Feb. 17, 1959 A. SHORTLAND 2,873,595

INSTRUMENT BEDS FOR KNITTING MACHINES

Filed Dec. 27, 1955 4 Sheets-Sheet 1

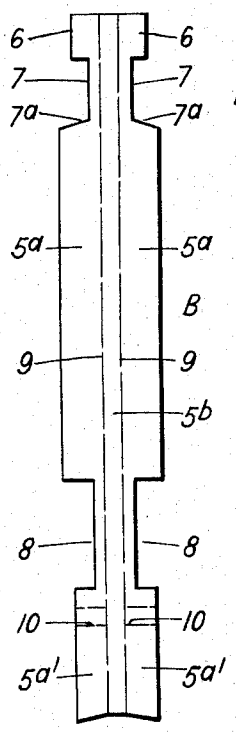


Fig. 1.

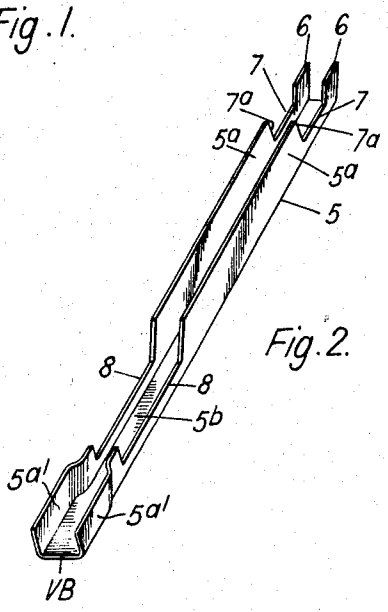
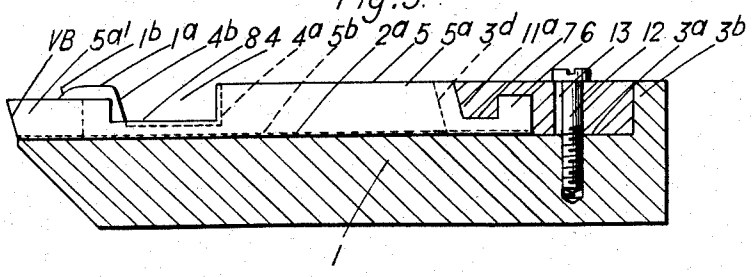


Fig. 2.

Fig. 3.



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INSTRUMENT BEDS FOR KNITTING MACHINES

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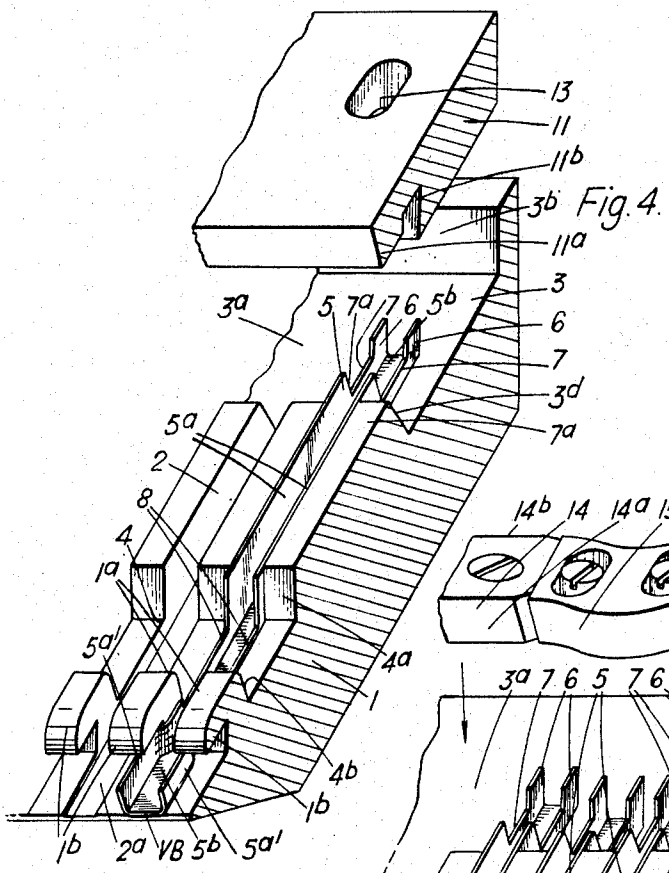


Fig. 4.

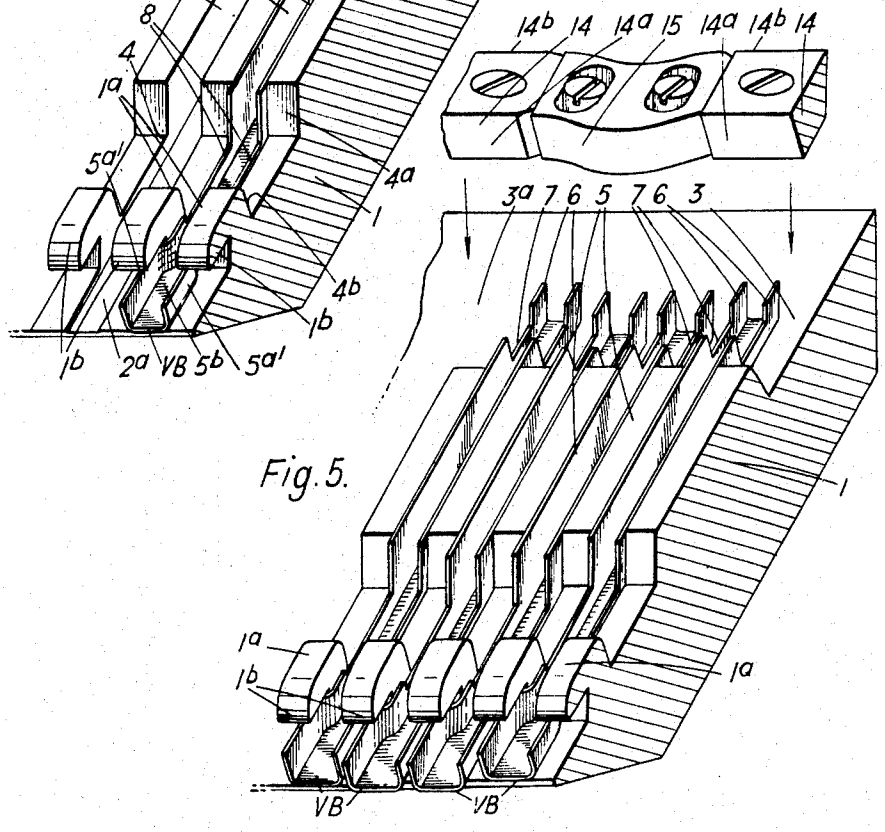


Fig. 5.

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Fig. 6.

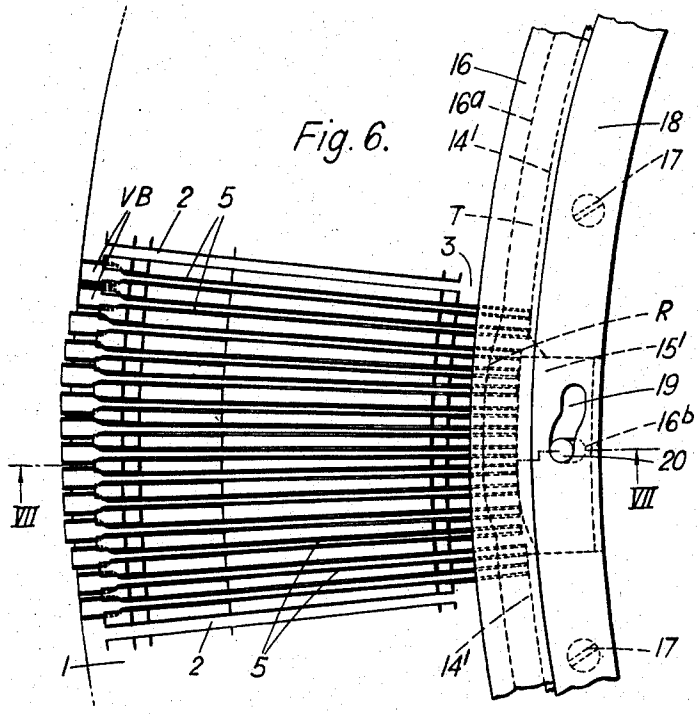
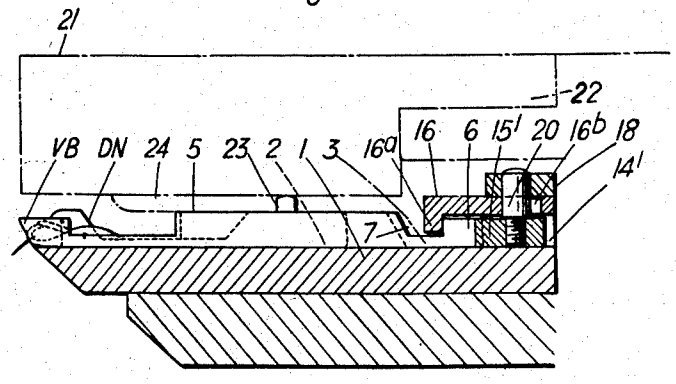


Fig. 7.



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INSTRUMENT BEDS FOR KNITTING MACHINES

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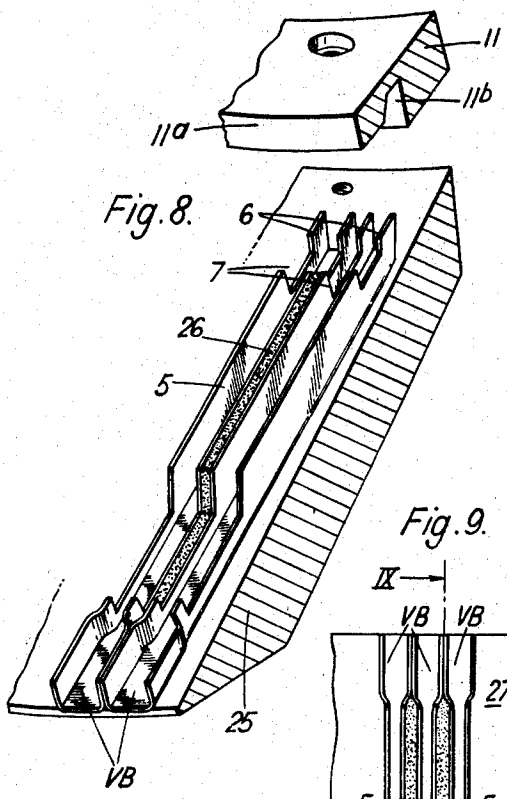


Fig. 8.

Fig. 9.

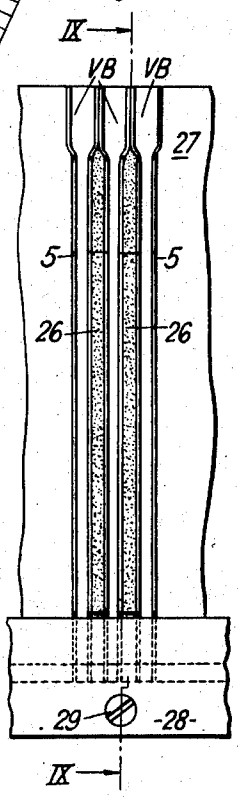
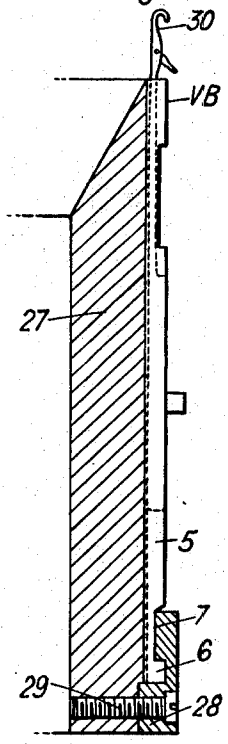


Fig. 10.



United States Patent Office 2,873,595 Patented Feb. 17, 1959

2,873,595

INSTRUMENT BEDS FOR KNITTING MACHINES

Arthur Shortland, Leicester, England

Application December 27, 1955, Serial No. 555,660

Claims priority, application Great Britain January 3, 1955

9 Claims. (Cl. 66—115)

This invention relates to instrument beds of the kind which are incorporated or adapted for incorporation in knitting machines, and are provided with grooves or channels, customarily known as "tricks," for the support and guidance of longitudinally movable knitting and like instruments.

Thus, the invention is applicable not only to needle and analogous dials and cylinders of circular knitting machines of various types, but also to beds in the form of plates or bars as embodied in flat and straight-bar knitting machines.

The expression "knitting and like instruments" used herein is intended to include not only looping elements which are actually in contact with loops during knitting, such as needles, sinkers and transfer instruments or points, but also associated instruments such, for instance, as needle-actuating jacks and sliders.

In the ordinary way, tricks are cut in dials, cylinders and other instrument beds of knitting machines, and the beds, after machining, are suitably hardened to enable walls and the backs or bottoms of the tricks adequately to withstand the rubbing contact with the longitudinally slidable instruments therein. The oxide formed as a result of the hardening process is, however, difficult to remove the cut tricks.

Quite apart from this, precision machining followed by hardening of instrument beds as heretofore commonly produced are expensive processes.

Moreover, it is extremely difficult to cut with a sufficient degree of accuracy from solid metal, tricks having walls which are so precisely spaced at all points along their lengths as to avoid friction and vibration when knitting or like instruments are being reciprocated therebetween.

The primary object of the present invention is to obviate the foregoing difficulties by the provision, for incorporation into, or application to, an instrument bed for a knitting machine, of simply produced and comparatively inexpensive tricks of novel form having certain advantages as will be hereinafter described.

The invention also includes complete instrument beds furnished with or made up of such tricks.

Broadly considered, a channel-shaped trick made in accordance with the invention consists of an individual element appropriately bent or folded to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the bottom or back of the trick.

The trick element is made from suitably hardened and tempered metal, and the surfaces thereof are wholly smooth and clean.

If desired, the appropriate end of a trick element made in this way may be so fashioned as to constitute an integral verge piece or bit. For example, the portions of the walls at the said end may be spaced apart to a greater extent than the remaining portions so that the

trick element is sufficiently wide at this location as to provide the required verge opening.

In one embodiment of the invention, a series of the individual trick elements are inserted and accommodated in a corresponding series of slots or grooves cut in an instrument bed.

It is, however, also within the scope of the invention to assemble and secure together a series of the individual trick elements suchwise as to provide a built-up instrument bed as will be hereinafter more fully described.

In any event, each individual bent or folded trick element can be easily fashioned, and adjusted if necessary, to fit an instrument of the kind and size concerned, thereby providing a smooth and clean and as near perfect a bearing as possible for the instrument. In this way friction and vibration is reduced to a minimum.

Where, as previously described, trick elements are inserted and accommodated in slots or grooves cut in an instrument bed, the elements may be fixed in the bed by means of one or more clamping components. For example, the or each such component may extend transversely with respect to the elements and be received in a recessed portion of the bed, the component being provided with a formation or formations adapted to interlock with a complementary formation or formations in or/and on the spaced side walls of the trick elements. In the case of a dial, the clamping component may consist of either a one-piece or a sectional annular plate or ring adapted to seat in a corresponding recess formed in the face of the dial. For a cylinder, a sectional clamping ring would be employed, whereas a one-piece clamping plate or bar would suffice in the case of a needle bed for a flat or straight-bar knitting machine.

In accordance with another feature of the invention, the said clamping component or components may, if desired, be made adjustable back and forth or up and down in the direction of the length of the trick elements for the purpose of varying the effective diameter, width or length, as the case may be, of the instrument bed. Thus, for instance, in the case of a dial equipped with longitudinally adjustable trick elements, the effect diameter of the dial can be increased by moving all of the elements radially outwards, and vice versa.

Alternatively, the trick elements of a series may be individually movable longitudinally in slots or grooves in the instrument bed and be formed at their appropriate ends whether for contact by cams or for engagement in a cam track adapted to effect projection or retraction of the elements seriatim and relatively to the instruments in the bed at any desired location or locations.

In order that the invention may be more clearly understood and readily carried into practical effect, specific constructional examples thereof as applied to needle dials and cylinders of circular knitting machines will now be described with reference to the accompanying drawings, wherein,

Figure 1 illustrates, in its initially flat condition, a sheet-metal blank from which one of the individual folded trick elements is fashioned,

Figure 2 is a perspective view of one of the folded trick elements per se,

Figure 3 is a cross-sectional view through a slotted needle dial of a circular knitting machine of the cylinder and dial type, showing one of the folded trick elements clamped in position in one of the cut slots,

Figure 4 is a part-sectional perspective view of a fragmentary portion of such a dial with one of the folded trick elements in position therein, the figure also depicting a portion of the clamping ring whereby the elements are secured,

Figure 5 is a perspective view somewhat similar to

Figure 4 showing a modification in which the folded trick elements are individually movable longitudinally in the slots in the dial, and are engageable by cams adapted to effect projection and retraction of the said elements seriatim,

Figure 6 is a plan view of a portion of a needle dial showing folded trick elements which are individually movable longitudinally and are formed for engagement in a cam track, as will be hereinafter described,

Figure 7 is a cross-sectional view taken on the line VII—VII of Figure 6,

Figure 8 is a perspective view illustrating an embodiment of the invention wherein individual trick elements are secured together suchwise as to provide a built-up needle dial,

Figure 9 is an exterior elevational view of so much of a built-up needle cylinder as is necessary to illustrate the manner in which individual folded trick elements are secured together upon a plain, i. e. un-slotted, cylinder, and

Figure 10 is a vertical sectional view taken on the line IX—IX of Figure 9.

Like parts are designated by similar reference characters throughout the drawings.

In the example illustrated in Figures 3 and 4, a ring-shaped dial of relatively soft metal and a portion of which is indicated at **1** has cut therein a circular series of radially extending parallel-sided slots such as 2 each of a width greater than the thickness of the dial needle to be located therein. In the top of the inner portion of the dial **1** is formed a comparatively wide annular recess **3** the bottom **3***a* of which is in the same horizontal plane as the bottoms **2***a* of the slots. The rear wall **3***b* of the recess, i. e. that of smaller diameter, is vertically disposed whilst the front wall **3***d* thereof slopes forwardly. Nearer to its outer periphery, the dial **1** has formed in its top face a further but somewhat shallower and less wide annular recess **4**. Here again, the rear wall **4***a* of this second recess is vertically disposed and the front wall **4***b* forwardly inclined. The portions **1***a* of the dial adjoining the wall **4***b* and alternating with the slots **2** are appropriately machined and undercut (adjacent to the periphery of the dial) suchwise as to provide outwardly directed nib-like formations **1***b* having flat undersides spaced above the horizontal plane containing the bottoms **2***a* of the slots.

Into each of the cut slots **2** is inserted an individual folded trick element **5** which lines the slot and provides a smooth and clean channel dimensioned to provide a good bearing for a dial needle such as that indicated at DN in Figure 7. Each trick element **5**, suitably hardened and tempered, is bent or folded to shape from an initially flat single piece sheet-metal blank like that illustrated at B in Figure 1, and comprises two spaced parallel side walls **5***a* connected by and disposed at right angles to an integral bottom **5***b* (see Figure 2). At and adjacent to their tail ends, the spaced side walls **5***a* of each such element **5** are so recessed and shaped as to provide a pair of upstanding square-shaped butts or tails **6** and adjoining recesses **7** having forwardly sloping front edges **7***a*. The spaced butts or tails **7** are of less height than the corresponding walls **5***a*. Nearer to its outer end, the walls **5***a* of each trick element **5** have formed therein rectangular recesses **8**. The leading end portions **5***a'* of the walls of each element are of slightly less height than, and are laterally offset with respect to, the major portions thereof so as to open out and increase the width of the element at this end and so provide an integral verge bit VB. The frontal edges of these verge bits are slightly undercut and slope rearwardly.

Thus, as will be apperciated, all that is necessary to convert the initially flat sheet-metal blank B into a finished trick element **5**, like that depicted in Figure 2, is to bend up the said blank at right angles along the lines **9** and to form the leading end portions **5***a'* at the locations marked **10** suchwise as to offset them laterally and thereby increase the width of the element as aforesaid. The

elements **5** are in the nature of supplementary inserts serving to line the slots or grooves **2** cut in the dial. The dial itself can accordingly be of a comparatively soft material which does not require to be hardened. Consequently, no difficulties can arise from oxidation due to hardening.

Into the wider annular recess **3** in the dial **1** is fitted a clamping ring **11** the under face of which is shaped to provide thereon and therein an annular rib **11***a* engaging in the recesses **7** in the tail ends of the trick elements **5** and an adjoining annular recess **11***b* (see Figure 4) to receive the upstanding butts or tails **6** of the said elements respectively. Screws such as **12** (Figure 3) are employed to fasten the clamping ring **11** to the dial **1**. To permit of adjustment of the clamping ring **11** (which is preferably sectional) the holes **13** in this ring through which the shanks of the screws **12** extend are elongated. If the ring is sectional then the adjustments may be for the purpose of varying the effective diameter of the dial by moving all of the elements radially outwards or inwards. The leading ends of the channel-shaped elements are held down by virtue of the upper edges of the opened-out integral verge bits VB being engaged beneath the flat underside of the aforementioned nib-like formations **1***b* on the dial **1**.

As previously mentioned herein, the trick elements of this invention may be individually movable longitudinally in a slotted bed and arranged to be projected and retracted seriatim by cam means. A single trick element or two or more of such elements at a time may be in the projected or retracted position at an appropriate location or at each of two or more desired locations. For example, in the case of a needle bed, trick elements with integral verge portions may be projected seriatim at the or each knockingover point, the cam or cams whereby the projection is effected being adjustable suchwise as to vary the extent of such projection in order to compensate for different qualities and counts of yarn. This will be clearer from a consideration of the arrangement illustrated in Figure 5 which is a modification of the example described with reference to Figures 3 and 4.

Thus, in Figure 5 it will be seen that the rear wall **3***b* of the wider recess **3** in the dial **1** is removed, and the clamping ring is dispensed with. Instead, a circular series of cams like those indicated at **14** and **15** are secured beneath the customary dial cam cap and engaged in the recesses **7** at the tail ends of the folded trick elements **5**. One of these cams, i. e. the cam **15**, at the or each knitting location, is suitably contoured as shown and adapted to effect first projection and then immediate retraction of the elements **5** seriatim so that their integral verge bits VB extend beyond the periphery of the dial **1** at the knocking-over point. The remaining cams **14** of the said series, however, have parallel faces **14***a* and **14***b* concentric with respect to the centre of the dial so that at all points, with the exception of the knocking-over point or points, the trick elements **5** are maintained stationary in relation to the dial needles. The or each cam **15** for effecting projection and retraction of the trick elements may, as shown, be made adjustable radially. For the sake of clarity in Figure 5, the cams **14** and **15** are shown in exploded relation with respect to the dial; in practice, these cams are located in the recesses **7**.

Instead of cams being engaged in the recesses **7** for the purpose of operating the folded trick elements **5** in the manner just described, the upstanding butts or tails **6** on the elements may, as illustrated in Figures 6 and 7, be arranged to run round in a cam track T. This track is defined, on the one hand, by the operative outer edges of a series of cams such as **14'** and **15'** which act on the vertical back edges of the butts or tails **6** and, on the other hand, by the inner face of a depending annular rib **16***a* which is formed on a ring **16** and extends down into the recesses **7** formed in the side walls **5***a* of the elements **5**. The said inner face of the depending rib

16*a* engages the front edges of the butts or tails 6. In the region of the cam 15' which projects forwardly somewhat from the faces of the cams 14' at a knitting location, the inner face of the depending annular rib 16*a* is correspondingly recessed as indicated at R in Figure 6. Thus, at the knitting location, the butts or tails 6 are acted upon by the bow in the cam track T as a consequence of which the elements 5 are first projected and then retracted seriatim. In this way, the verge bits VB integral with the said elements are caused to project beyond the periphery of the dial 1 at the knocking-over point. The ring 16 is clamped down solidly upon the top flat surfaces of the fixed cams 14' by means of screws 17 (Figure 6). But a small clearance is provided between the underside of this ring and the top face of the (or each) cam 15' to enable the latter to be moved outwards and inwards radially at desired times for the purpose of either disposing it in its operative position or withdrawing it to an inoperative position as required. Incidentally, although the ring 16 serves to hold down the trick elements 5 in slots 2 cut in the dial 1, the arrangement is such that these elements can slide freely back and forth radially beneath the ring. For operating the cam 15' or each such cam, as the case may be, there is provided an angularly shiftable operating ring 18 which is mounted upon the top of the ring 16 and has formed therein a cranked cam slot 19 into which extends the upper end of a pin 20 set, e. g. by screwing, in the cam 15'. Thus, referring to Figure 6, it will be seen that as the operating ring 18 is turned to a small extent anti-clockwise, the crank in the cam slot 19 will, by action on the pin 20, retract the cam 15' from its operative, i. e. forward, position shown, and vice versa. The pin 20 extends up through an aperture 16*b*' formed in the ring 16 and, to permit of the necessary radial movements of the cam 15', this aperture is elongated as shown more clearly in Figure 6.

In Figure 7, the dial cam plate or cap is indicated in chain lines at 21 and the numeral 22 indicates the hub of this component. The dial needles DN are furnished in the conventional way with operating butts 23 to be acted upon by dial cams one of which is diagrammatically represented at 24.

It has been stated earlier that a series of the individual trick elements 5 may, instead of being inserted in slots cut in an instrument bed, be assembled and secured together in such a way as to provide a built-up instrument bed. In this regard a flat and plain (i. e. un-slotted) ring or plate or a plain cylinder, according to the form of the bed being constructed, may be provided as a carrier and support for the assembled elements. The elements may be secured together by means of soft solder or the equivalent, this material being run in between the elements. The advantage of such a built-up construction is that the elements are readily detachable and easily replaceable, as occasion may demand. Another advantage is that the comparatively costly process of cutting slots in the bed is eliminated.

An example of a built-up needle dial is illustrated in Figure 8, wherein a flat and plain, i. e. un-slotted annular plate or ring 25 is provided as a carrier and support for trick elements 5 which are assembled upon the flat top of the said plate or ring and are secured together by soft solder run into the spaces 26 between the elements. For additional security, a clamping ring 11 may be provided in this, as also in the first described, example. A built-up needle cylinder is shown in Figures 9 and 10, wherein a ring of vertically disposed trick elements 5 of the form already described are secured upon and around the outer surface of a plain cylinder 27. Here again, the elements 5 are secured by soft solder introduced into the spaces 26 between them. For greater security, a sectional clamping ring 28 formed to receive the butts or tails 6 on, and to engage in the recesses 7 in, the elements 5 is attached to the lower end of the plain cylinder 27 by means of screws 29. A cylinder needle is indicated at 30 in Figure 10.

I claim:

1. For a knitting machine, an instrument bed which has formed therein a series of grooves in each of which is inserted an individual channel-shaped trick element for the support and guidance of a longitudinally movable knitting instrument, said element being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick and cooperating means on said elements and said grooves for holding down said elements.

2. For a knitting machine, in combination, an instrument bed having formed therein a series of grooves and a recess extending transversely with respect to said grooves, individual channel-shaped trick elements which are inserted in the grooves and are adapted for the support and guidance of longitudinally movable knitting instruments, each of said elements being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, cooperating means on said elements and said grooves for holding down said elements, and at least one clamping component which is accommodated in the recess and has provided thereon and therein formations interlocked with complementary formations in and on the spaced side walls of the trick elements.

3. A combination according to claim 2, wherein the clamping component is adjustable in the direction of the length of the trick elements for the purpose of varying the effective size of the instrument bed.

4. In a knitting machine, in combination, an instrument bed having formed therein a series of grooves, individual channel-shaped trick elements which are inserted in the grooves and adapted for the support and guidance of longitudinally movable knitting instruments, each of said elements being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, cooperating means on said elements and said grooves for holding down said elements, said trick elements being themselves individually movable longitudinally in the grooves, and cam means engaging the tail ends of the trick elements suchwise as to effect projection and retraction of the latter seriatim respectively from and into the instrument bed at a desired location.

5. In a knitting machine, in combination, an instrument bed having formed therein a series of grooves, individual channel-shaped trick elements which are inserted in the grooves and adapted for the support and guidance of longitudinally movable knitting instruments, each of said elements being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, portions of the side walls of each element at the appropriate end thereof being spaced apart to a greater extent than the remaining portions so that the element is sufficiently wide at this end to provide an integral verge piece having therein a verge opening, means on said grooves cooperating with said verge pieces to hold said elements down, and the trick elements being themselves individually movable longitudinally in the grooves, and cam means engaging the opposite, tail ends of the trick elements suchwise as to effect projection and retraction of the verge pieces seriatim respectively from and into the instrument bed at a knocking-over point.

6. A combination according to claim 5, wherein said cam means are adjustable to vary the extent of projection of the verge pieces, for the purpose specified.

7. For a knitting machine, in combination, a needle dial which has formed therein a circular series of

radiating grooves, the top of the inner portion of said dial having formed therein an annular recess, individual channel-shaped trick elements which are inserted in the grooves and are adapted for the support and guidance of longitudinally movable dial needles, each of said elements being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, the tail ends of the said side walls of each trick element being so recessed and shaped as to provide respectively thereon and therein a pair of butts and adjoining recesses, whilst near to the opposite end of the element the said walls have formed therein further recesses at locations adjoining which the leading end portions of the walls of each element are laterally offset with respect to the major portions thereof so as to open out and increase the width of the element at this end and so provide thereon an integral verge bit, nib means on said grooves cooperating with said verge bits to hold said elements down, a clamping ring which is located in the aforementioned annular recess in the grooved dial, the under face of said clamping ring being so shaped as to provide respectively thereon and therein an annular rib engaging in the recesses in the tail ends of the trick elements and an adjoining annular recess to receive the butts on the elements, and means securing the clamping ring to the dial.

8. In a circular knitting machine, in combination, a needle dial which has formed therein a circular series of radiating grooves, the top of the inner portion of said dial being annularly rebated, individual channel-shaped trick elements which are inserted and slidable longitudinally in the grooves and are adapted for the support and guidance of longitudinally movable dial needles, each of said elements being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, the tail ends of the said side walls of each trick element being so

recessed and shaped as to provide respectively thereon and therein a pair of butts and adjoining recesses, whilst near to the opposite end of the element the said walls have formed therein further recesses at locations adjoining which the leading end portions of the walls of each element are laterally offset with respect to the major portions thereof so as to open out and increase the width of the element at this end and so provide thereon an integral verge bit, nib means on said grooves cooperating with said verge bits to hold said elements down, a dial cam cap disposed above the dial, and a circular series of cams which are secured to said cap and engaged in the recesses in the tail ends of the trick elements, said cams effecting projection and retraction of the verge bits seriatim respectively from and into the dial at a knocking-over point.

9. For a knitting machine, an instrument bed which has formed therein a series of grooves in each of which is inserted an individual channel-shaped trick element for the support and guidance of a longitudinally movable knitting instrument, said element being bent to shape from an initially flat sheet-metal blank and comprising two spaced side walls connected by an integral transverse portion forming the back of the trick, nib means on said grooves, said element being further shaped to cooperate with said nib means for holding down said elements, and means attached to said instrument bed to effect individual longitudinal movement of said elements in said grooves.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,873,595 February 17, 1959

Arthur Shortland

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1, 2 and 3, for "Arthur Shortland, of Leicester, England," read -- Arthur Shortland, of Leicester, England, assignor to Mellor Bromley & Co., Limited, of Leicester, England, a British company, --; line 12, for "Arthur Shortland, his heirs" read -- Mellor Bromley & Co., Limited, its successors --; in the heading to the printed specification, line 3, for "Arthur Shortland, Leicester, England" read -- Arthur Shortland, Leicester, England, assignor to Mellor Bromley & Co., Limited, Leicester, England, a British company --.

Signed and sealed this 30th day of June 1959.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents