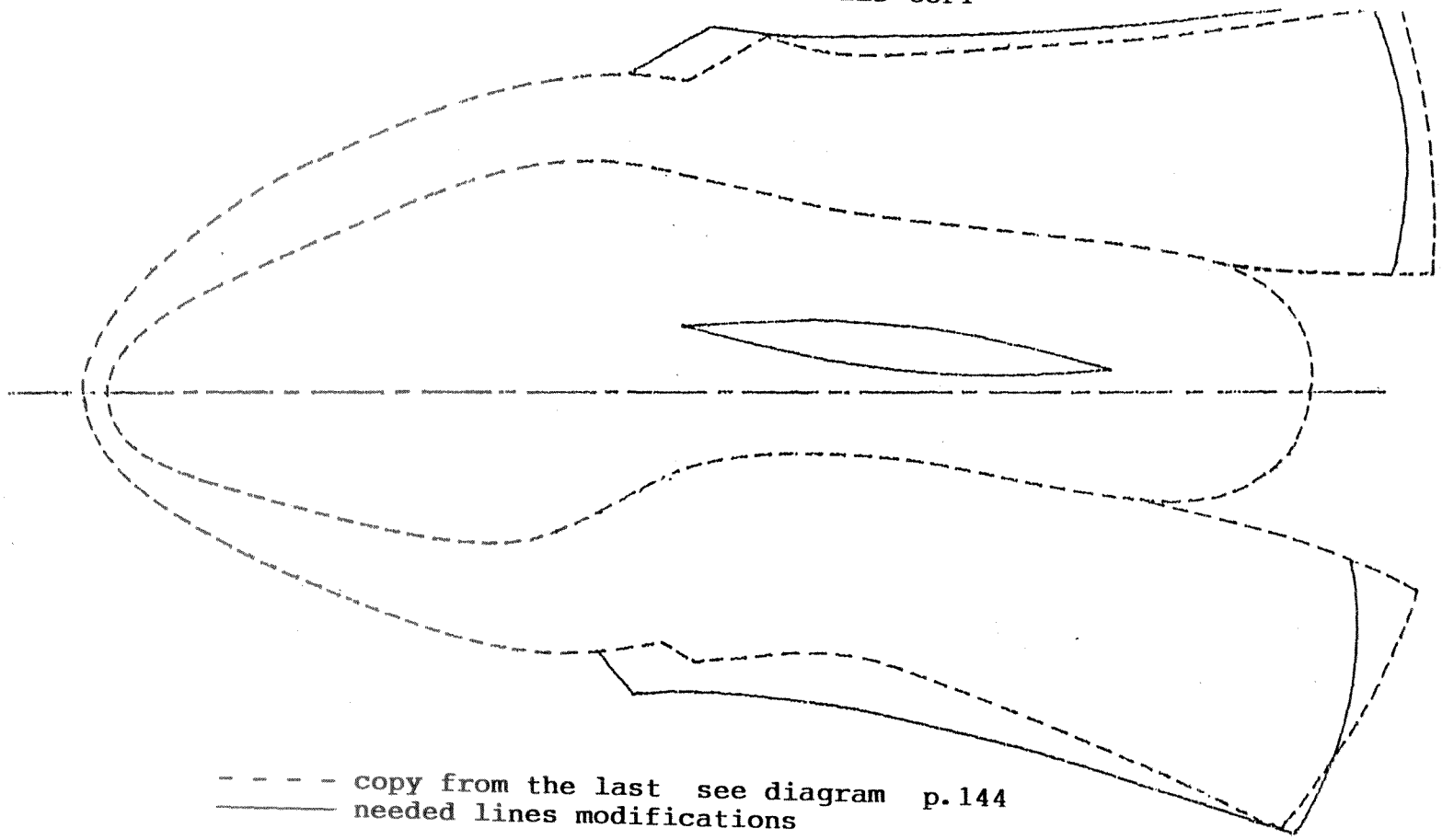
TRUE MOCASSIN STYLE A- COPY FROM THE LAST

using tapping method



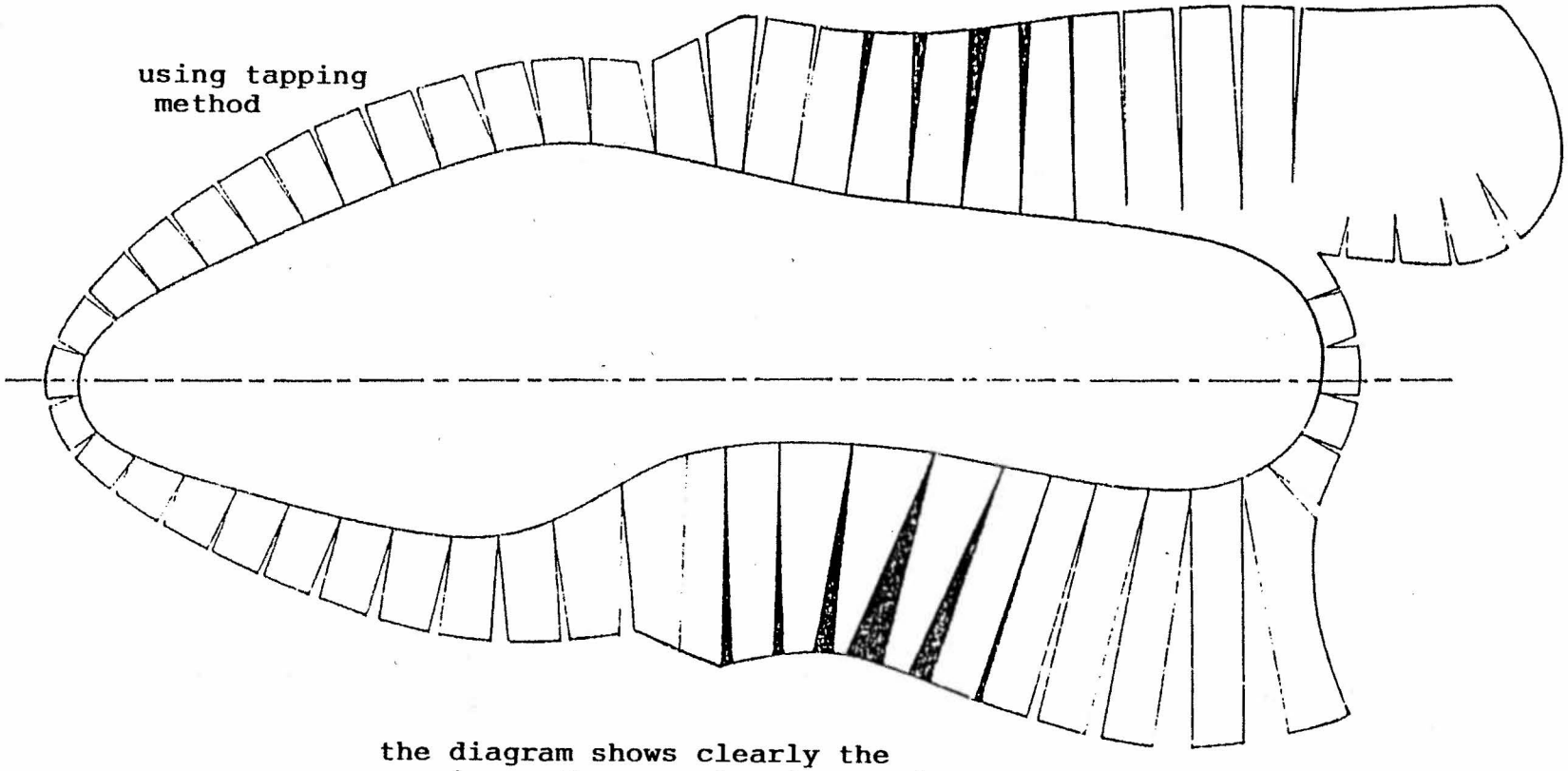
the diagram shows clearly the openings, the overlappings and the lines distorsions

TRUE MOCASSIN STYLE A- MODIFIED COPY

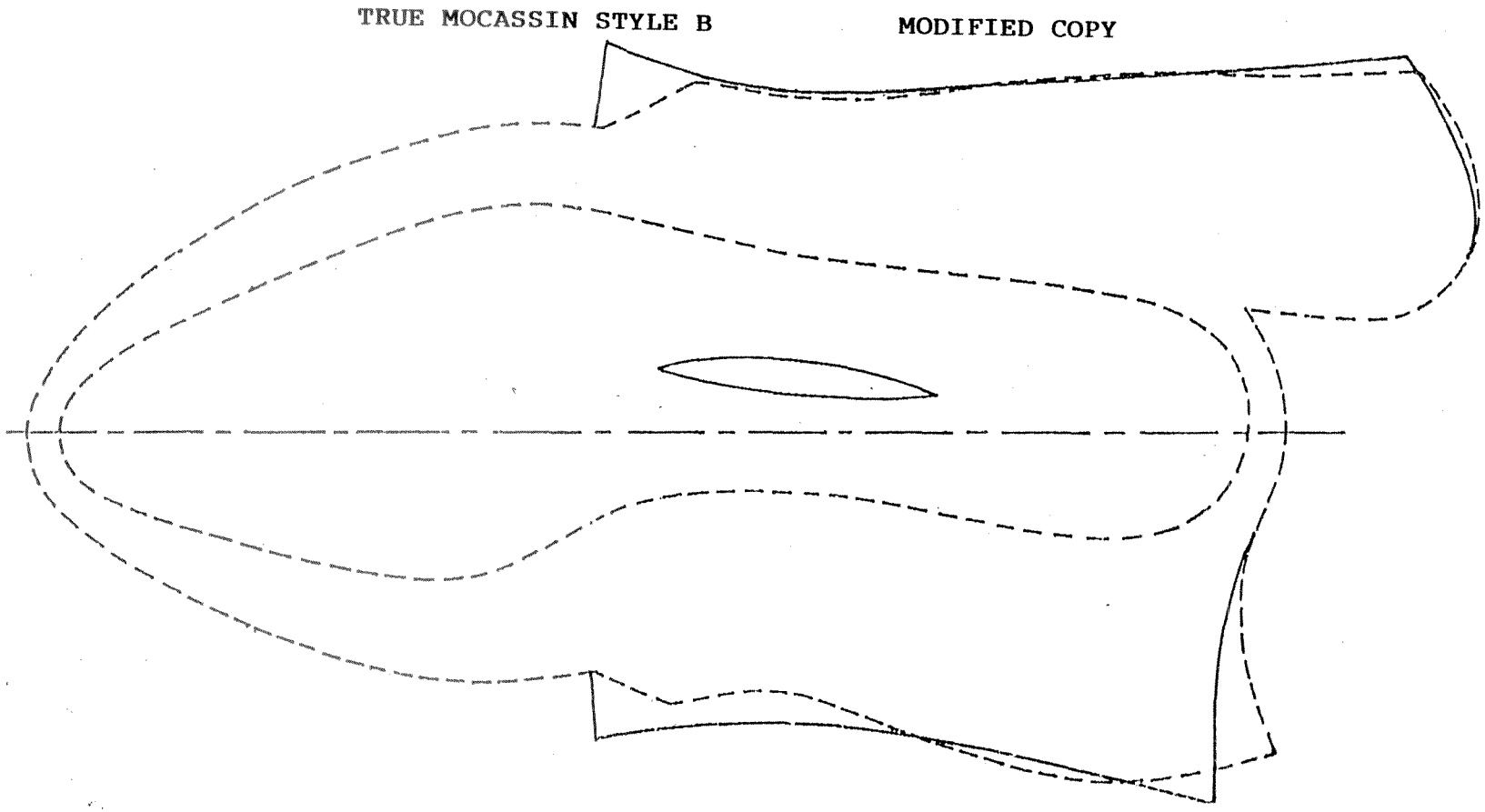


- - - - copy from the last see diagram p.144
——— needed lines modifications

TRUE MOCASSIN STYLE B- COPY FROM THE LAST



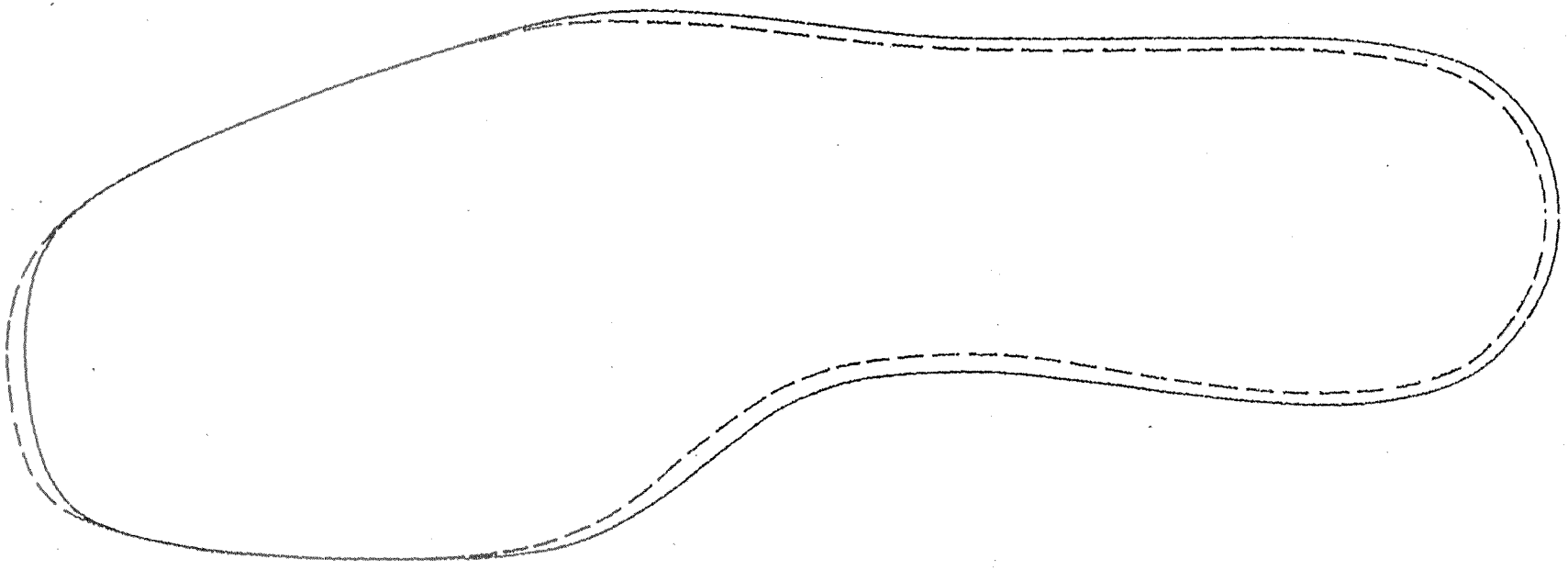
the diagram shows clearly the openings, the overlappings and the lines distortions



- - - - copy from the last see diagram p. 146

——— needed lines modifications

SOLING COMPONENT - SOCK PATTERN



- - - - insole line

——— sock line

EXAMPLE OF SOLE MOULD TECHNICAL DRAWING

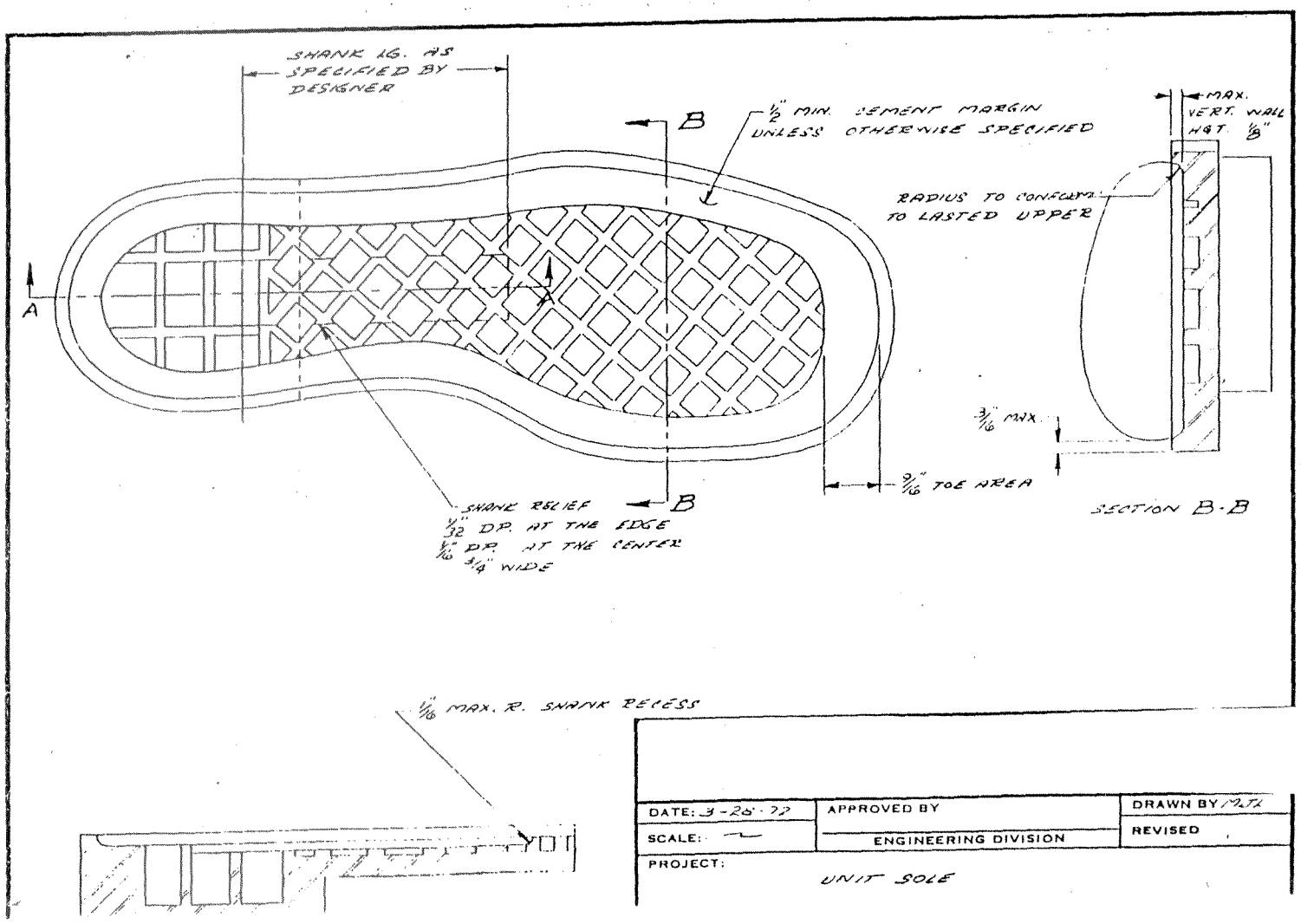
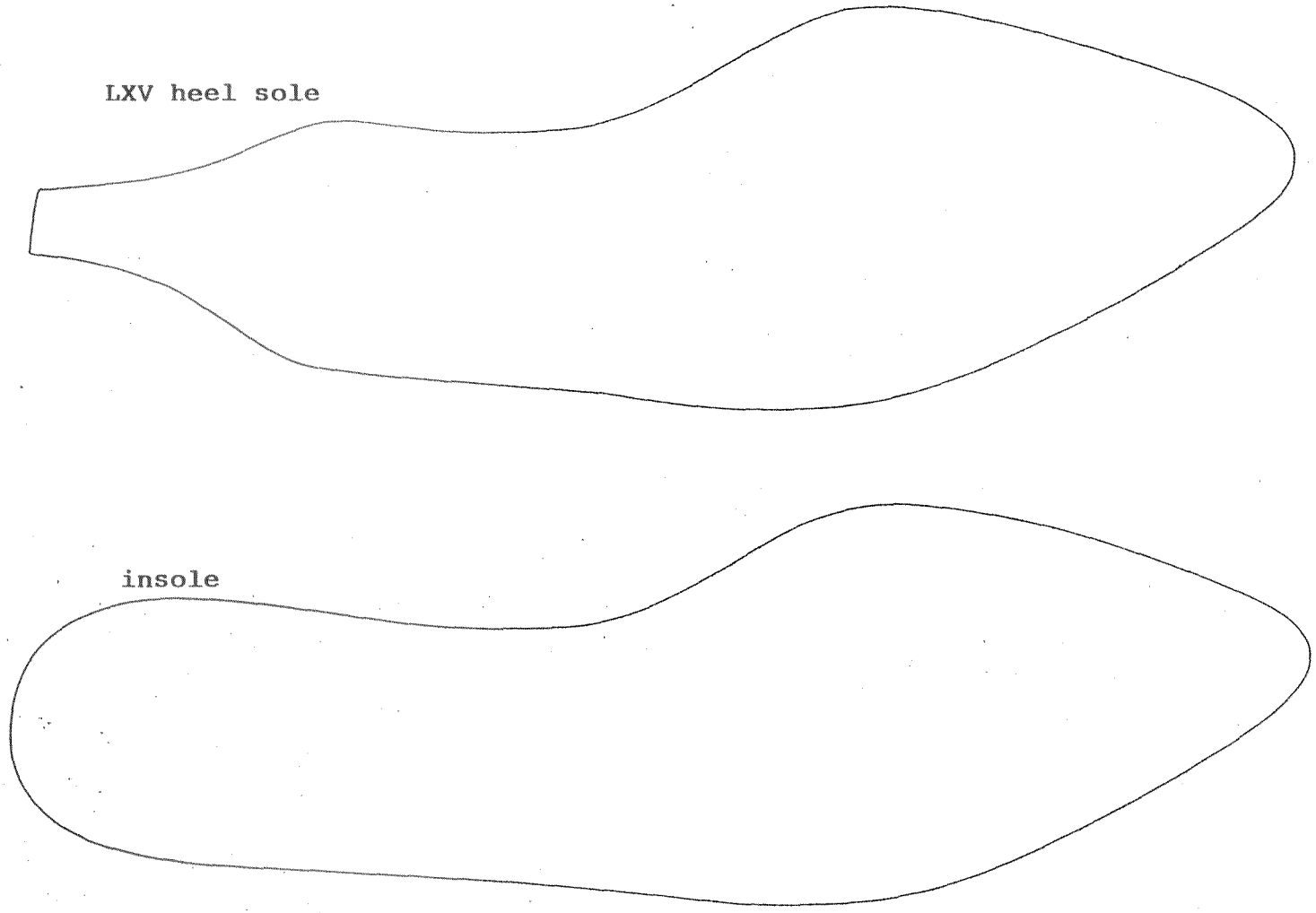
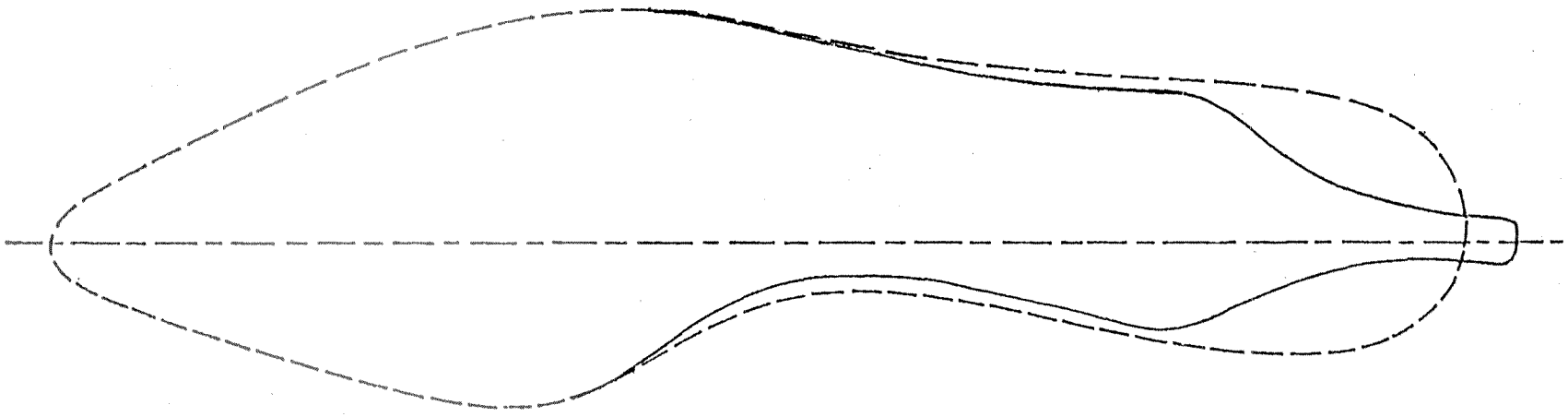


FIGURE VIII

SOLING COMPONENT - LADIES' SHOE



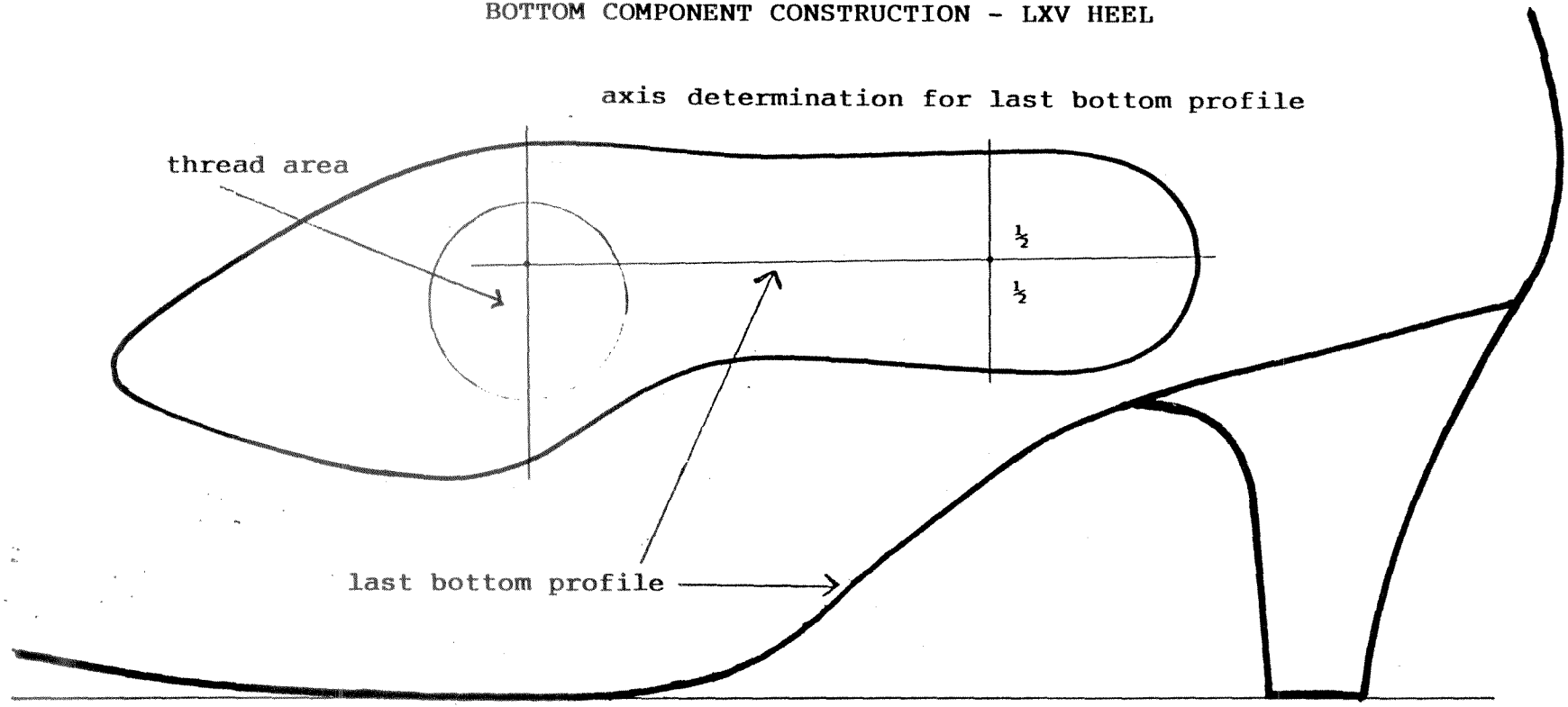
SOLING COMPONENT - LXV SOLE



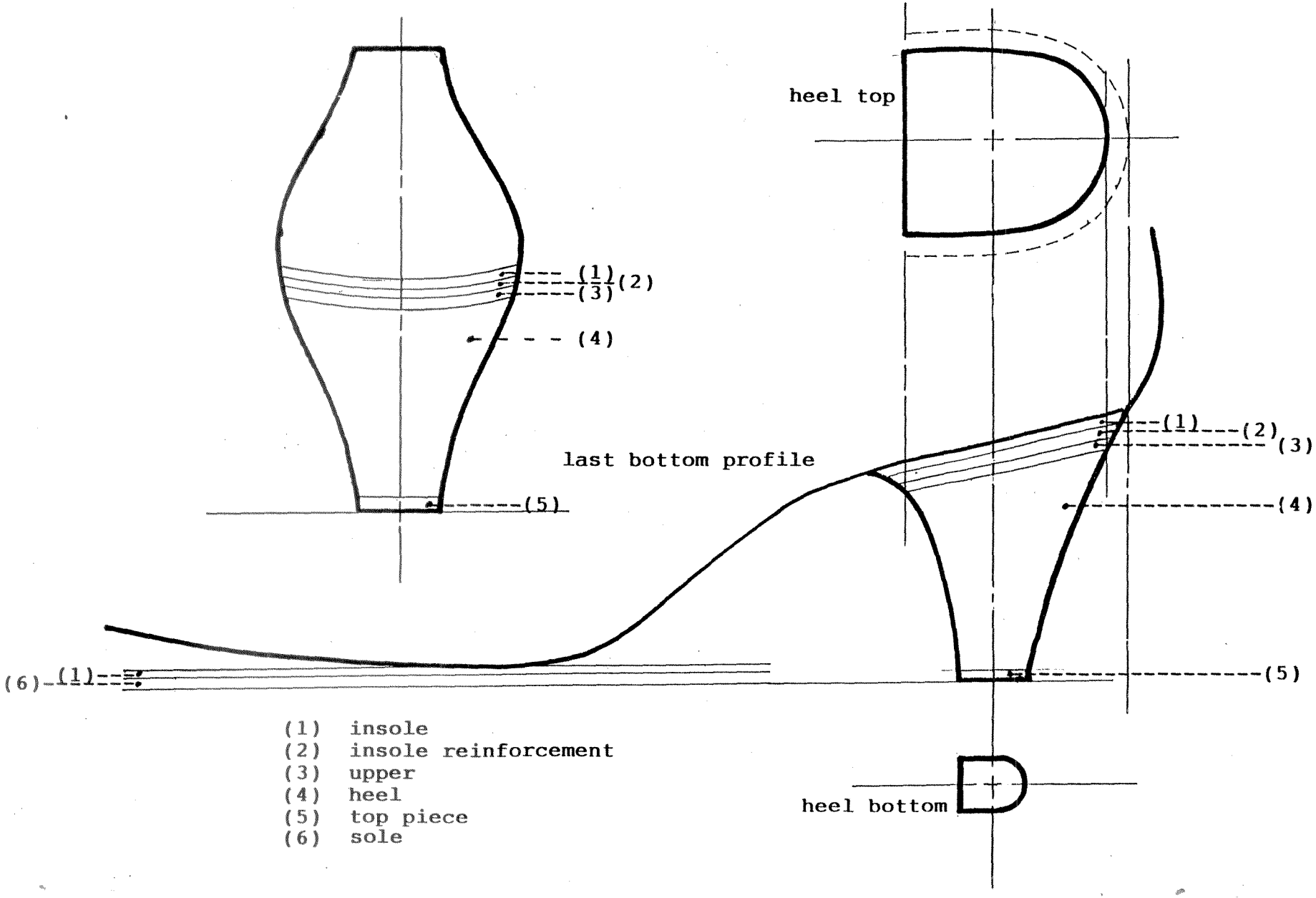
- - - insole line

——— sole line

BOTTOM COMPONENT CONSTRUCTION - LXV HEEL

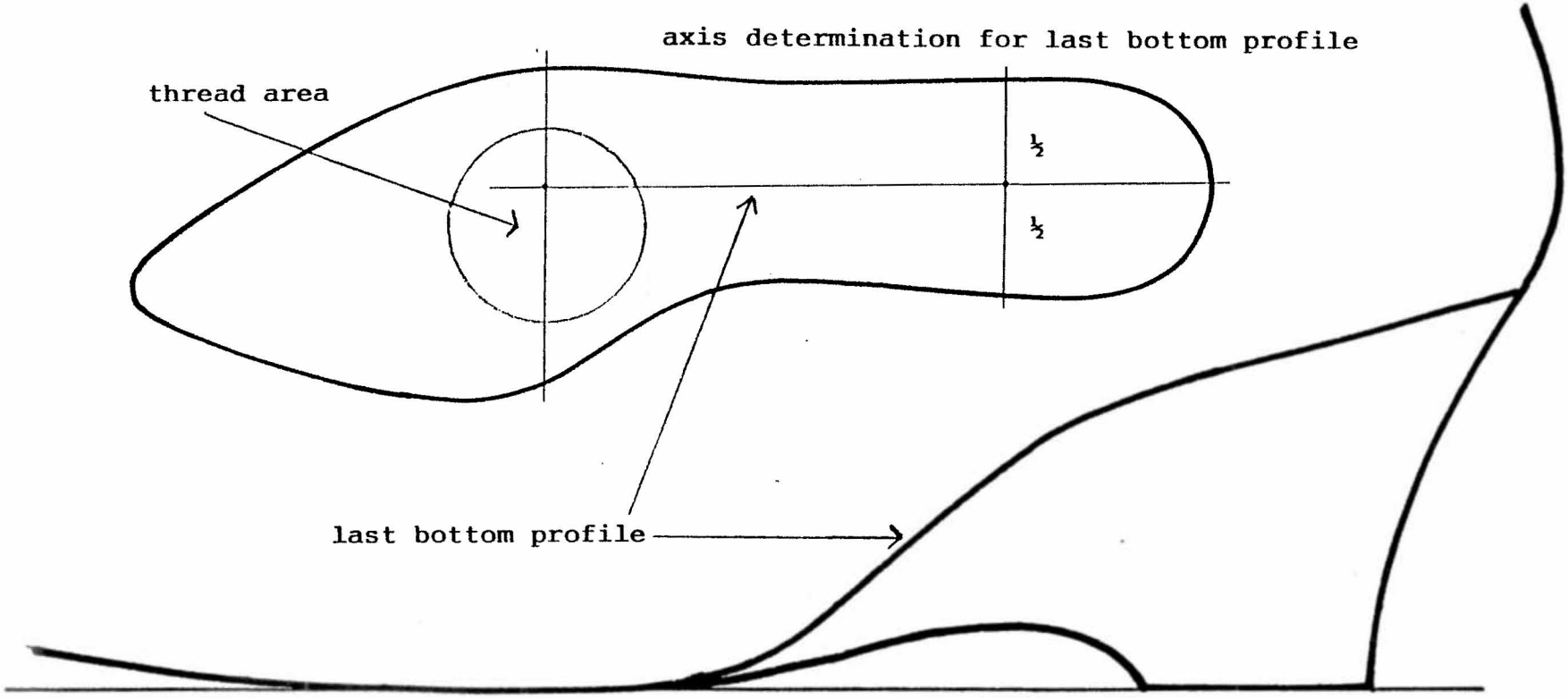


BOTTOM COMPONENT DEVELOPMENT - CUBAN HEEL



(1) insole
(2) insole reinforcement
(3) upper
(4) heel
(5) top piece
(6) sole

BOTTOM COMPONENT CONSTRUCTION - WEDGE HEEL



Annex I

PATTERN MAKING TIPS ON:

Pattern deadening

One Bar style

T Bar style

Monk style

OPF phenomemon

Provided by:

Mr. Steve Weston
CFI Moderator

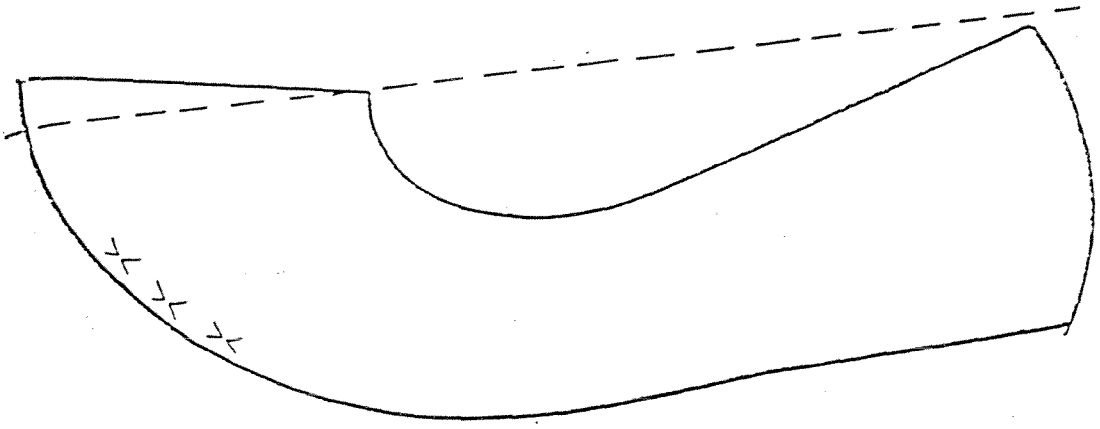


Fig.J - 1 Simple deadening for a court shoe.
(effective to a degree).

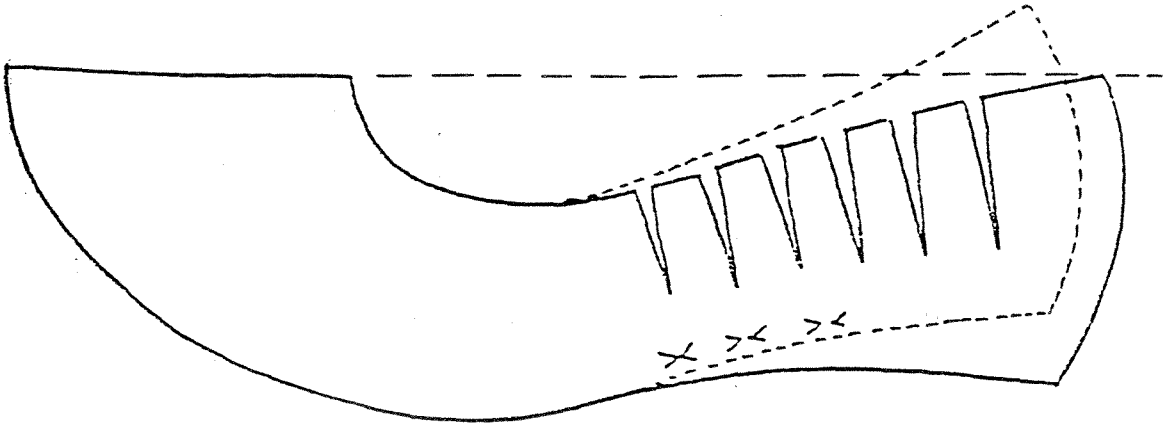


Fig.J - 2 The slotted method, used at counter area.

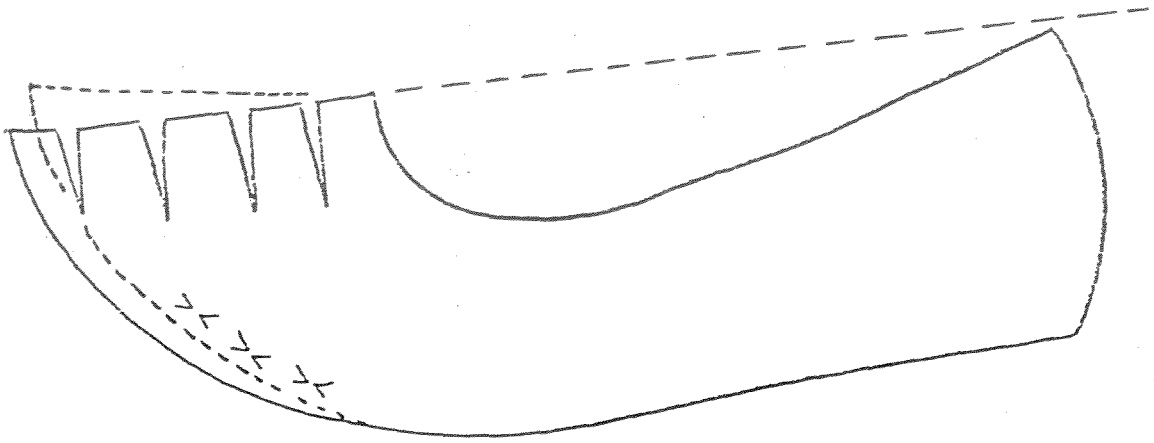


Fig.J - 3 The slotted method used at toe area.

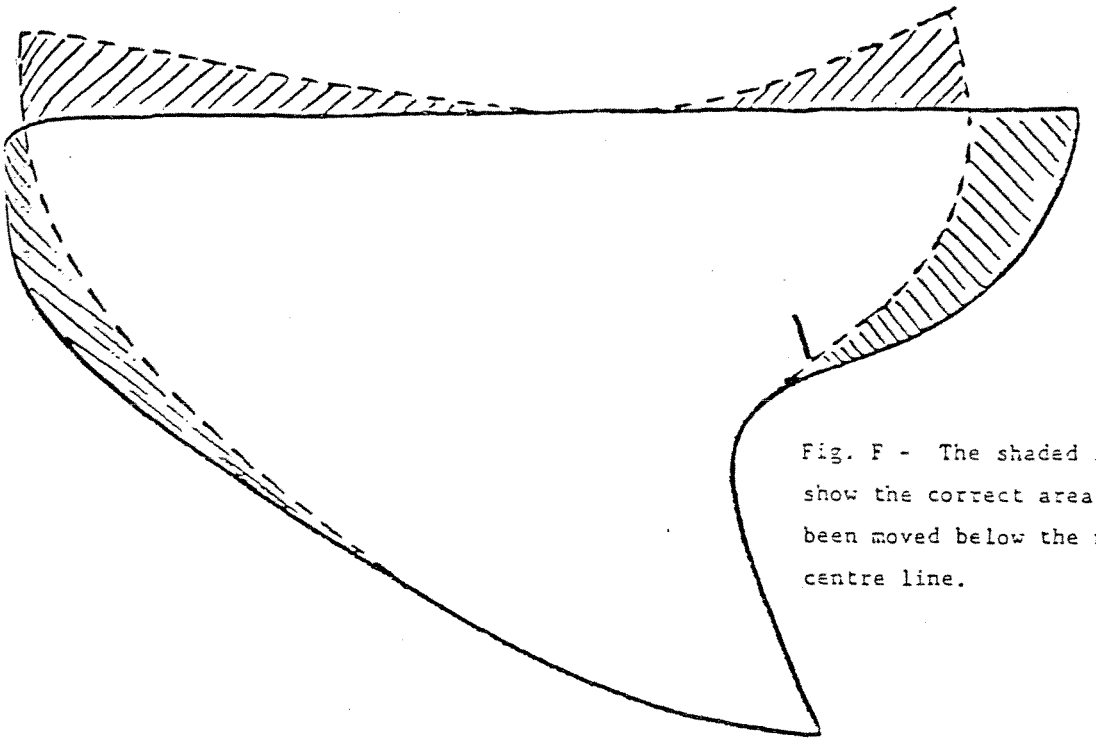


Fig. F - The shaded sections show the correct areas have been moved below the new centre line.

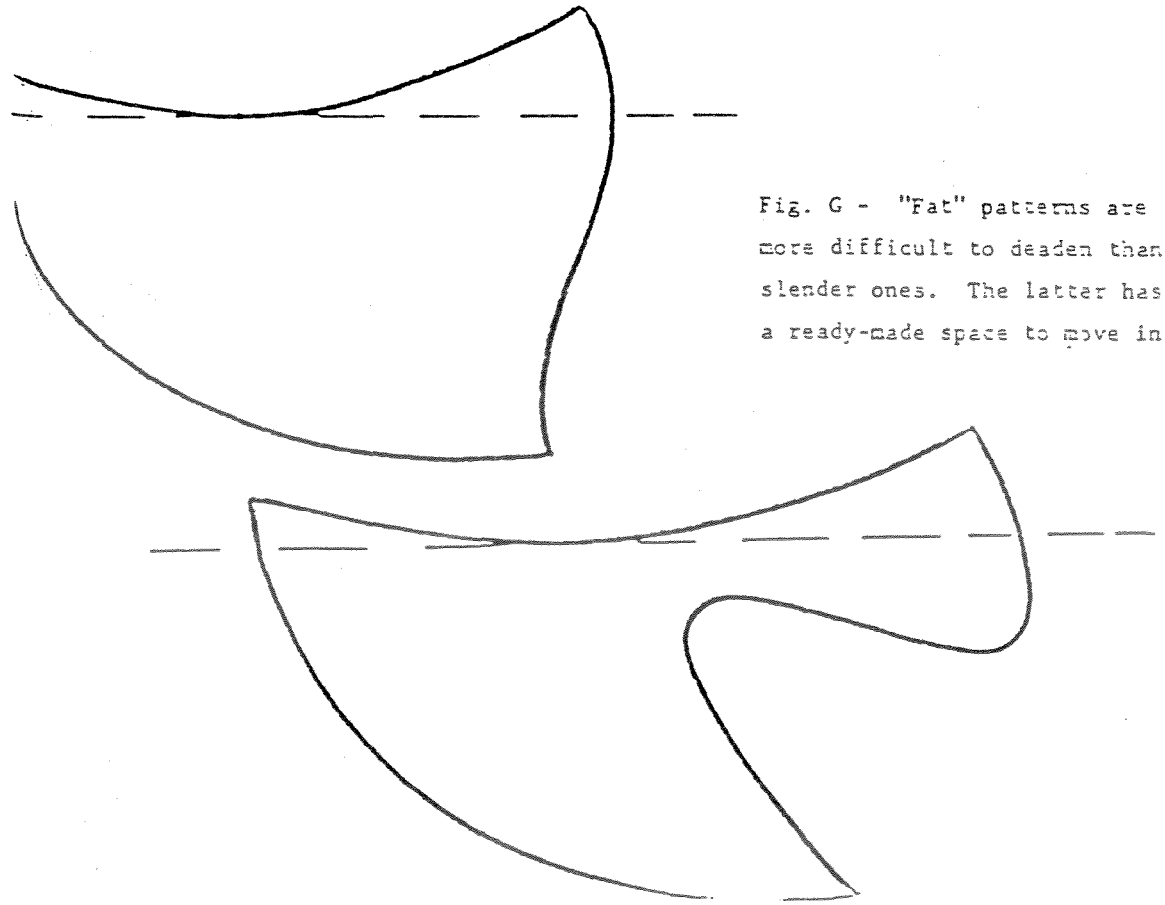


Fig. G - "Fat" patterns are more difficult to deaden than slender ones. The latter has a ready-made space to move into.

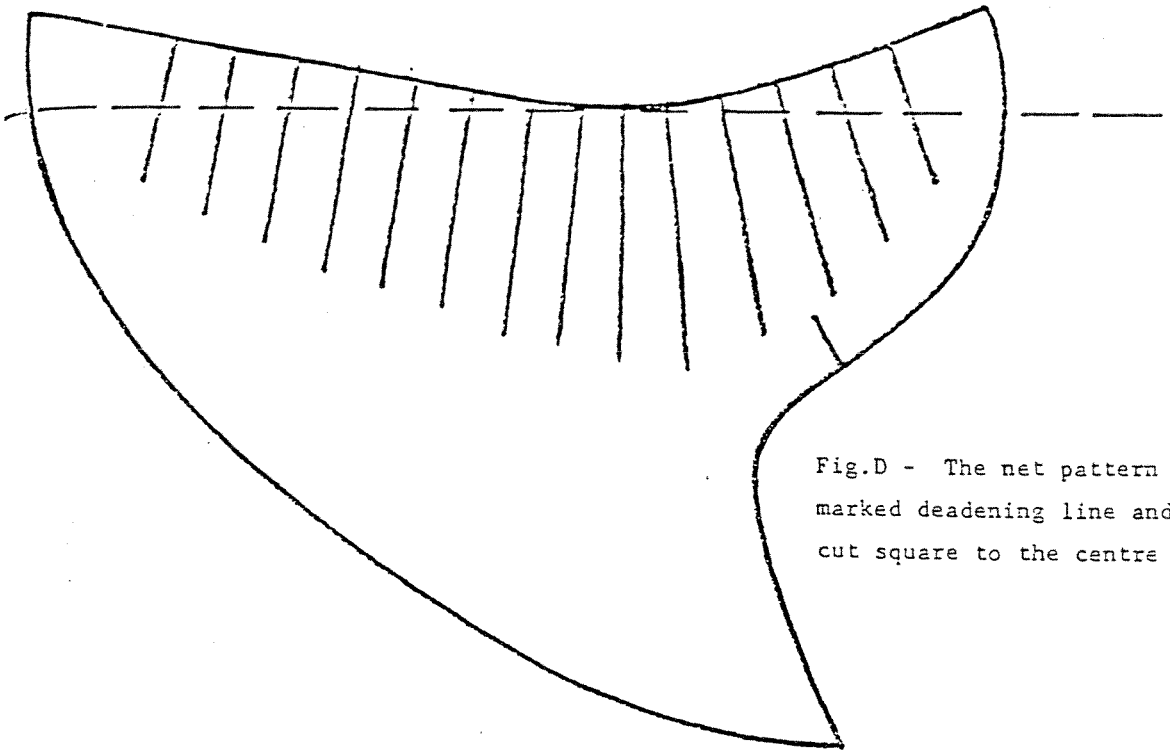


Fig.D - The net pattern with marked deadening line and slots cut square to the centre edge.

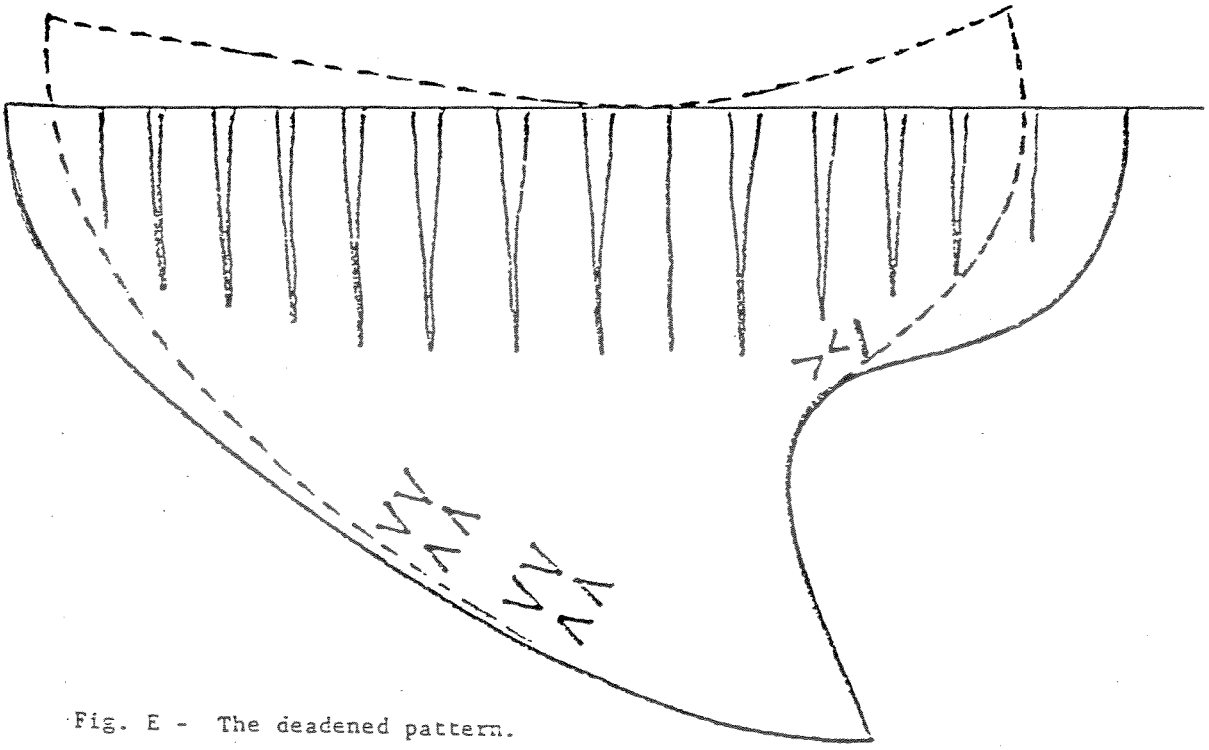


Fig. E - The deadened pattern. The slots open out and the pattern is pulled down to the

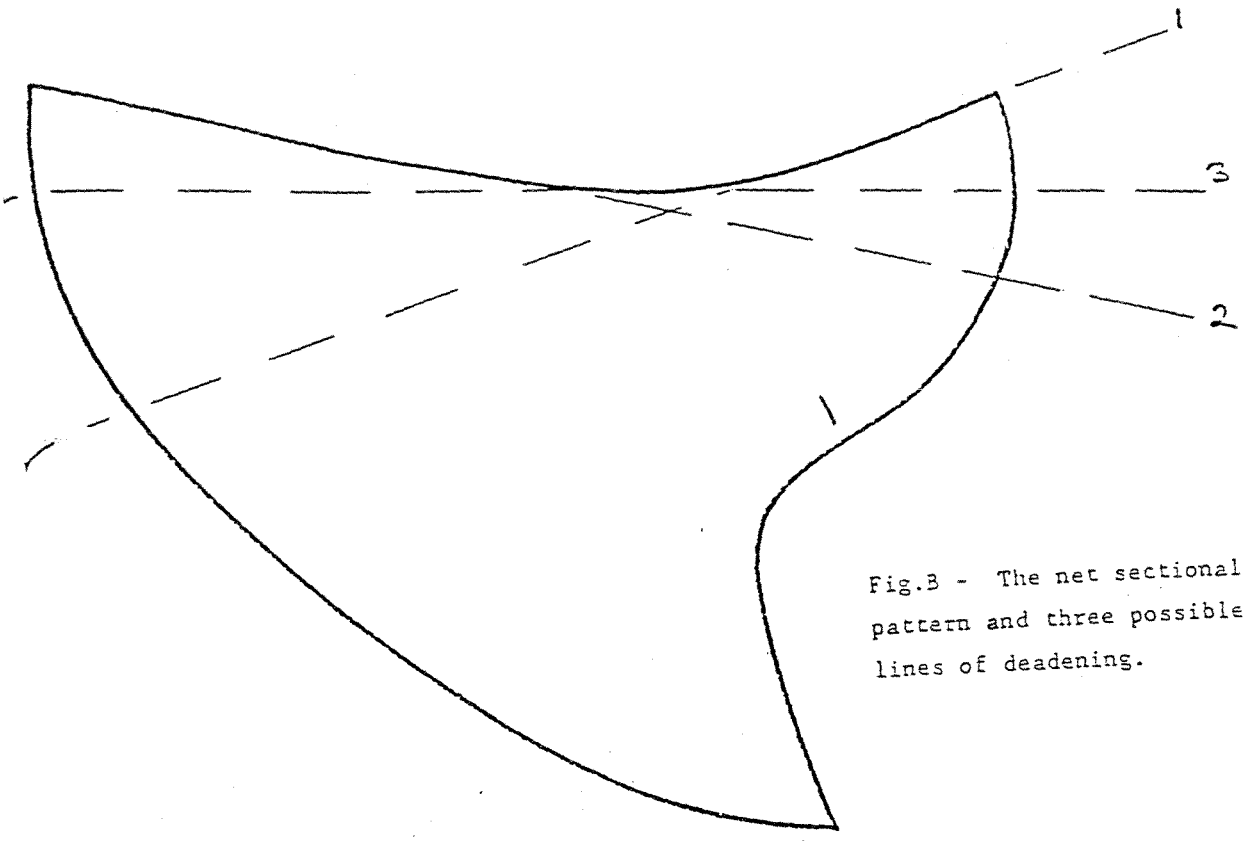


Fig.B - The net sectional pattern and three possible lines of deadening.

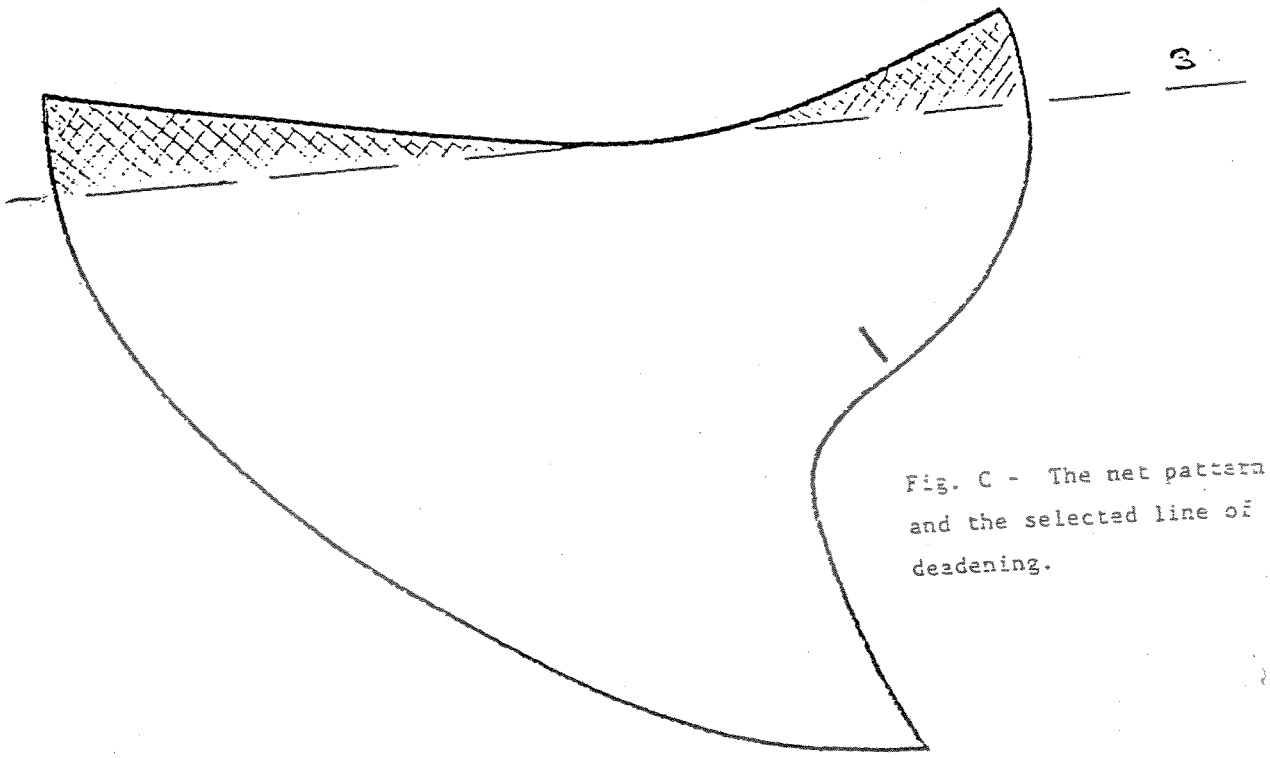


Fig. C - The net pattern and the selected line of deadening.

The shaded area shows the amount to be moved below the centre line.

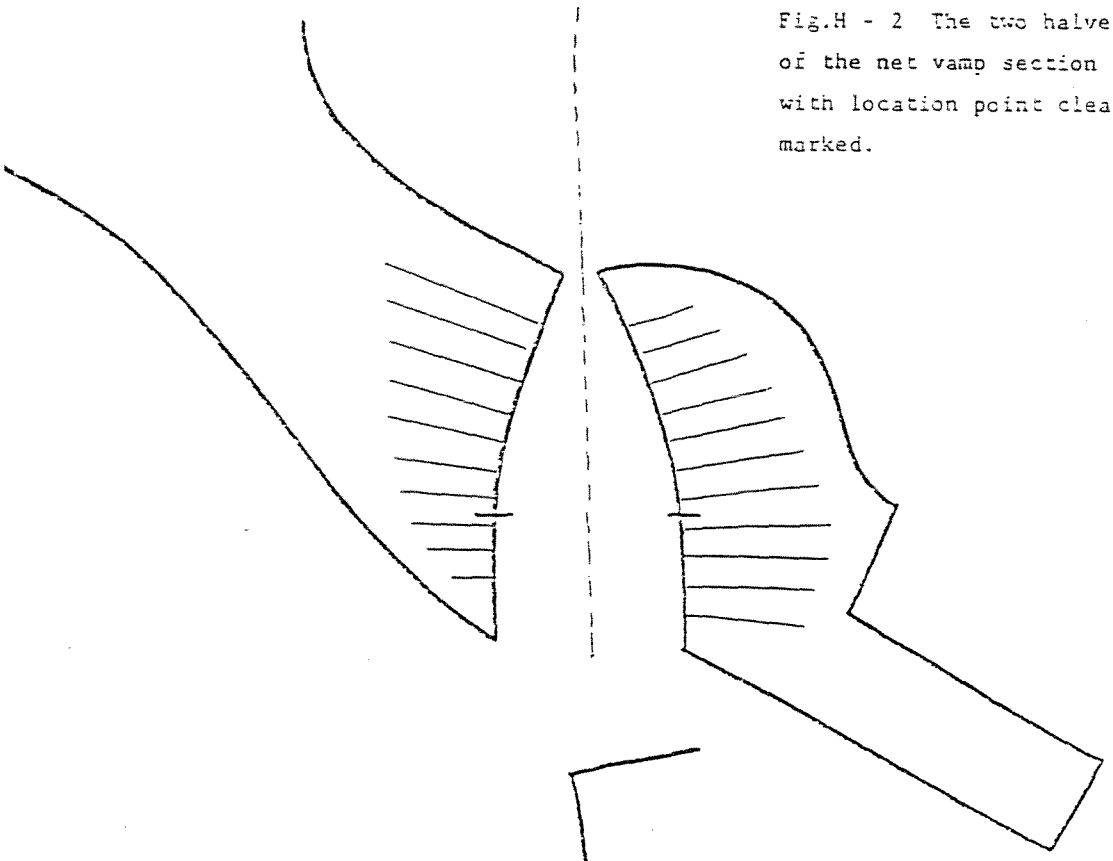


Fig.H - 2 The two halves of the net vamp section with location point clearly marked.

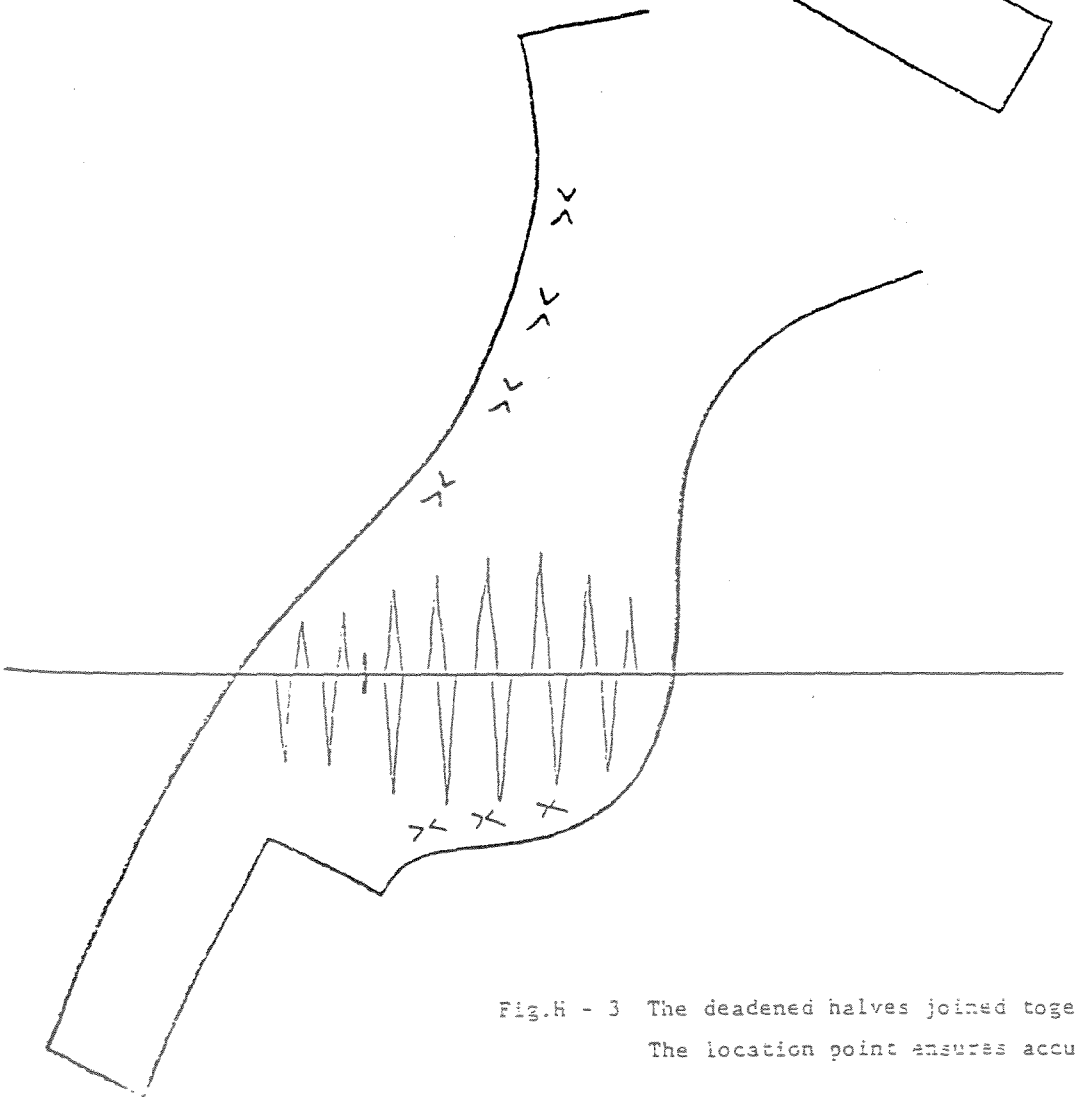


Fig.H - 3 The deadened halves joined together. The location point ensures accuracy.

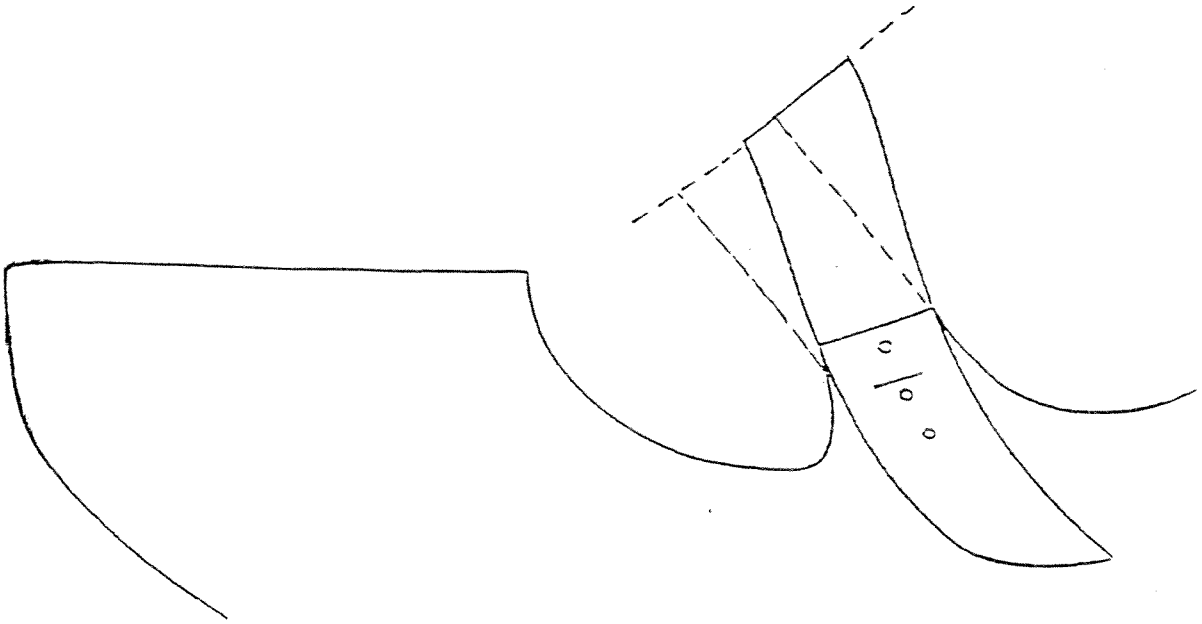


Fig.B - Too much curve in straps leads to poor fitting properties.

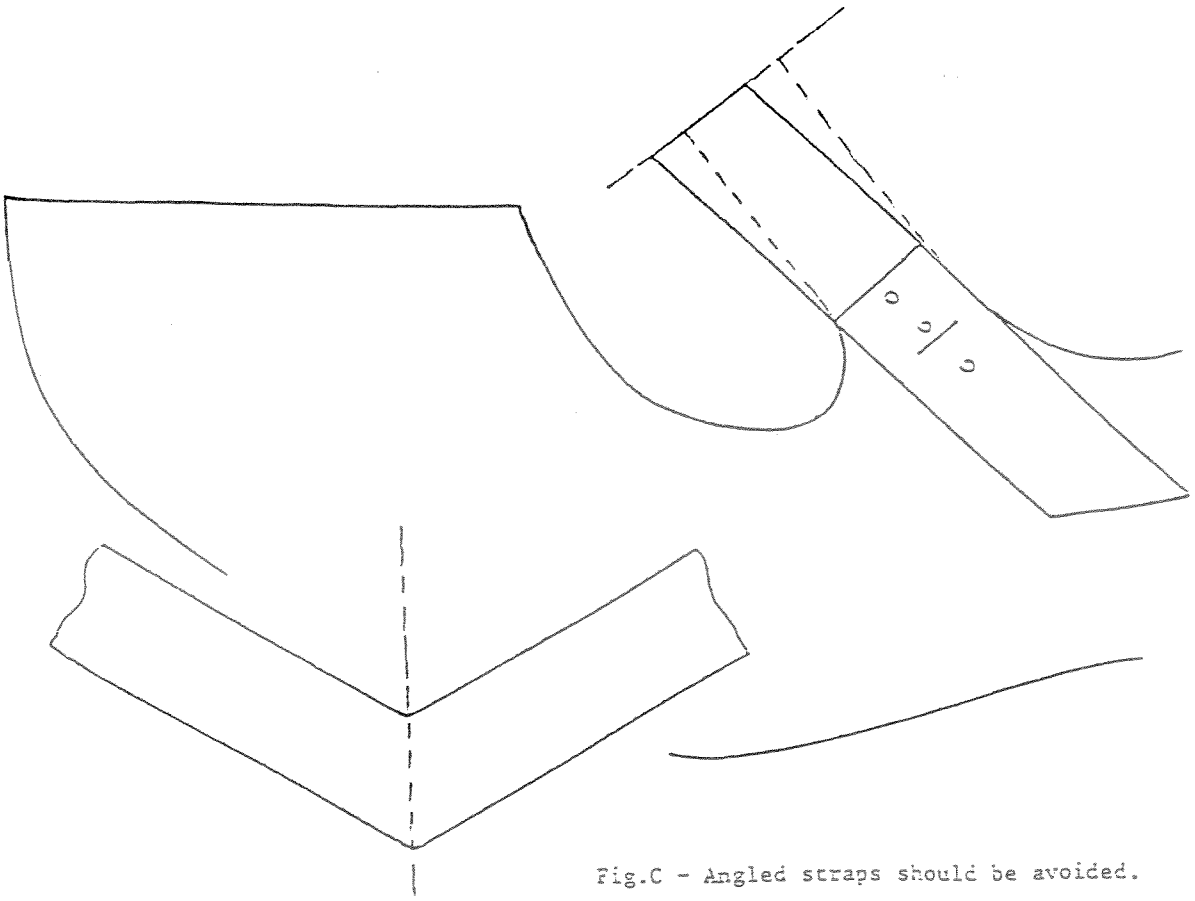


Fig.C - Angled straps should be avoided.

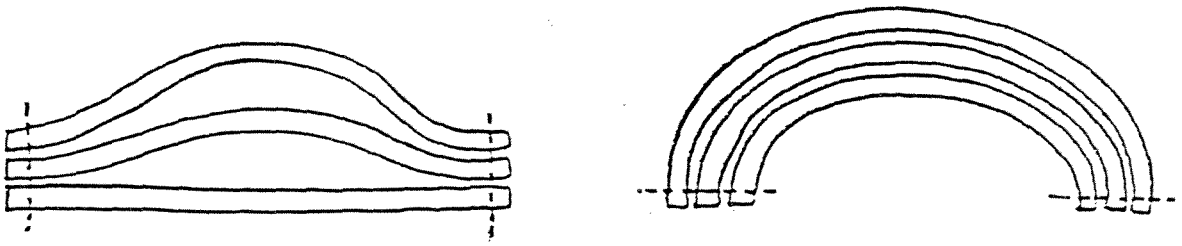


Fig.C - Flat uppers show the OPF - once lasted the "blowing" disappears.

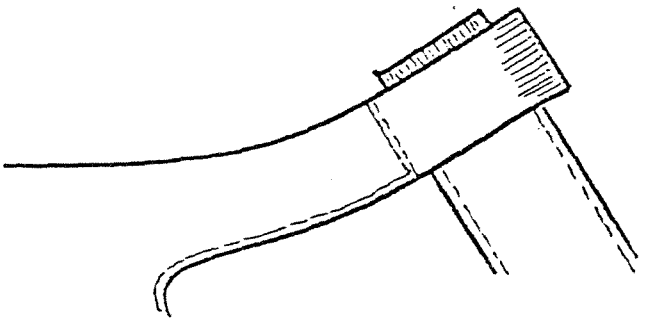


Fig.D-1. The OPF on T-bar styles.

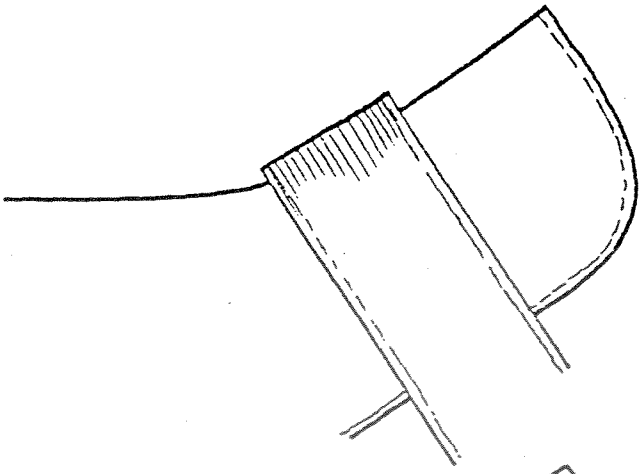


Fig.D-2. On Tab/T. styles.

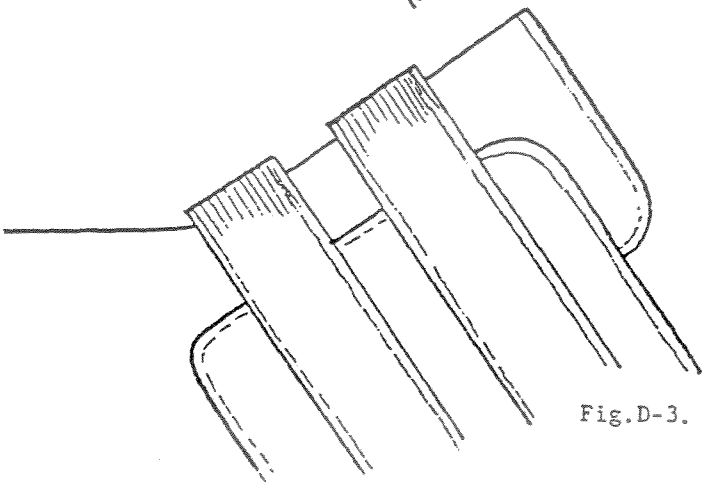


Fig.D-3. And on Monk styles.

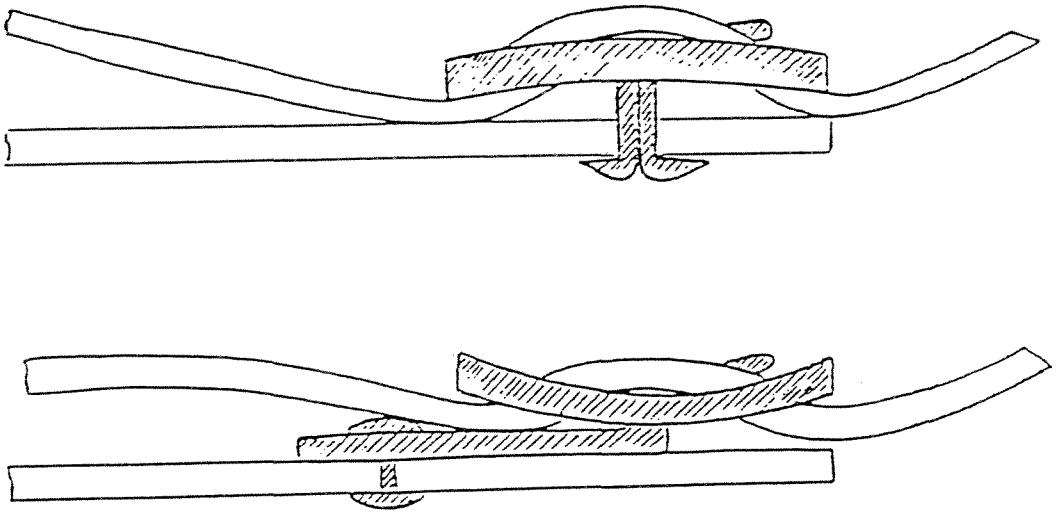


Fig.D - The OPF. is very apparent in Buckle/Strap styles

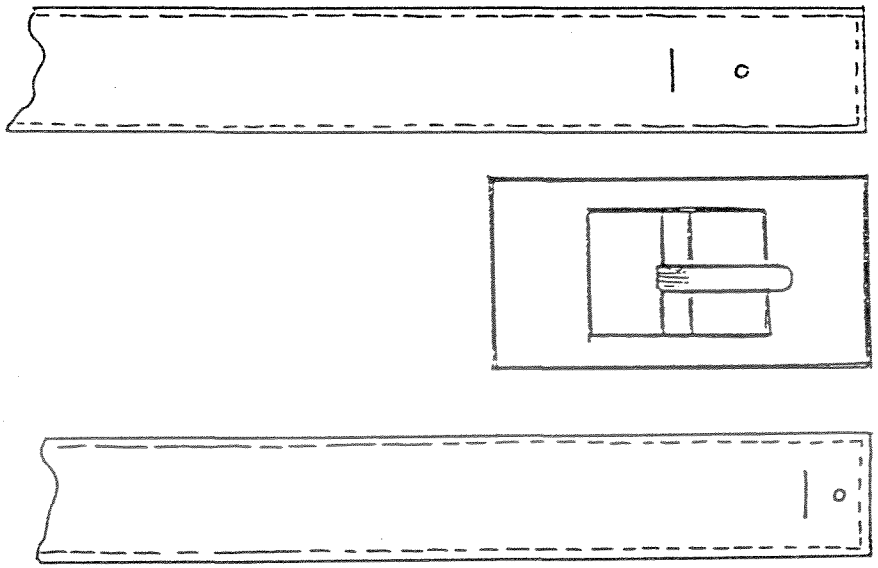


Fig.E - Different buckle shapes effect the fit of the patterns