

April 23, 1935.

F. L. FOSTER ET AL

1,998,499

PATTERN COPYING MACHINE

Filed Oct. 2, 1931

2 Sheets-Sheet 1

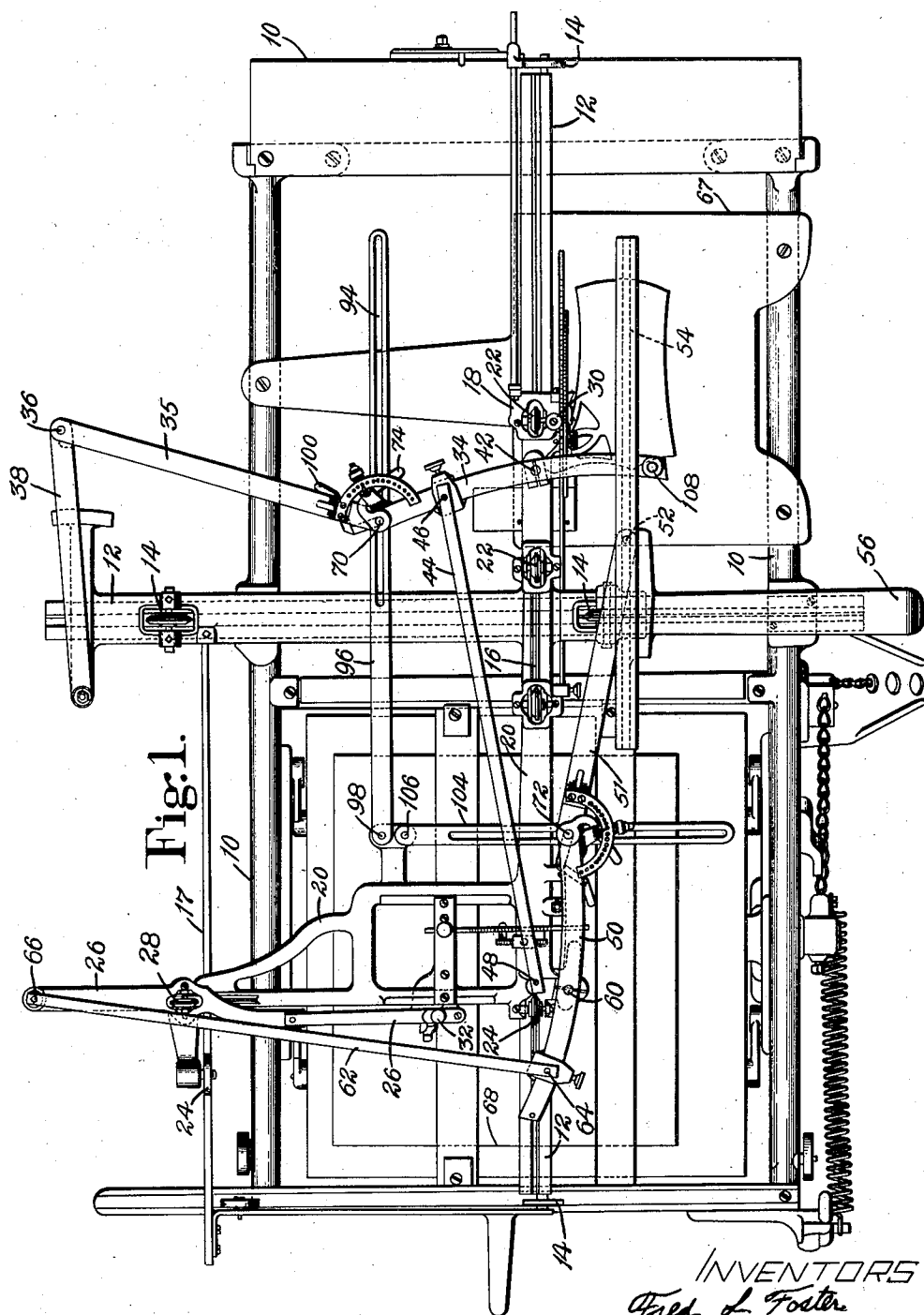


Fig. 1.

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Fig:2.

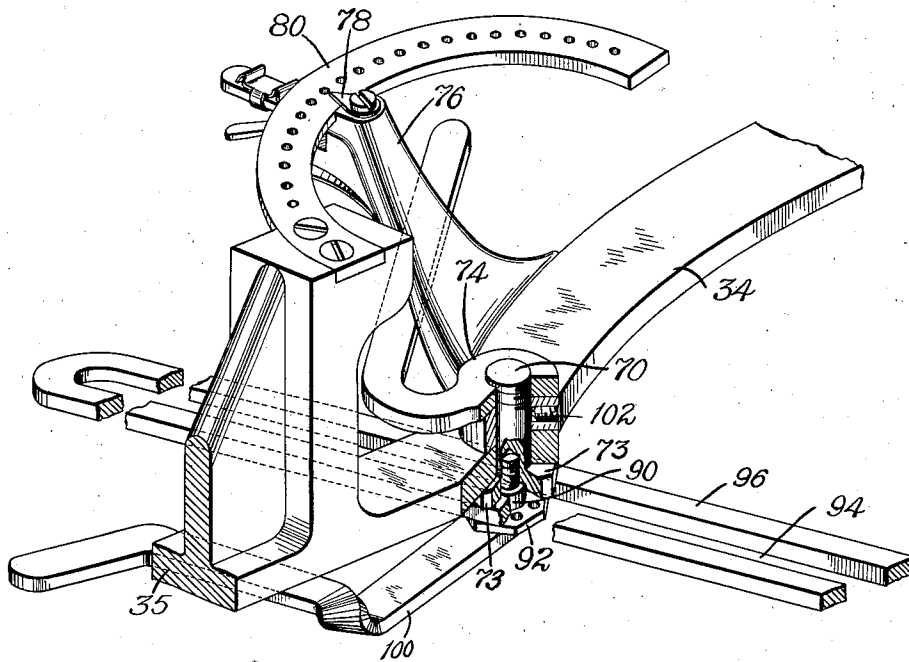


Fig. 3.

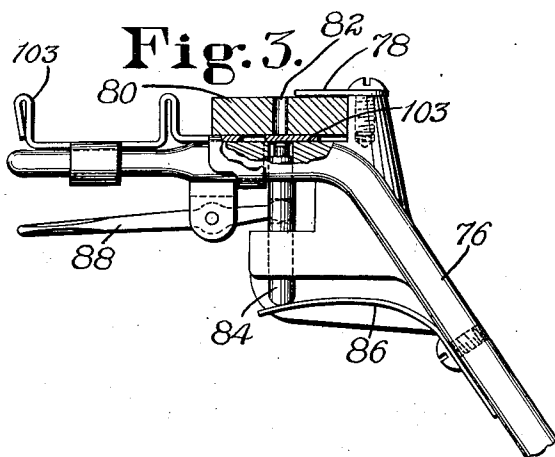
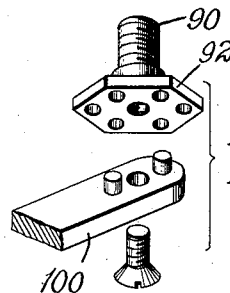


Fig.4.



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PATTERN COPYING MACHINE

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7 Claims. (Cl. 33—23)

This invention relates to pattern reproducing machines, that is, machines for reproducing a model in a work piece, and is illustrated herein as embodied in a pattern grading machine of the "two-dimensional" kind for producing shoe upper patterns from a model.

Machines of the type shown comprise four primary instrumentalities, namely, a model holder, a work holder, a model guide or follower, and a cutting tool, interconnected by two pantographic mechanisms operating to magnify or reduce the length and width of the model relatively to length and width grading axes independently, in the work piece.

Pattern grading machines are used in the boot and shoe industry for reproducing from a flat model or template of a part of a boot or shoe upper, one or more patterns which are used subsequently in cutting out the part from leather or other suitable material. A pattern generated by such a machine will, in general, if it is not of the same size as the model, be a general pantographic enlargement or diminution of the model relatively to the grading axes, the magnification factors relatively to the two axes being independent.

It is sometimes desired to grade a pattern from a model having an ornamental cut-out portion in such manner as to cause a chosen part of the corresponding cut-out portion on the work to grade into position, along a certain direction, relatively to an edge of the work but yet to grade the cut-out portion itself in such manner as to cause its dimension in the work along the said direction to be equal to that of the cut-out portion in the model along the corresponding direction. Such a method of grading part of the model at a 1:1 ratio, called "center grading", often presents difficulties particularly when the model has a number of cut-out portions distributed over its area.

Heretofore this problem has been dealt with by locating a point of the pattern at which it is desired to begin the center grading at the grading center of the machine. The grading center is a point such that when the model follower is located upon it, the grading mechanism settings can be altered without causing any relative movement of the tool and work. This procedure has not been successful since there are often several points at which such a change, either to begin or to end the center grading, is desirable, and the change will cause a jog in the work if made anywhere else than at the grading center.

The object of the present invention is to pro-

vide in a pattern grading machine improved means which are capable of dealing with difficulties of the kind above indicated.

Accordingly, the invention provides novel means whereby, at any time during a grading operation, the pantograph mechanism of the machine may be quickly and easily rendered inoperative so far as grading effect is concerned without causing relative movement to take place between any of the primary instrumentalities due to the said adjustment of the pantograph mechanism. The machine will then grade at a 1:1 ratio irrespective of the actual settings of the grading mechanism. A change back to the normal grade is effected with similar ease and advantage.

These and other features of the invention comprising certain combinations and arrangements of parts will be apparent from the following description of a preferred embodiment of the invention shown in the drawings, in which

Fig. 1 is a plan view; and

Figs. 2, 3 and 4 are details of the center grading mechanism.

The illustrated machine is, in its main structure, a Hartford pattern grader of ordinary construction. The main frame or bed 10 is provided with smooth tracks or ways upon which the carriage 12 slides freely toward and from the operator (or "north and south") on wheels 14. The carriage 12 is provided with tracks 16, 17 on which the model wheel carriage 18, and a similar carriage 20, slide freely east and west on wheels 22, 24 respectively. The carriage 20 is provided with a track on which the tool carriage 26 slides north and south on wheels one of which is shown at 28. The model wheel is indicated at 30, and the tool at 32.

The carriages 18 and 20 are connected by the length grading mechanism comprising an arcuate length grading lever 34 having a straight extension 35 with one end pivoted at 36 to a link 38 which is pivoted to the carriage 12. This lever is pivoted at 42 on the carriage 18, and a link 44, adjustable along the arc 34 and pivoted thereto at its point of adjustment 46, is pivoted to the carriage 20 at 48. With the parts as shown in Fig. 1 an east or west movement of the carriage 18 and model wheel 30 will cause a smaller but proportional movement of the carriages 20 and 26 and tool 32. The effect of the link 38 is substantially that of a north and south slide to permit the lever 34, 35 to swing. Such a slide is found on some machines of this type.

The width grading mechanism connects the

carriages 20 and 26 and effects proportional north and south movements of the tool 32 and model wheel 30. It comprises the arcuate width grading lever 50 having a straight extension 51 with its end pivoted at 52 in an overhanging east and west slideway 54 mounted on an arm 56 on the frame 10. It is pivoted at 60 on the carriage 20, is joined to the lever by a link 62 at an adjustable pivot 64, and is connected to the carriage 26, at the pivot 66. With the parts as shown in Fig. 1, a north movement of the model wheel 30 will cause a greater, but proportional, north movement of the cutter 32.

The model table is indicated at 67, and the work table at 68.

Each of the grading levers is provided with a mechanism known as a "shift". This consists essentially of a pivot between the straight and arcuate parts of the levers, at 70, 72, respectively, with clamps to render the levers normally rigid. These constructions are alike on both levers, and are shown in detail in Figs. 2, 3 and 4. The pivot 70 is formed as a stud having a flange 73 underlying the member 35, the stud extending up through the members 34 and 35. A screw thread at its top is engaged by a handled nut 74 to clamp the parts 34 and 35 firmly together. The arc 34 is provided with an arm 76 with a pointer 78 co-operating with a segment 80 mounted on the member 35. The segment 80 has a series of holes 82 engageable by a sliding pin 84 in the arm 76. This pin is pressed up into a hole 82 by a spring 86 and is pulled down out of the hole by a lever 88. Thus, when the nut 74 is loosened, the pin 84 can be used to set the members 34 and 35 at a different angle to each other and then the nut 74 is tightened again. The purpose of this mechanism, which is well known, is to avoid, for example, grading the top of a high shoe. When such a shoe is regularly width graded, the top line of the leg portion comes too high to look well, and the shift at 72 is used to throw the tool north or south, discontinuously, to lower the top line and cut off the unwanted portion by the east or west movement along the top.

The radii of the arcs 34 and 50 are equal to the lengths of the links 44 and 62 respectively. Obviously, when the parts are in such a position that the arc 34 lies symmetrically relatively to the line 42, 48, the length grader setting can be changed without causing any movement of other parts. The north and south line on the model holder 67 which registers with the model wheel 30 at such time is called the length grading axis, and an east and west line corresponding to a similar position of the width grading lever 50, 51 is known as the width grading axis. Their intersection is the grading center, above mentioned.

All of the structure above described is well known.

The new structure cooperating with parts already described to effect the objects of the invention will now be described.

The stud 70 is tapped at its lower end to receive a stud 90 having a flat head 92. This stud passes through a slot 94 in a link 96, pivoted at 98 to the carriage 20. The head 92 is clamped against the link, thus holding it firmly to the stud by a handle 100 having an adjustable engagement with it, as shown in Fig. 4, so that the requisite range of movement of the handle can be secured without interference with other parts. (The same object is accomplished in the case of the nut 74 by the set screw 102 in the arc 34, which permits rotary adjustment of the flange 73.)

Suppose now that a point has been reached on the model periphery at which it is desired to change the length grade from that shown in Fig. 1 to a 1:1 ratio. The operator will loosen the nut 74, tighten the stud 90 (thereby clamping the link 96 rigidly to the flange 73 on the pivot 70, and hence to the lever 34), pull down the pin 84, and shove in a little slide 103 (Fig. 3) which passes over the top of the pin 84 and prevents its rising. Then the carriage 20, link 96, arc 34, and link 44 form a rigid quadrilateral, and the two carriages 18 and 20 must move at a 1:1 velocity ratio, thus accomplishing the 1:1 length grading, or "center grading" in length, as desired. This causes no disturbance of the machine, or jog in the work, and a reversal of the setting procedure described above will set the machine back into the length grade for which it was set without disturbance. During the center grading the parts 34 and 35 will swing relatively to each other about the pivot 70, which thus provides a lost motion device preventing locking or cramping.

A similar construction, including a link 104, pivoted to the carriage 20 at 106, is provided in connection with the width grading lever 50, 51. The clamping of the link 104 to the lever 50 locks the lever 50 to the carriage 20, thus holding the tool carriage 26 relatively motionless thereon.

Thus center grading in both length and width, independently, at any desired point in the production of a work piece, is secured, without disturbance of the machine at the points of transition from one grade to the other.

A handle 108 is provided at the end of the lever 34 nearest the operator, and is used to control the movement of the model wheel around the model in the heavier machines of the type shown. The connection of the link 96 at the point 70 of the lever 34 renders it possible to use this handle efficiently without any lost motion, or cramping, which might result if, for example, the link 96 were connected straight across between the carriages 18, 20, or straight across between the carriage 20 and the pivot 42, in case the pivot 42 happened to be near the pivot 42.

Having described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and tool to reproduce a model in a work piece, an element operatively connected with one of said primary instrumentalities in such manner as to have the same movement, perpendicular to the width grading axis, as said primary instrumentality and movable relatively to another of the said primary instrumentalities in the width grading direction during the action of the width grading mechanism, means comprising a clamp for positively holding said element and said last-named primary instrumentality against relative movement in the width grading direction, at the will of the operator at any time during the production of a work piece, and a lost motion means in said grading mechanism acting to prevent cramping when said element and said primary instrumentality are so held.

2. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, connections between them comprising a grading mechanism for effecting relative movements be-

tween the work holder and tool to reproduce a model pantographically in a work piece, said connections including a member which is operatively connected to one primary instrumentality in such manner as to have the same movement, perpendicular to a grading axis, as said primary instrumentality and moves relatively to a certain other primary instrumentality during the grading action, a holding means arranged to hold said element and said certain other primary instrumentality positively against relative movement, when it is desired to center grade, and a lost motion device arranged to absorb the normal grading movement of the machine to prevent cramping, when center grading is being done.

3. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and tool to reproduce a model in a work piece, said grading mechanism comprising a lever operatively located between two of said primary instrumentalities to transmit movement from one to the other, means operative to hold said lever immovable relatively to one of said two primary instrumentalities in order to effect center grading, and a lost motion device operable when the lever is so held, to prevent cramping.

4. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and tool to reproduce a model in a work piece, said grading mechanism comprising a lever operatively located between two of said primary instrumentalities to transmit movement from one to the other, means operative to hold said lever immovable relatively to one of said two primary instrumentalities in order to effect center grading, and a normally rigid pivoted joint in the lever operable to prevent cramping when the lever is so held.

5. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and

tool to reproduce a model in a work piece, said grading mechanism comprising a lever and a link operatively located between two of said primary instrumentalities to transmit movement from one to the other, a second link operatively located between said lever and one of said two primary instrumentalities, means for clamping said last-named link to said lever, when center grading is desired, and a lost motion device operable to prevent cramping when said last-named link is clamped to said lever.

6. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and tool to reproduce a model in a work piece, said grading mechanism comprising a lever and a link operatively located between two of said primary instrumentalities to transmit movement from one to the other, a second link operatively located between said lever and one of said two primary instrumentalities, means for clamping said last-named link to said lever, when center grading is desired, and a normally rigid pivoted joint in said lever to be loosened when center grading is desired, said second-named link being connected with said lever at said joint.

7. In a pattern reproducing machine, four primary instrumentalities, namely, a model holder, a work holder, a model guide and a tool, grading mechanism interconnecting them for effecting relative movements between the work holder and tool to reproduce a model in a work piece, said grading mechanism comprising a lever and a link operatively located between two of said primary instrumentalities to transmit movement from one to the other, a second link operatively located between said lever and one of said two primary instrumentalities, means for clamping said last-named link to said lever, when center grading is desired, at a point remote from the point of attachment of said first-named link to the lever, a lost motion device operable to prevent cramping when said last-named link is clamped to said lever, and a handle on the end of the lever to operate the machine.

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