April 21, 1936. E. KINSELLA ET AL 2,037,798

KNITTING MECHANISM

Filed Oct. 26, 1932 2 Sheets-Sheet 1

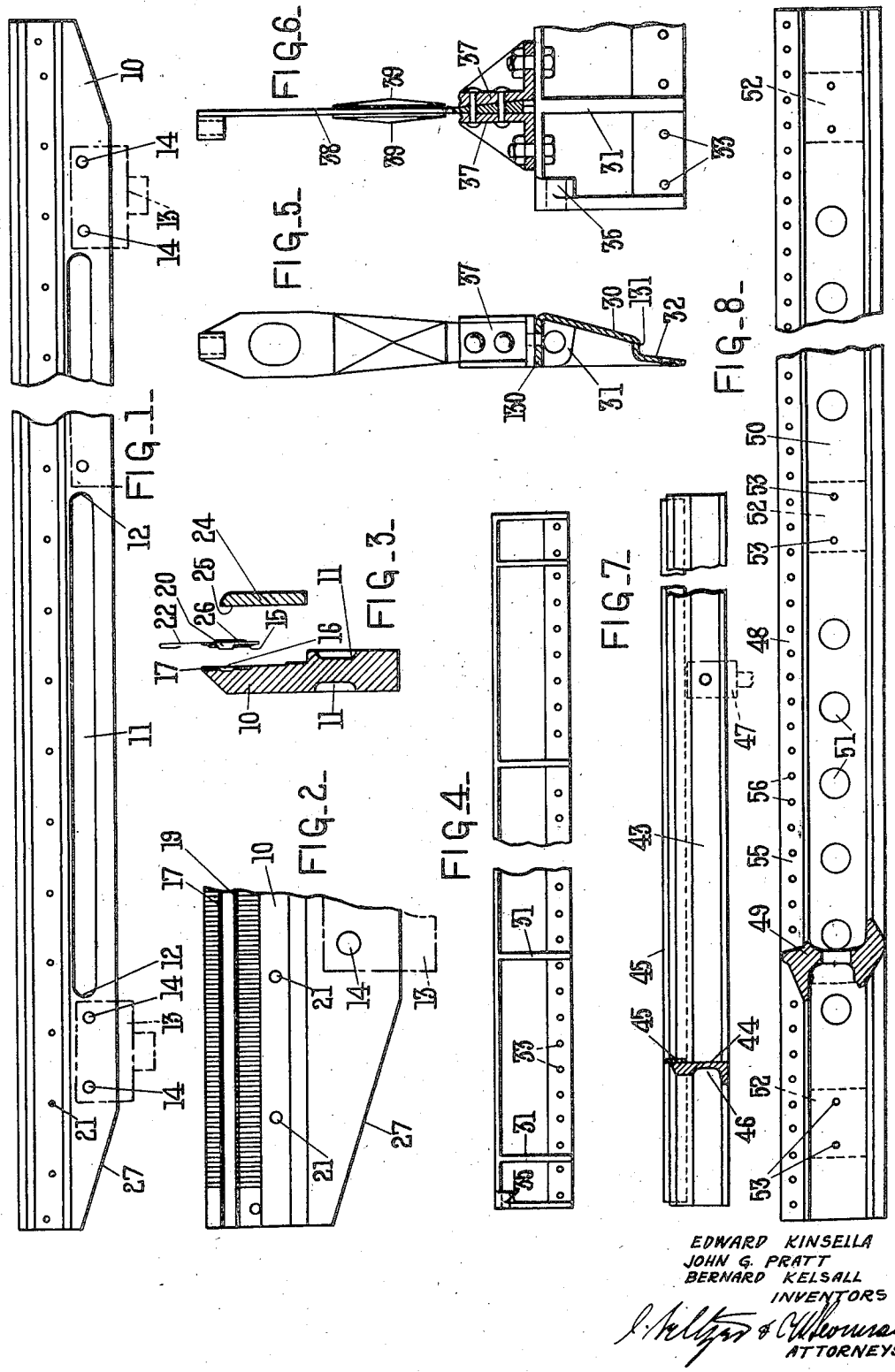

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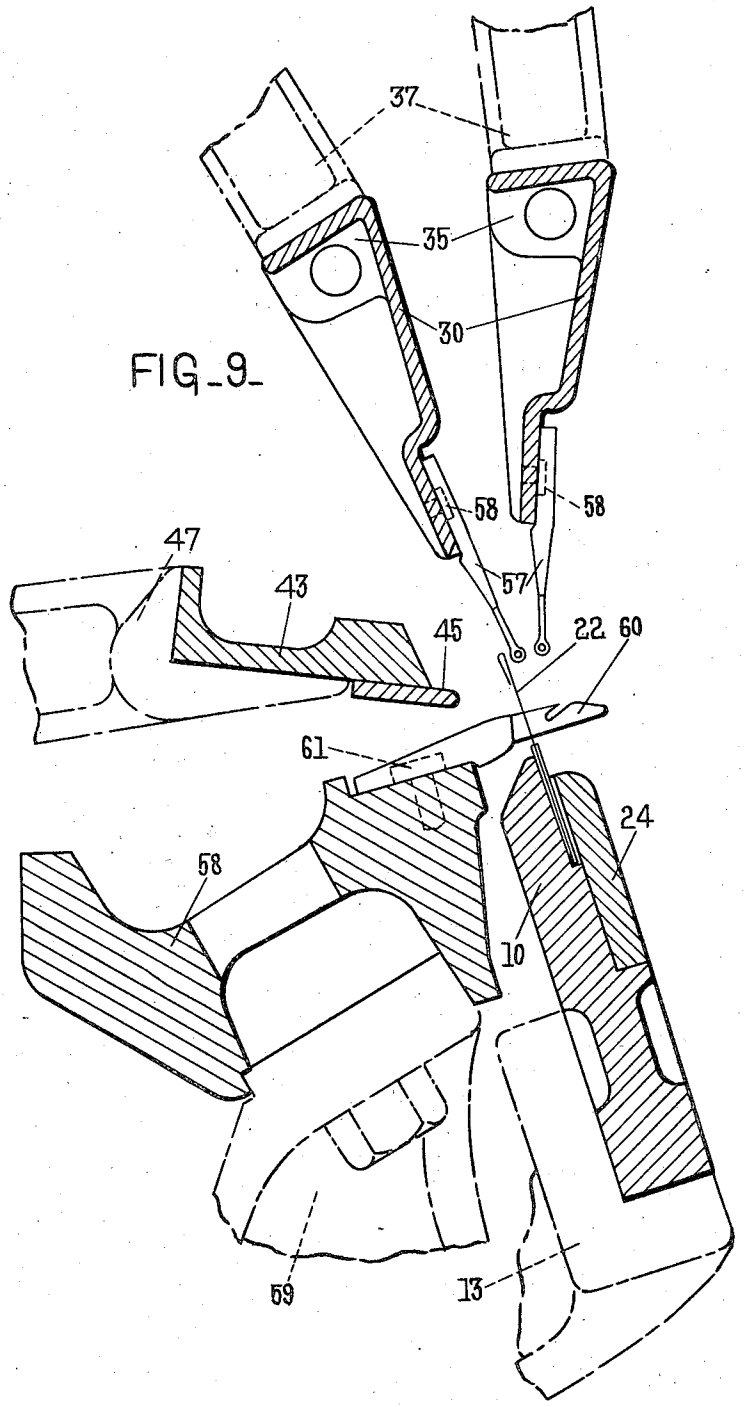
FIG. 9.



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2,037,798

KNITTING MECHANISM

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Application October 26, 1932, Serial No. 639,636
In Great Britain November 3, 1931

1 Claim. (Cl. 66—86)

This invention relates to the production of textile fabrics, and more particularly to the production of knitted fabrics on warp knitting machines.

The object of the invention is to improve warp knitting machines with the object of greatly increasing their rate of working and smoothness of operation, and rendering them capable of knitting fabrics of better and more uniform quality.

It has been found that the bars extending along the length of the machine and carrying the moving knitting parts for example the needles, sinkers, guides and the presser under the forces involved in bringing about their oscillating movements vibrate by bending between the supporting arms and so give rise to deflection of the bars and displacement of the knitting parts themselves, this deflection and displacement increasing very rapidly with increasing speed, and militating against any increase in the working speed of the machine. Since the weight of the bars themselves is a factor in the causes of such bending between supports, increasing the strength of the bars by increasing their weight has little or no effect in reducing the deflection; obviously, a heavier bar requires greater operating forces, and these in turn tend to produce greater deflection.

It has now been found that by the adoption of a bar of such section as to be rigid in construction but still light in weight, the inertia of the bar may be made quite small thus permitting a high speed of operation. According to the present invention the bars extending along the length of the machine and carrying the moving knitting parts, e. g. the needles, sinkers, guides and the presser, are formed with recessed beam-sections, and are thereby adapted to offer a high resistance to bending in the direction of motion of the bars. That is to say the cross-section of the bar is such as to have a moment of inertia about a radius from the centre of motion of the bar through the bar itself which is high in comparison with the area of the section. In addition it is preferred that the bars should be made of light material in order to maintain the weight low while obtaining high rigidity. Light aluminium alloys of high modulus of elasticity such as those used in modern internal combustion engines for racing purposes are particularly suitable, since they combine an extremely high resistance to deflection with very low specific gravity.

The bars may be made in any convenient manner, e. g. built-up, cast or extruded, though of these three methods the last is preferred in view of the length of the bars which renders casting difficult and of the advantages inherent in a solid bar as opposed to a built-up bar. In the case of an extruded bar, suitable members may subsequently be added to the bar to provide for the connection of the bar to the rocker arm carrying it. In any event machining may be resorted to for the purpose of providing convenient attachments for the knitting parts. However, for the guide bars, a pressed or rolled sheet-metal member may be used, suitably stiffened against distortion of the bar-section.

The invention may be used with advantage in conjunction with the invention described in U. S. application S. No. 639,637 filed October 26, 1932, which is primarily concerned with securing the knitting parts together in series in a strip of light alloy which is then fastened in position along the edge of the bar, other methods for securing the knitting parts in series also being described.

By the adoption of a bar section which is not only light in structure but also light in weight, the inertia of the bar may be made very small so that the vibrational forces arising from the oscillation of the bars in the course of knitting and transmitted to the machine frame are reduced. These forces may be balanced by the methods described in U. S. Patents Nos. 1,981,512 and 1,981,513. The reduction in weight, however, is of considerable importance in connection with the mechanism described in U. S. Patent No. 1,981,511, which describes a cam mechanism for effecting the endwise movements of the thread guides. According to U. S. Patent No. 1,981,511, the forces necessary to effect such endwise movements are not balanced, but their reaction is transmitted as directly as possible to the machine frame. The reduction in weight of the guide bar effected by the present invention permits of still further increasing the high rate of to-and-fro endwise motion arising from methods described in U. S. Patent No. 1,981,511.

The invention will now be described in greater detail with reference to the accompanying drawings, but it is to be understood that this description is given by way of example only, and is in no respect limitative.

Figure 1 shows a view of a needle bar;

Figure 2 is a detailed view on a larger scale of part of Figure 1;

Figure 3 shows a sectional view of Figure 2 together with needle sections and clamping plate for securing same;

Figure 4 is a view of a guide bar;

Figures 5 and 6 are detailed views of the guide

bar shown in Figure 4 together with its connections;

Figure 7 is a view of the presser bar with the presser attached;

Figure 8 is a view of the sinker bar; and

Figure 9 is a view of the bars assembled.

The parts shown in these figures are particularly suitable for use in work knitting machines described in U. S. Patents Nos. 1,981,512 and 1,981,513 to which reference may be had for the disposition and operation of the parts.

Referring to Figures 1 to 3, the needle bar **10**, is shown deeply channelled out at **11**, thus leaving the bulk of the metal at the upper and lower edges of the section and forming a beam of I-section. The channelling **11** is interrupted as at **12** for the connection of the bar to the ends of the needle bar operating or supporting arms shown at **13** in dotted lines, bolt holes being provided at **14** for this connection.

As shown in Figures 2 and 3 the bar is recessed on one face at **16** and in the recessed portion is provided with frequently occurring grooves **17** into which ridges **15** on the needle sections fit. The bar is also provided on its recessed face with a long horizontal groove, this groove **19** engaging with upstanding parts **20** on the needle section shown in Figure 3. The long groove **19** and the vertical grooves **17** accurately locate and align the needles **22**. Holes **21** are provided for bolts (not shown) by means of which the needles **22** are clamped to the recessed face of the bar by means of a clamping plate **24**. The inner face of the clamping plate **24** is lined with felt at **25** engaging with ridges **26** on the forward face of the needle sections. For the sake of lightness the bar is tapered at **27** beyond the end supports **13**. The bar is preferably cast from a high tensile aluminium alloy.

Reference to Figure 1 will show that the needle bar is subjected to operating forces applied by the levers **13** at intervals along the length of the bar, these forces having to bring about a rapid reversal of movement of the bar and attached needles substantially in the general plane of the bar. The reduction in weight offered by the use of the light aluminium alloy for the bar in itself reduces the mass to be moved and the forces required to move the mass, while in addition, the cross-section of the bar is so formed as to make the best use of the material in resisting deflection.

In Figures 4, 5 and 6, one of the guide bars is shown, the section of the bar as shown at **30** in Figure 5 being a distorted U or channel and so rigid and able to resist deflection during its motion which takes place in an approximately horizontal direction, both lengthwise and transverse to the bar. The narrowing of the bars as shown in Figures 5 and 9 is necessitated by the two guide bars commonly used in warp knitting having to converge towards the needle heads and to provide a free space between each other for the free passage of one warp sheet.

The structure shown provides rigidity notwithstanding these limitations, the flange **130** at the top of the channel sections and the smaller horizontal portion **131** resisting deflection under the horizontal forces arising out of the between-needle movements of the guides. The bar is reinforced at intervals by means of webs **31** preferably welded in position, which act as cantilevers to prevent distortion of the bar section itself under these horizontal forces. Sections of guides of the kind described in U. S. Patent No. 1,980,209 are attached to the face **32** of the bar being bolted thereto at **33**, to form a continuous series. The bar is connected by means of a boss **35** to a lapping mechanism e. g. of the kind described in U. S. Patent No. 1,981,511.

The suspension of the guide bars is clearly shown in Figures 5 and 6, the guide bars being connected by means of brackets **37** to a series of flat springs **38** which are reinforced by means of stiffening plates **39**. The springs **38** are supported at their upper ends and by their deflection permit of ready, substantially effortless movement of the guide bar **30** under the action of the lapping force applied at **35**. The between-needle movement of the guides on the other hand is imparted to the bar **30** by a transverse swinging of the springs **38**, the width of the springs in conjunction with the stiffening plates **39** providing a rigid connection for imparting the desired oscillation.

In Figure 7 a presser bar is shown at **43**, the section **44** of the bar being recessed at **46**, and substantially of U-form, giving the bar a high resistance to bending under the transverse forces applied in the plane of the flat face of the bar. The presser **45** itself is attached to the underside of the forward edge of the bar, which is carried by levers, of which one is indicated in dotted lines at **47**. The bar may be of rolled, cast or extruded material.

In Figure 8 a sinker bar **48** is shown, a section of the bar being indicated at **49**. The moment of inertia of the section at **49** is considerable when taken about an axis at right angles to its web. Though distorted, the section may be regarded as actually of I or H form, the particular section shown being suitable for use in the machine described in Patent No. 1,981,513, where the space available for the bar is closely circumscribed by the other bars and their operating and supporting levers.

The web **50** of the bar is perforated as at **51** to ensure lightness and is provided with pads **52** indicated in dotted lines in the section **49**, the pads being bolted at **53** for the connection of the bar to its rocker arm. Sections of sinkers are secured to the face **55** of the bar by means of bolts passing through the bars **56** bolted in this face.

The bar is conveniently made from an extruded length the pads **52** being welded in position in the recessed under face of the bar.

Figure 9 is a view of the bars described with reference to the preceding figures, assembled in their knitting relationship, the needles, sinkers, and thread guides also being shown. The needle bar **10** carrying the needles **22** is shown slightly inclined to the rear. The needles **22** move substantially parallel to their length. The bar **10** is carried by a number of levers **13**, the end of one of which is shown in chain dotted lines.

Two guide bars **30** are shown secured to their supports **37** in the manner described with reference to Figures 4 and 5, sections of guides **57** being secured to the bars by means of screws **58** so that their lower ends are opposite the heads of the needles **22**.

The sinker bar **50** is carried on a plurality of levers **59**, one of which is shown in chain lines, the sinkers being secured thereto by means of bolts **61**. The sinkers **60** project through the row of needles **22**, and move substantially at right angles to the line of the needles.

The presser **45** is carried by its bar **43** on the ends of a number of levers **47**, one being shown in

chain lines. The presser moves substantially horizontally to and from the needles. This figure shows particularly clearly how it is necessary to crowd the bars carrying the knitting parts into a small space in order that knitting can take place.

What we claim and desire to secure by Letters Patent is:—

A bar for carrying the guides in the neighbourhood of the heads of the needles of a warp knitting machine, said bar being of U-section adapted to be supported at one side of the U and distorted on the other side to converge towards the needle heads, said bar being provided with stiffening ribs adapted to act as cantilevers to resist cantilever deflection of the bar.

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CERTIFICATE OF CORRECTION.

Patent No. 2,037,798. April 21, 1936.

EDWARD KINSELLA, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 14, strike out "application S. No. 639,637 filed October 26, 1932" and insert instead Patent No. 2,014,529; page 2, first column, line 8, for the word "work" read warp; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of June, A. D. 1936.

Leslie Frazer
Acting Commissioner of Patents.

(Seal)