Feb. 3, 1942. A. L. BRUMBACH 2,271,852

BEARING CONSTRUCTION FOR KNITTING MACHINES

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Fig. 1.

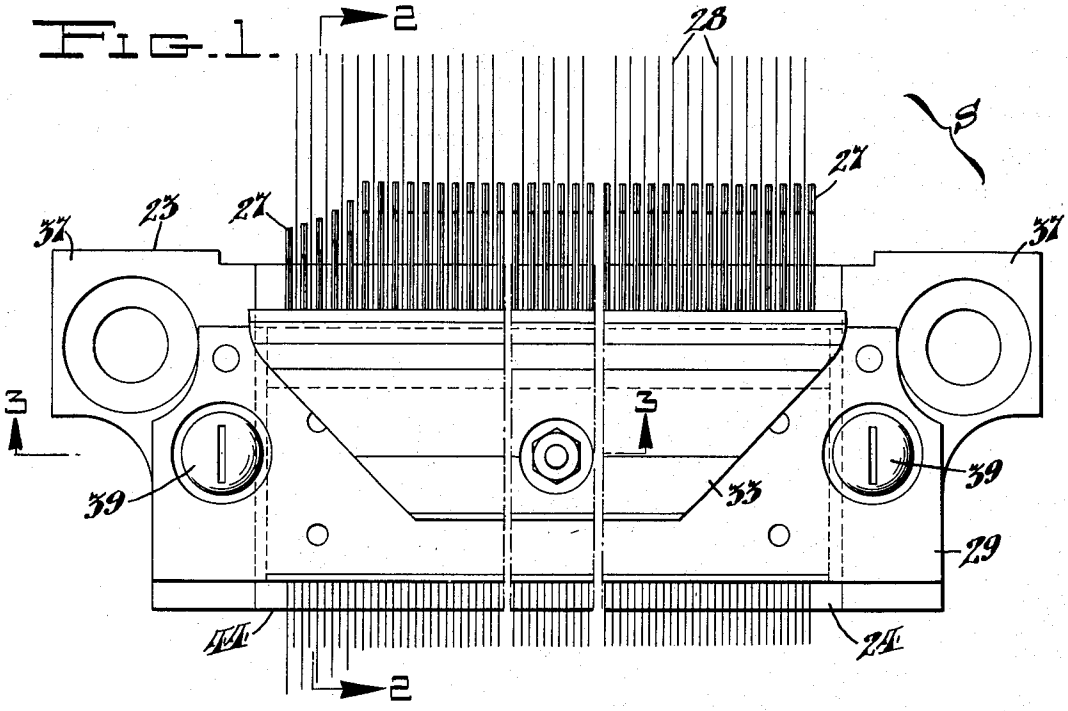


Fig. 2.

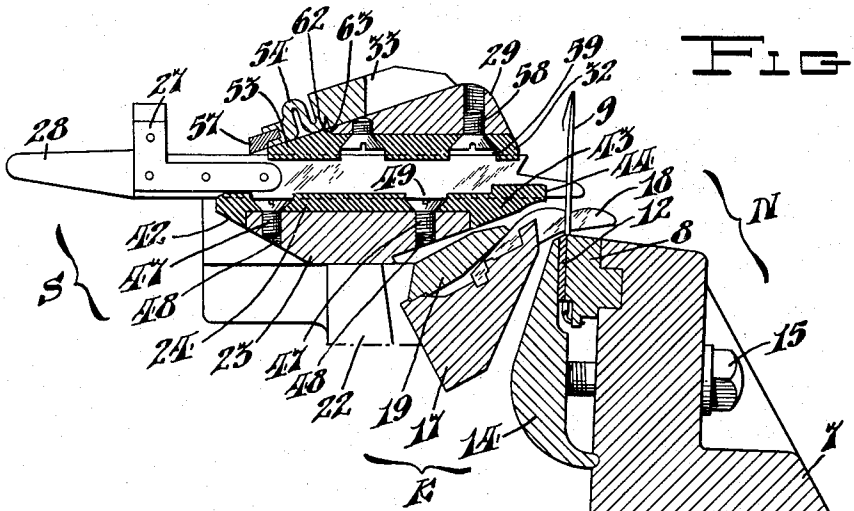
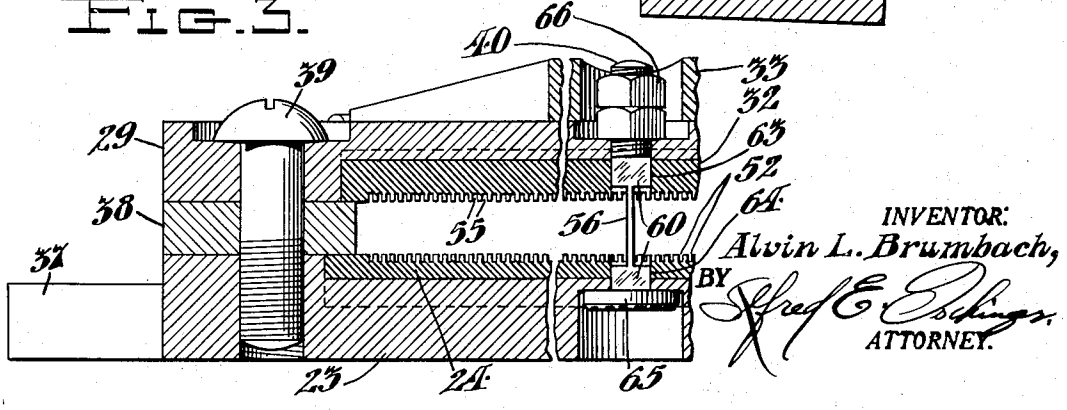


Fig. 3.



INVENTOR:
Alvin L. Brumbach,
BY
Fred E. Jenkins
ATTORNEY.

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FIG. 4.

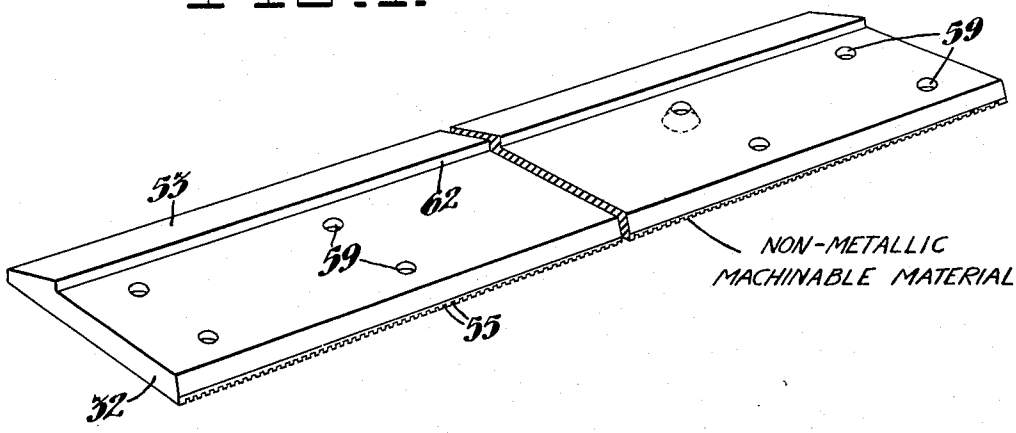
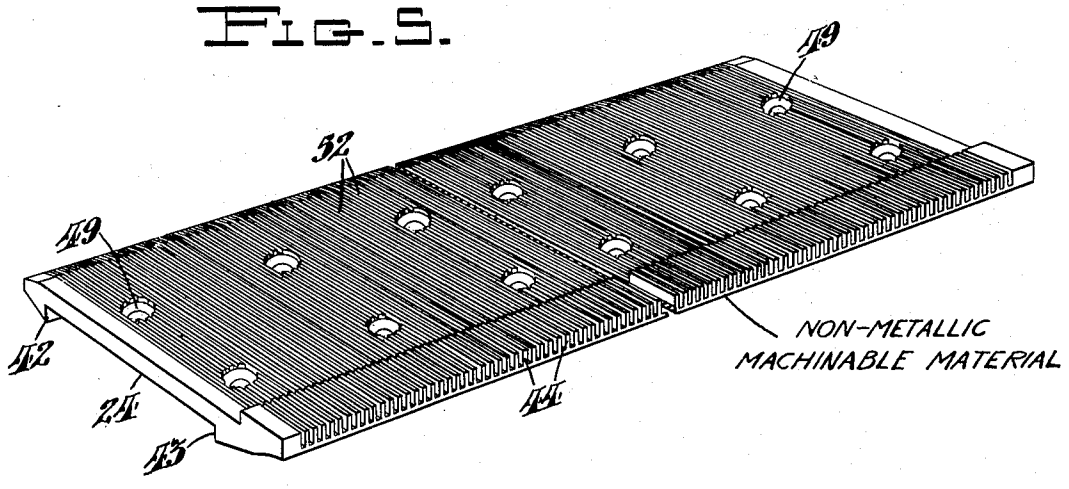


FIG. 5.



INVENTOR:
Alvin L. Brumbach,
BY Alfred E. Eschinger
ATTORNEY.

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Fig. 6.

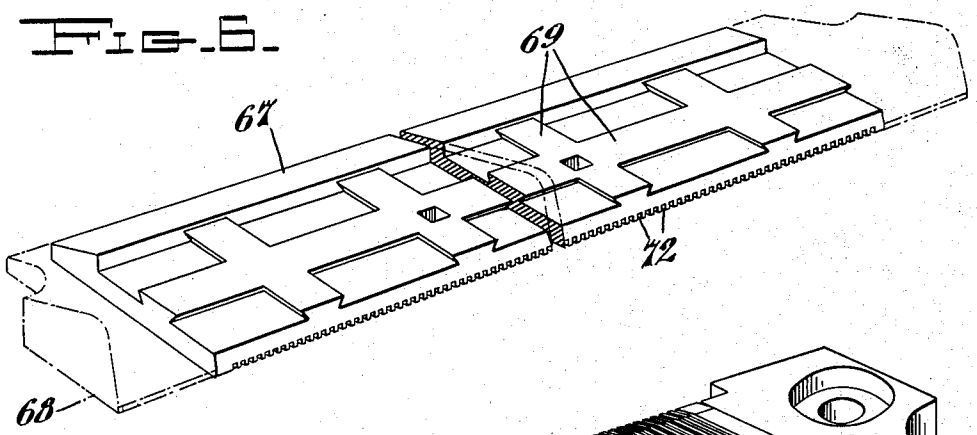


Fig. 7.

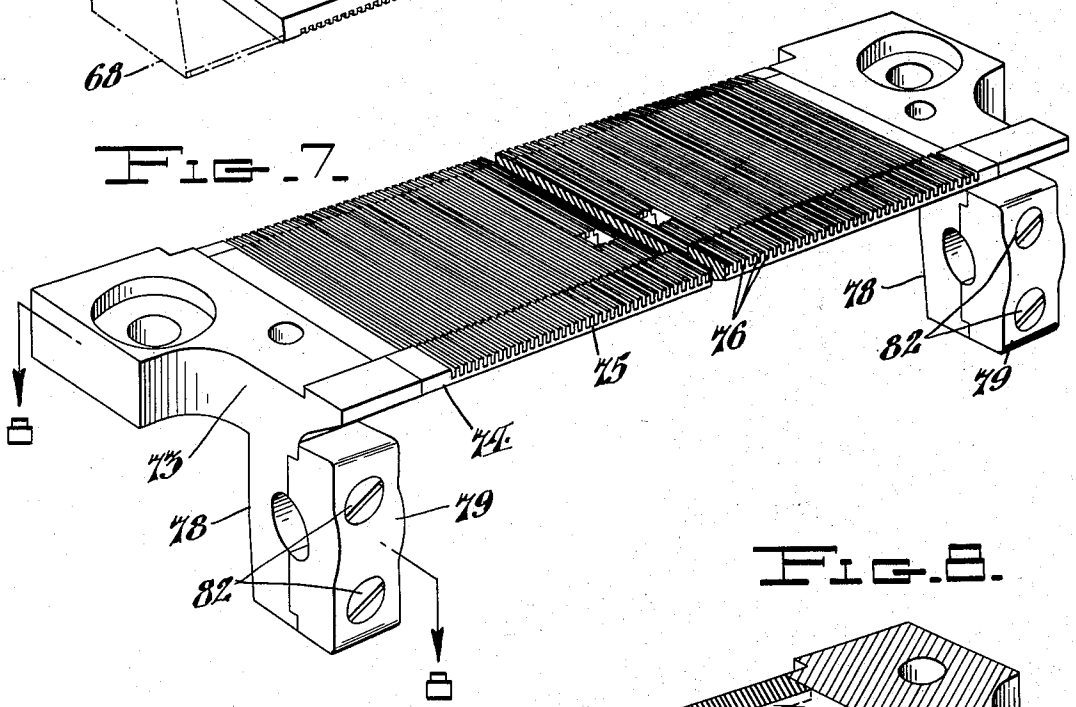
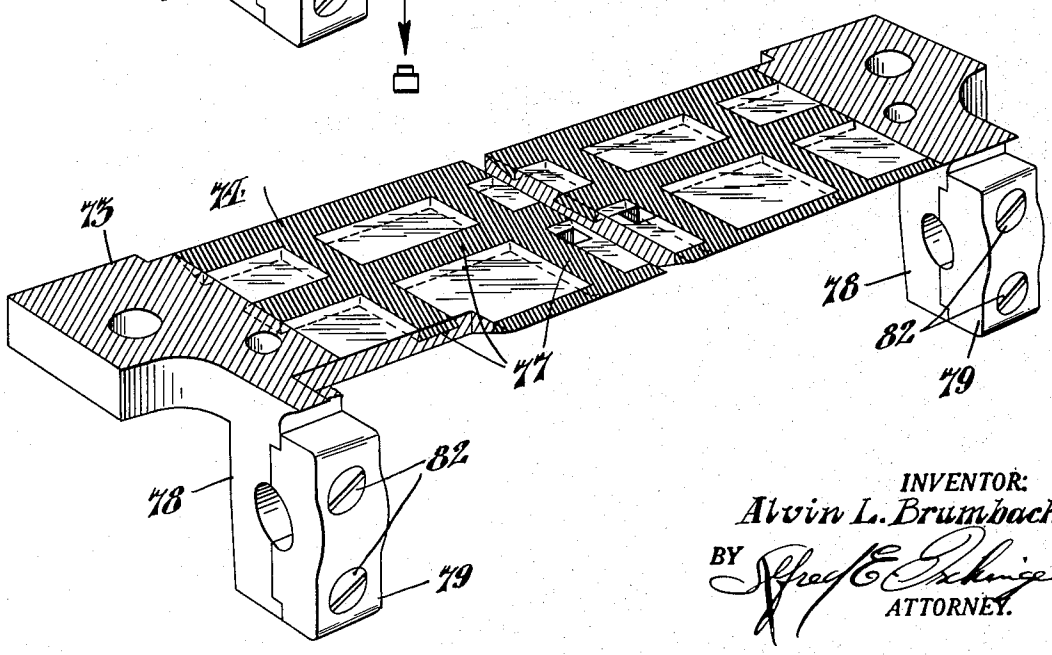


Fig. 8.



INVENTOR:
Alvin L. Brumbach,
BY
ATTORNEY.

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Fig. 9.

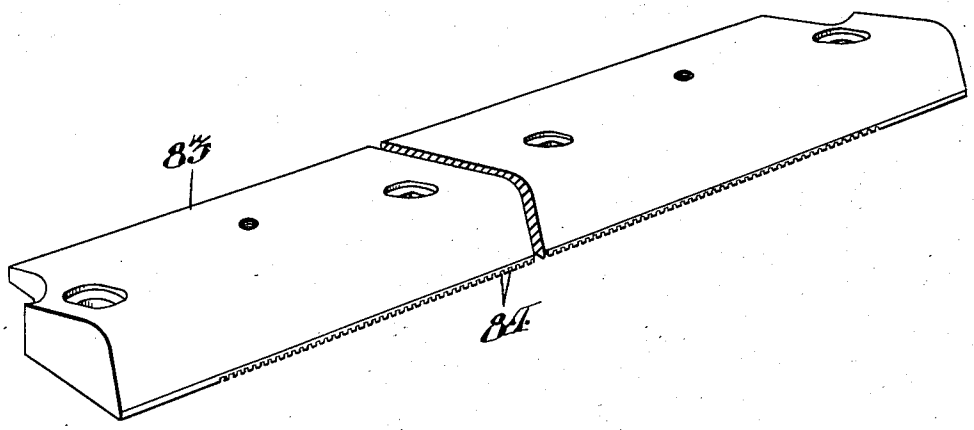
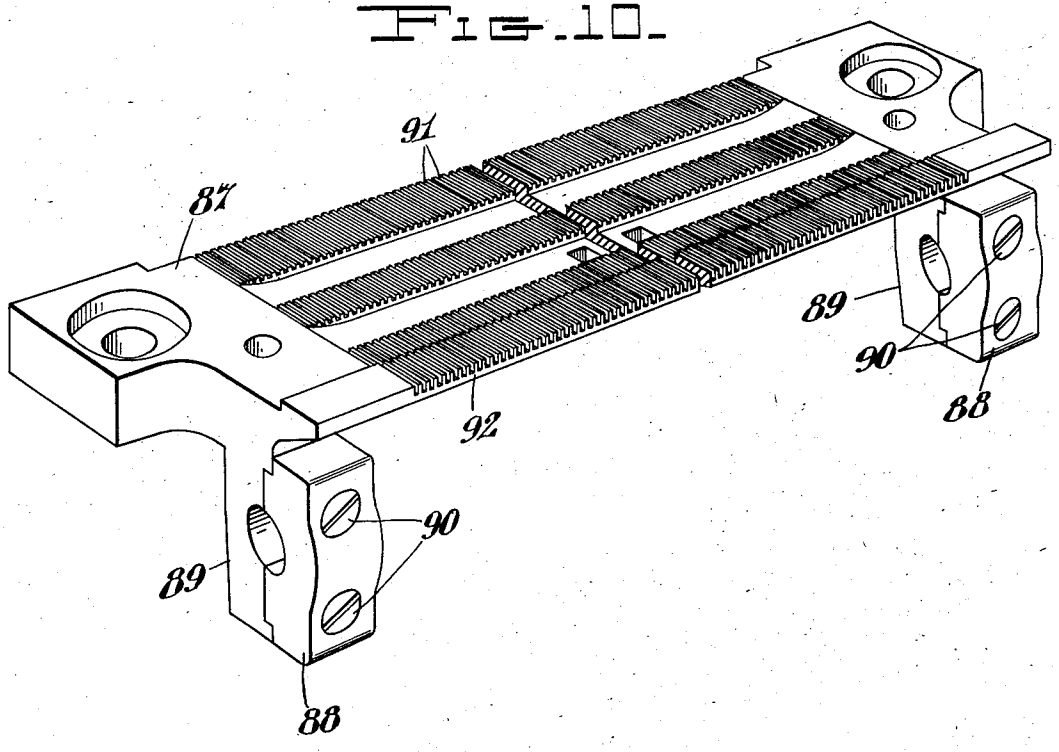


Fig. 10.



INVENTOR:
Alvin L. Brumbach,
BY Fred E. Pschinger
ATTORNEY.

Patented Feb. 3, 1942 2,271,852

UNITED STATES PATENT OFFICE

2,271,852

BEARING CONSTRUCTION FOR KNITTING MACHINES

Alvin L. Brumbach, Reading, Pa., assignor to Textile Machine Works, Wyomissing, Pa., a corporation of Pennsylvania

Application June 16, 1938, Serial No. 214,058

8 Claims. (Cl. 66—110)

My invention relates to sinker head and other knitting machine constructions, embodying non-metallic material of certain characteristics in novel manner, and particularly to constructions of this nature for straight, or full fashioned knitting machines.

It has been customary to construct the bearing and guiding portions for sinkers, dividers, and other knitting machine elements entirely of metal.

Although available for a long time, the only known use of non-metallic material, of the characteristics herein set forth, in knitting machines, has been in the form of impact elements; other non-metallic elements, such as dampers, brakes or friction eliminators, and the well known friction box shoe pads, having been of material of different character from the material hereof, and unsuited to the purposes of the invention.

Also, it has heretofore been suggested to employ a bearing insert in a sinker head, but this suggestion only contemplates the insertion of one metal member, at a local position within another metal member, to obtain better wearing properties; the possibility and operability of any non-metallic material as a main guide or bearing for elements, such as the sinkers and dividers, or other elements of a knitting machine, never having been suggested.

I have discovered that certain non-metallic materials of readily-machinable character, not only have the advantages of such machinability, but also embody higher wear resistance, and more enduring accuracy of fit for the sinkers and dividers of a knitting machine, than any all-metal sinker head structure of which I am aware. They also are adapted to form presser edges, and are adapted in other ways to form stationary or movable bearing structure members for relatively movable engagement with thin hard metal parts having reciprocatory movement relative thereto, wherefrom a grooving action would naturally be expected.

An object of the invention is therefore to utilize this discovery, to the betterment of the knitting machine art, and to do so in an expeditious manner.

Another object of the invention is to increase the life of knitting machine elements.

Another object of the invention is to provide renewable inserts for members of knitting machines, whereby to render it unnecessary to discard certain larger units corresponding to members of the invention having the inserts, but heretofore not having them.

Another object of the invention is to provide a non-metallic bearing unit for application to a standard knitting machine, with minimum change in the latter.

Another object of the invention is to provide an insert unit, or assembly, for knitting machines, in which the insert and its support, or backing structure, are held or locked together, as against movement relative to each other in the direction of movement of another element movably engaging the insert.

Another object of the invention is to provide a novel non-metallic element for a knitting machine, whereby this element may constitute a presser edge for closing the beards of needles, or be integrally combined with, for accurate maintenance in relation to, a sinker bed or insert of the same or other material.

Another object is to form knitting mechanism units embodying insert elements of accurately machinable hard non-metallic material for use as journal or bearing means, and insert-receiving elements, whereby the elements may be separately preformed and assembled, formed in one piece, or formed to include a preformed part, with another part molded thereto, and machining operations may be effected on the completed unit, or on certain parts thereof before completion.

Another object of the invention is to provide a novel non-metallic sinker-bed cover or insert element, and to render this element capable of supporting, or cooperating with, a verge plate.

A further object of the invention is to provide a device of the above-indicated character that is simple and durable in construction, economical to manufacture, neat and compact in assembly, and effective in its operation.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, my invention resides in the novel elements, features of construction and arrangement of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a top plan view of a sinker head structure, embodying the invention, having distance breaks indicating a contraction of the length thereof to simplify illustration; the structure forming part of a well known multi-section full fashioned knitting machine;

Fig. 2 is a sectional view having a portion taken substantially along the line 2—2 of Fig. 1, and a portion of a needle bed structure not shown in that figure;

Fig. 3 is a detail fragmentary sectional view, taken substantially along the line 3—3 of Fig. 1, the sinkers and dividers being omitted;

Fig. 4 is a perspective view, having an intermediate break, of a sinker bed cover insert of the invention;

Fig. 5 is a view, similar to Fig. 4, of a sinker bed insert, also of the invention;

Fig. 6 is a perspective view of a modified form of the invention, showing a sinker bed cover insert-receiving element in dot-and-dash lines, and an insert element molded thereto;

Fig. 7 is a perspective view of a sinker bed unit according to the form of the invention of Fig. 6, showing a non-metallic sinker guide insert molded to a metal receiving element therefor;

Fig. 8 is a view of the structure of, and as viewed in, Fig. 7 taken in section along the line 8—8;

Fig. 9 is a perspective view of a further form of the invention, showing a sinker bed cover unit constructed entirely of non-metallic material; and

Fig. 10 is a perspective view of a sinker bed unit constructed entirely of non-metallic material according to the form of the invention of Fig. 9.

In the drawings and description, only those parts necessary to a complete understanding of the invention have been set forth; further information as to the construction and operation of other elements not herein specifically pointed out, but which are usual and well known, being available in the pamphlet entitled "Full Fashioned Knitting Machines," copyright 1920, and in the "Reading" Full Fashioned Knitting Machine Catalogues, copyright 1929 and 1935, published by the Textile Machine Works, Reading, Pennsylvania, and in a pamphlet entitled "Knitting Machine Lectures," published in 1935 by the Wyomissing Polytechnic Institute, Wyomissing, Pennsylvania.

Certain parts of full-fashioned knitting machines are subjected to grooving wear from thin hard ferrous parts such as sinkers, dividers and needles, and must withstand such wear with only the aid of such moisture and light oil as reaches them from the yarn and the needles, respectively. Such parts wear the bottoms of the grooves and the presser edges of the sinker-heads. These wearing and fitting surfaces must not only be machined within close tolerances, but they must wear a considerable time without being replaced in order to keep within a permissible upkeep cost. Heretofore, hard metal has been the material used for the sinkerheads of full-fashioned knitting machines, but it not only has exhibited an undesirable rate of wear, but has often worn the beards of the needles undesirably. I have discovered that certain moldable, synthetic resinous substances having no natural grain are not only accurately machinable to the extent required in making sinker-heads, but withstand the wear of the moving part with which they are in grooving contact, while reducing the wear on said part to a degree making said substances commercially superior to metal for serving in contact with said thin ferrous parts.

Referring to the drawings, Figs. 1 and 2 illustrate a sinker head assembly S embodying the invention; Fig. 2 showing this structure in operative relation to a needle bar assembly N, and a knockover bit assembly K, each constituting a part of a multi-section full fashioned knitting machine, as set forth in the above-mentioned catalogues, except for the improvements in the sinker head herein set forth.

The needle bar assembly N comprises a needle bar 7, a needle bed 8, needles 9, a yieldable needle-clamping strip 12, as of paper, and clamps 14 held to the bar 7, as by screws 15.

The knockover bit assembly K comprises a knockover bit bed 17, knockover bits 18, and a knockover bit clamp 19.

The sinker head assembly S, which is mounted on a center bed 22 of the machine, comprises, in the structure illustrated, a sinker bed backing member or base 23 for a sinker bed insert 24, sinkers 27, dividers 28, a sinker head cover backing member 29, sinker head cover insert 32, and a verge plate 33.

The sinker bed backing member 23 has apertured lugs 37 through which screws (not shown) extend to secure the member 23 to the center bed 22.

The sinker bed cover backing member 29 is mounted in superposed spaced relation to the member 23 by spacers 38 (Fig. 3), screws 39, and spacer bolts 40.

The sinker bed backing member 23 is, in the present instance, composed of metal having a hollowed out top portion or face for the reception of the insert 24, which is of accurately-machinable or formable non-metallic material, such as, phenolic condensation products of the type of plastics widely sold under the trade names of "bakelite," "textolite," "synthane" et cetera, which are accurately-machinable substances of wear resistant, and hard, or distortion opposing, characterisitcs. Methods of making said "bakelite" and like products are well known in the trade. Depending portions 42 and 43 (Figs. 2 and 5), of the insert 24, hold or lock the insert against displacement, relative to the backing member 23, in the direction of the forward and backward movement of the sinkers 27 and the dividers 28.

Also, at the front end of the insert 24, the latter is extended forwardly and upwardly to form a presser edge 44 the function of which is, as is well known, to engage the beards of the needles on the down stroke of the needles to close the beards by pressing their ends into the grooves in the upper portions of the needle bodies.

After the underside surfaces of the insert 24 have been accurately machined, for close precision fit to the cooperating similarly machined surfaces of the backing member 23, the members 23 and 24 are secured to each other, as by screws 47 that are disposed partially in apertures 48 in the member 23, and partially in countersunk openings 49 in the insert 24.

With the backing member 23 and the insert 24 thus assembled, they are then machined and finished, the same as though they were of one integral metal piece, to form sinker and divider grooves 52, and to have them of proper shape and dimension in every other particular. The cover backing member 29, and the cover insert 32, are made, fitted, assembled and finished similarly to the members 23 and 24, to form sinker and divider grooves 55.

The sinker-heads and sinker-head covers of full-fashioned knitting machines, as is well known, have a sinker or divider mounted in alinement with the gap between each pair of needles.

Also, the number of the gauge of a full-fashioned knitting machine is equal to the number of needles in one and a half inches. Assuming therefore that a sinker-head assembly S for a 39 gauge machine is shown in the drawings, the grooves **52** and **55** in the inserts **24** and **32** respectively are machined in the resin twenty-six per inch. For the now more popular higher gauge machines, the grooves are set even closer.

The bolts **40**, since they extend through the member **29**, the inserts **32** and **24**, and the member **23**, in the working zones of the sinkers and dividers, are each therefore provided with a thin plate-like intermediate section **56** to fit between a sinker and a divider. Also, since, in this position, they must not turn, the bolts **40** are each provided with square-section portions **60** fitting square openings **63** and **64** in the inserts **32** and **24**, and the backing members **23** and **29**, respectively. Disk like heads **65** of the bolts **40** are held against the members **23** by nuts **66**.

At its rear edge, the insert element **32** has an inclined bearing surface portion **53** for an impact reducing portion **54** of the verge plate **33** having an impact insert **57** which may also be constructed of material similar to the material of the inserts **24** and **32**. The major portion of the verge plate **33** is in rigid stationary position on the backing member **29**, but the portion **54**, having some impact movement when engaged by the sinkers and dividers, is mounted for such movement on the bearing portion **53** of the insert **32**. The backing member **29** and the insert **32**, which guide the sinkers and dividers, are secured to each other by screws **58**, in openings **59** of the insert with a ledge **62** on the insert (Figs. 2 and 4) engaging an edge **63** of the backing member.

In the form of the invention illustrated in Fig. 6, an insert element **67**, shown in full lines and constructed of the non-metallic material above set forth, is molded to a metal insert-receiving backing member **68**, shown in dot-and-dash lines. The latter is provided with dove-tail grooves on its surface next to the insert element **67**, such that when the latter is molded in position, ridges **69** are formed in, and coact with, the grooves in the element **67** as anchorage means for holding the elements **67** and **68** together.

The sinker bed cover assembly of Fig. 6, is first formed to its general shape, and subsequently accurately machine finished as one piece and provided with sinker and divider grooves **72**.

As shown in Figs. 7 and 8, a sinker bed unit is formed similarly to the sinker bed cover unit of Fig. 6, by having an insert-receiving base **73** of metal, and an insert **74** of non-metallic material, as set forth; the insert, in this instance also, having ridges **77** dove-tailed into grooves in the receiving member to hold the elements together. Depending integral bearing portions **78** and separate cooperating bearing elements **79**, of non-metallic or metallic material, secured to the portions **78** by screws **82** adapt the assembly as a mounting for the customary knockover bit trunnions (not shown) of the machine. The sinker bed unit is formed to its general shape, and subsequently accurately machine finished and provided with a presser edge **75** and sinker and divider grooves **76**.

In the form of the invention of Fig. 9, a sinker bed cover unit **83** is similar in shape to the assembly of Fig. 6, but is constructed entirely of the aforementioned non-metallic material which may be reinforced, or of a solid homogeneous mass, as illustrated. In this form also, the unit may be machined from a block of the material, or molded to its general shape, and subsequently finished to provide sinker and divider grooves **84**, and other features.

As shown in Fig. 10, a sinker bed unit **87** is constructed entirely of one homogeneous mass of non-metallic material, except for separately formed bearing members **88**, similar to the members **79** above set forth, for attachment to depending portions **89**, similar to the portions **78**, by screws **90**. This structure is likewise molded to its general shape, and subsequently machine finished to exact form to provide it with sinker and divider grooves **91**, a presser edge **92**, and other features.

The sinkers and dividers of the "Reading" full-fashioned knitting machine are of Swedish steel, or of as nearly equivalent material as may be obtainable, cold rolled to a thinness of .007" for the 39 gauge machine, the machines of higher gauge having sinkers and dividers thinner than .007". See page 177 of the parts catalogue of "The Reading Full-Fashioned Knitting Machine" of January 1929. The diameter of the needles of a machine of a given gauge at the points at which they drag against the presser edge is somewhat greater than the thickness of the sinkers and dividers for a machine of the given gauge, the diameter of the needle beard of a needle for a thirty-nine gauge knitting machine being quite approximately .010". Being round, however, the width of the area of the needle beard in contact with the presser edge is normally no greater than that of the sinkers resting on the sinker-head. The sinkers and dividers being of cold rolled heat treated carbon steel material are very hard and the needle beards are also hard because they are of steel initially quenched from a red heat and the hardness drawn only enough to enable them to withstand the repeated flexing to which they are subjected. The sinkerhead material therefore must withstand for long periods a grooving action from very thin and hard metal which, although not associated with much pressure, is repeated almost an incalculable number of times within the expected commercial life of the sinker-head. Experience has shown that not only does the synthetic resin show a less rate of wear in a sinker-head than the hard metal which it has been the custom to use for sinker-heads, but it also causes a less rate of wear on the sinkers, dividers and needle beards which slide against it in use. Wear on the sinkers and dividers assists wear on the sinker-head in causing looseness and consequent unevenness of the knitted loops while wear on the needle beards causes snagging and nicking of the yarn with consequent tendency to weaken the yarn and the fabric.

The arrangements illustrated provide accurate, effective substitutes for the old metal parts which they supplant, and although they wear better and longer before reaching a stage at which such metal parts would be discarded, they do not require any such discard even after the longer wear, but only the renewal of the non-metallic parts.

Of course, the improvements specifically shown and described by which I obtain the above results, can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

I claim as my invention:

1. The combination with an element formed essentially of hard machinable resinous phenolic condensation material, of a plurality of hard fer-

rous metal parts each having groove wearing contact therewith along a surface not over .007 inch in width.

2. A knitting machine sinker-head comprising a portion essentially of hard machinable synthetic phenolic condensation material arranged to provide support for the lower edges of hard ferrous reciprocable sinkers and dividers in sliding contact therewith, said edges having a thickness of not more than .007 inch and said portion arranged also to contact the hard beards of ferrous needles during their down stroke to press said beards into the needle grooves, said beards having a bearing surface not substantially wider than .007 inch at the points of contact with said portion, whereby said sinkers, dividers and needle beards all have a grooving action on said material.

3. The combination of a sinker-head of a full-fashioned knitting machine comprising a stationary portion composed essentially of hard machinable synthetic Bakelite resin material having accurately machined closely arranged slots therein, of hard ferrous sinkers, dividers and needles, said portion providing support for the lower edges of said sinkers and dividers during their back and forth movement and having a surface for contacting the beards of the needles during their down stroke, the sinkers, dividers and needles having widths of not more than .007 inch where in contact with said portion.

4. A sinker-head for a knitting machine comprising a portion composed essentially of a hard machinable resinous phenol-formaldehyde condensation material having not less than twenty-six accurately machined slots therein per inch for providing support for the lower edges of reciprocable sinkers and dividers, said material having the characteristics that it outwears hard metal and, at the same time, produces less wear on said parts than said hard metal.

5. The combination of an element formed essentially of hard machinable resinous material of Bakelite type of phenolic condensation product, a plurality of hard ferrous metal parts having frequent sliding contact therewith along a bearing edge having a thickness of not over .007 inch, said material having the characteristics that it outwears hard metal and, at the same time, produces less wear on said parts than said hard metal.

6. A sinker-head comprising a portion formed essentially of hard machinable synthetic Bakelite type of phenolic condensation material arranged to provide support for the lower edges of hard ferrous reciprocable sinkers and dividers in sliding contact therewith, said edges having a thickness of not more than .007 inch, said portion arranged also to contact the hard beards of ferrous needles during their down stroke to press said beards into the needle grooves, said beards being of a diameter not substantially greater than .007 inch at the points of contact with said portion, said material having the characteristics that it outwears hard metal and at the same time produces less wear on said sinkers, dividers and needles than said hard metal.

7. The combination of a sinker-head of a full-fashioned knitting machine comprising a stationary portion composed essentially of a hard machinable resinous synthetic Bakelite material having accurately machined closely arranged slots therein, of hard ferrous sinkers, dividers and needles, said portion providing support for the lower edges of said sinkers and dividers during their back and forth movement and having a surface for contacting the beards of the needles during their down stroke, said material having the characteristics that it outwears hard metal and, at the same time, produces less wear on said parts than said hard metal, the sinkers, dividers and needles having widths of not more than .007 inch where in contact with said portion.

8. The combination of an element having bearing surfaces essentially of phenolic-condensation material of the heat hardened type and a plurality of hard ferrous parts each having groove wearing contact with one of said surfaces of not over .007 inch in width.

ALVIN L. BRUMBACH.