

[54] **NEEDLE LOOMS**

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[58] Field of Search **28/4 R**

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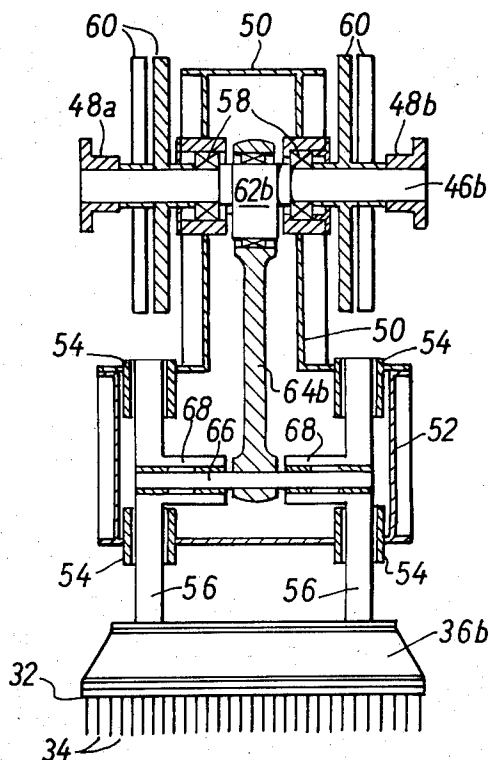
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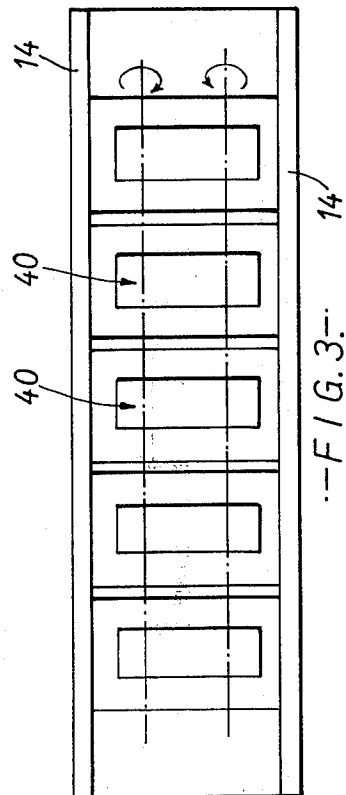
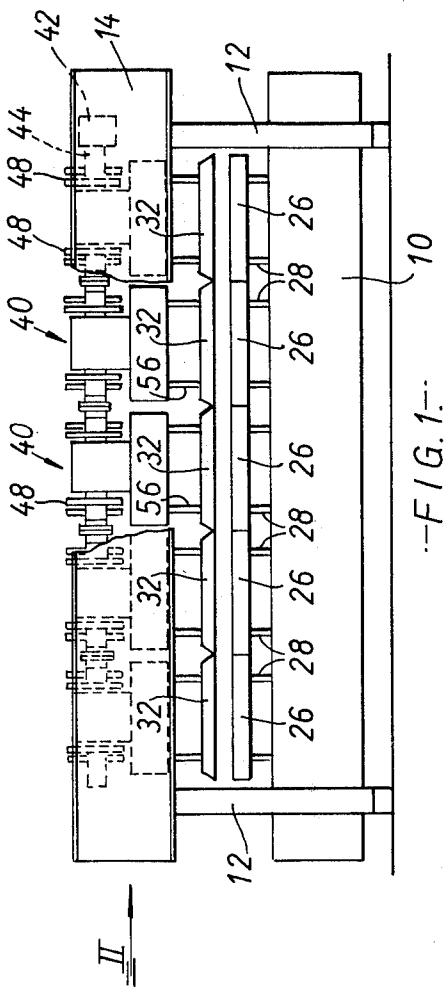
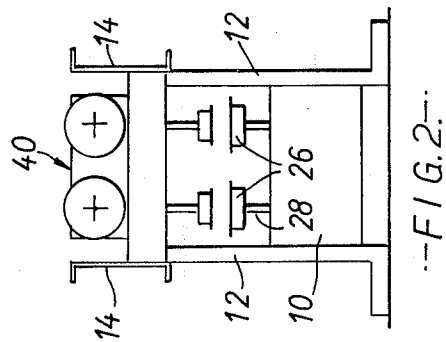
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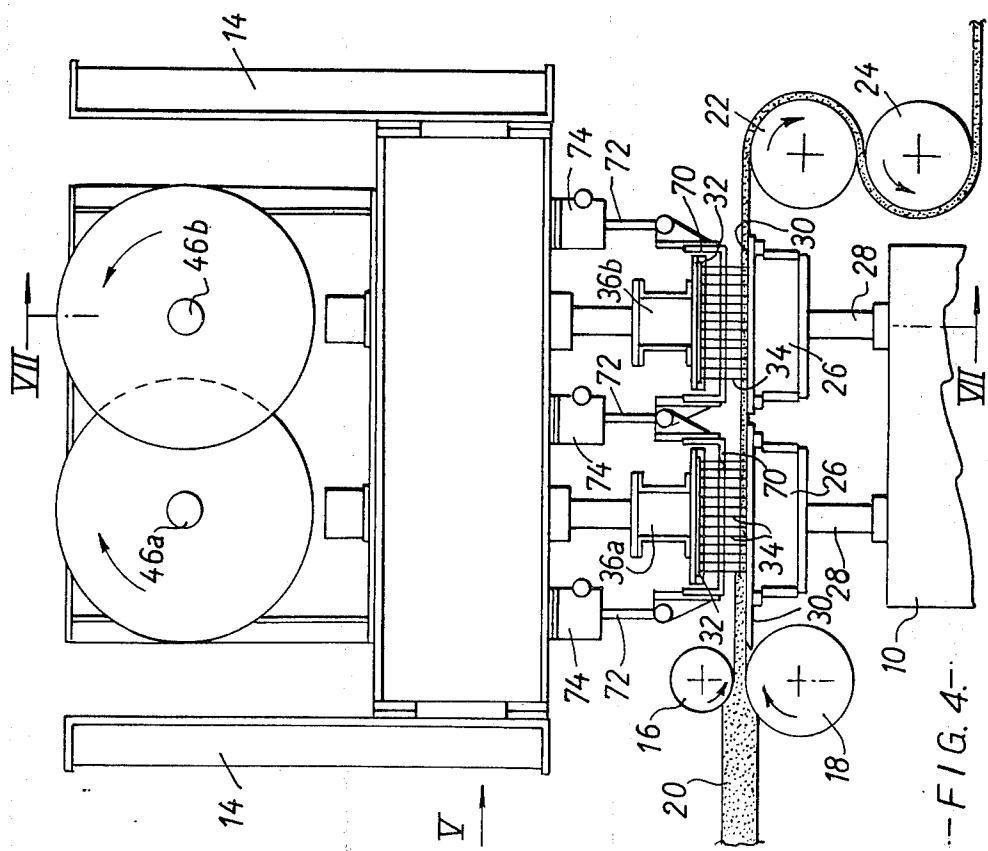
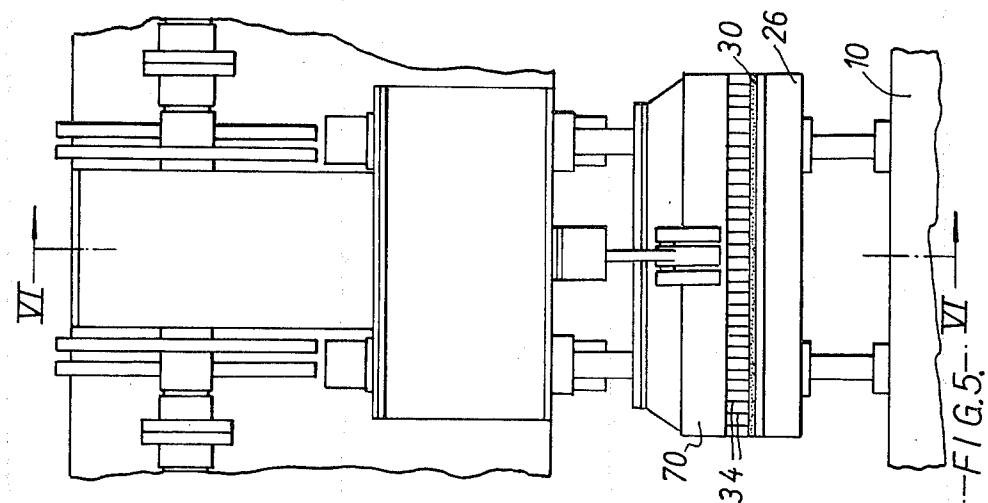
[57] **ABSTRACT**

The invention is concerned with needle board assemblies and driving units for use in needle looms. The needle loom is driven by an eccentric, cam or crank mechanism from a driving shaft, and the connecting rod from this mechanism, is coupled to a drive rod which works like a piston in a pair of spaced apart slide bearings. The coupling is between the two slide bearings, so that there are reduced stresses in the rapidly moving parts. The invention also includes a drive unit in which a single connecting rod mounted between a pair of main journal bearings has a gudgeon pin projecting on opposite sides, and engaging in bosses on two drive rods connected to a single needle arm.

11 Claims, 7 Drawing Figures







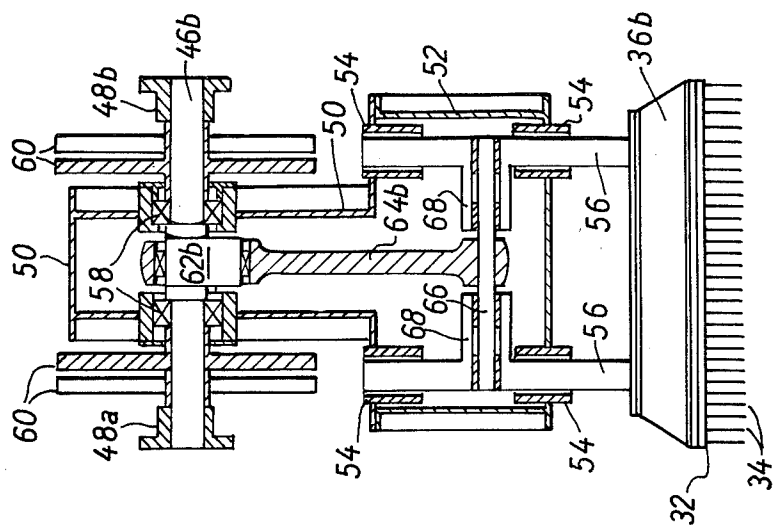


FIG. 7

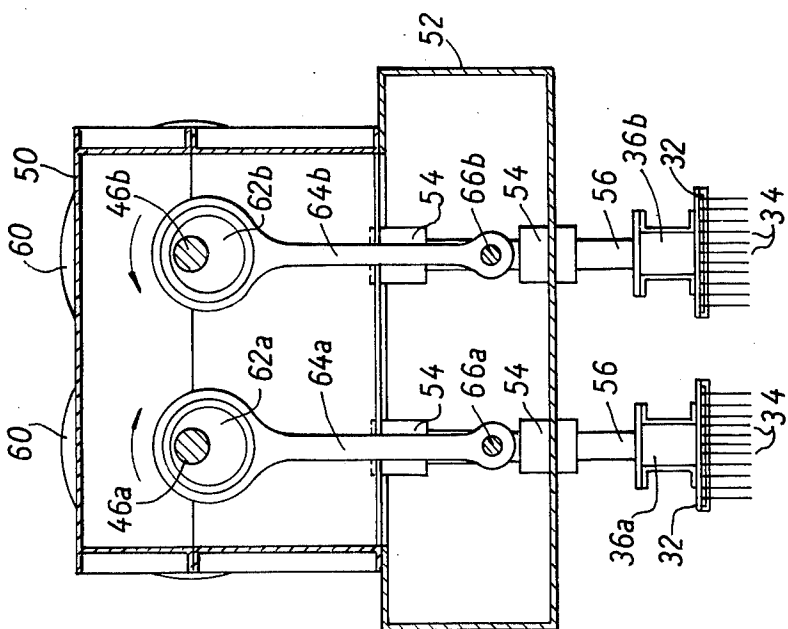


FIG. 6

NEEDLE LOOMS

BACKGROUND OF THE INVENTION

This invention relates to needle looms as used in the textile industry, for binding together a web of fibrous materials. More particularly, the invention is concerned with needle board assemblies, and driving units for reciprocating the needle boards.

In a needle loom, the fibrous web or batt is subjected to the needling action of a multiplicity of needles, which are reciprocated through the web or batt. It is necessary therefore to provide for reciprocation of the needles in a path — usually rectilinear — which is transverse to the direction of travel of the batt. Thus, in the conventional needle loom, the fibrous batt travels along a horizontal path, and the needles are reciprocated vertically. It is to be understood, however, that this is not the only possible arrangement, and that, for example, the batt could travel vertically and the needles horizontally. Furthermore, it is not essential that the needles should travel at right angles to the path of the batt, although this will generally be the case.

It is known to drive the needles in a needle loom by a crank mechanism coupled to the needle board by a connecting rod and a drive rod, the latter being constrained to follow the desired rectilinear path, so that the drive mechanism resembles the piston and crank arrangement of a reciprocating engine, driven in reverse.

The invention is concerned with a new driving arrangement, which allows the needles to reciprocate at higher speeds than heretofore, without setting up undue stresses in the loom. Since the frequency of reciprocation of the needles is usually the limiting factor in the speed of operation of the loom, it follows that an increase in needle speed produces an increase in production on the loom.

SUMMARY OF THE INVENTION

It is the object of the invention to provide a needle board assembly for use in a needle loom which assembly comprises a needle board; a drive rod attached to said needle board for movement therewith; first and second bearings spaced apart axially with respect to said drive rod and constraining said drive rod to follow a rectilinear axial path; a rotary driving shaft, and a connecting rod; a mechanism for producing reciprocation of said connecting rod from rotation of said driving shaft, and coupling means coupling said connecting rod to part of said drive rod located between first and second bearings.

The disposition of said coupling between said connecting rod and said drive rod, in the part of said drive rod which is between the bearings produces an improvement in the load distribution, which enables said needle board to be reciprocated at high speed. This is because the connecting rod inevitably applies side thrust to the drive rod, and if the coupling is at the end of the drive rod opposite to the board, this thrust produces a bending of the drive rod projecting beyond the two bearings, which is (in relation to the side thrust) a cantilever. On the other hand, with the arrangement provided by the invention, the side thrust is applied to a part of said drive rod, which in relation to that thrust is a simply supported beam. Now it is well known that a simply supported beam offers greater rigidity against an applied load than a cantilever. Hence the needle

board assembly provided by the invention is less liable to deflection in the drive rod than known assemblies.

It is a further object of the invention, to provide a needle board assembly for use in a needle loom, said assembly comprising a needle board; a pair of drive rods spaced apart longitudinally of said needle board and attached to said needle board for movement therewith; first and second bearings for each of said drive rods, said first and second bearings of each said drive rod being spaced apart axially with respect to their associated drive rods, said first and second bearings constraining their respective drive rod to follow a rectilinear axial path; a rotary driving shaft; a connecting rod; a mechanism for producing reciprocation of said connecting rod from rotation of said driving shaft, and coupling means coupling said connecting rod to parts of said drive rods located between said first and second bearings.

It is a further object of the invention to provide a needle board assembly for use in a needle loom, wherein said connecting rod is positioned between said pair of drive rods and said coupling means comprises a gudgeon pin extending on opposite sides of said connecting rod and engaging in parts of said drive rods. Further, according to a preferred feature of the invention, there is provided a pair of main journal bearings mounting said driving rod for rotation about its own longitudinal axis, said mechanism for producing reciprocation of said connecting rod being located between said pair of main journal bearings, and said driving shaft extending outside each of said main journal bearings, there being a flywheel on each of said outward extensions of said driving shaft.

The invention also includes within its scope a needle board unit comprising two needle board assemblies each in accordance with the invention, said assemblies being arranged with their respective needle boards and driving shafts parallel with each other, there being gearing coupling said driving shafts together for contrarotation.

The invention also includes within its scope a needle loom incorporating needle board assemblies in accordance with the invention.

DESCRIPTION OF SPECIFIC EMBODIMENT

A needle loom incorporating needle loom assemblies in accordance with the invention, will now be described by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is a somewhat diagrammatic front elevation of a needle loom, with part of a drive unit housing cut away, to show the interior,

FIG. 2 is an end view looking in the direction of arrow 11 in FIG. 1,

FIG. 3 is a plan view,

FIG. 4 is an end view to a larger scale, of a needle board unit,

FIG. 5 is a view looking in the direction of arrow V in FIG. 4,

FIG. 6 is a section on the line VI—VI in FIG. 5, and FIG. 7 is a section on the line VII—VII in FIG. 4.

The loom itself is shown diagrammatically in FIGS. 1 to 3, and in essence, is similar to conventional needle looms. Basically, the loom comprises a bed beam 10, which extends from end to end of the loom, vertical end columns 12, and a pair of parallel top beams 14, which also extend from end to end of the loom. It will

also be understood, that the loom frame includes other members, which have been omitted from the drawings for clarity, only those basic frame units which are essential to an understanding of the arrangement of the loom having been referred to.

On the rear side of the loom, there is a pair of feed rollers 16 and 18, which are journaled in bearings (not shown), and which are rotated in the directions indicated by the arrows in FIG. 4. A continuous batt of fibrous material 20, which is usually in the form it is received from a carding machine, and which at this stage is quite thick, is introduced into the nip between the feed rollers 16 and 18, which forward it through the loom.

At the front of the loom, there is a pair of Capstan take-off rollers 22 and 24 which are also journaled in bearings (not shown) and driven in the directions illustrated by the arrows in FIG. 4, these rollers being provided for the purpose of pulling the needled batt of fibres (which in consequence of the needling operation is considerably reduced in thickness) out of the needle loom. The loom will also be provided with a take-up means for collecting the needled batt of fibrous material on to a beam. Since however this is conventional, it is not necessary to illustrate it or describe it herein.

Two series of bed frames 26 are provided, the bed frames in each series being arranged in abutting end to end relationship as illustrated in FIG. 1. The two series of bed frames are disposed one in advance of the other (with respect to the direction of travel of the fibrous web 20 through the loom) as is clearly shown in FIGS. 2 and 4. Each of the bed frames 26, is supported by a pair of bed columns 28, and these columns project upwardly from the bed beam 10. A bed plate 30 is provided on the top of each bed beam 26, and the bed beams are set at such a height, that the top surfaces of the bed plates 30, are substantially tangential to the zenith of the bottom feed roll 18. It will also be observed by reference to FIG. 4, that the bed plates on the rear series of bed beams 26, extend close to the periphery of the roll 18, so that the batt of fibres 20, has a smooth passage from the nip of the rollers 16 and 18 on to the bed plates 30. It is whilst the batt of fibrous material is travelling over the bed plates 30, that it is subjected to the needling action of the loom. Therefore, it is necessary for the bed plates 30 to be perforated in a pattern which corresponds to the arrangement of the needles with which the loom is equipped, and this is the conventional arrangement.

Above each bed beam 26, there is a needle board 32, and these boards 32 are arranged in an end to end relationship corresponding to that of the bed beams 26. Thus there are two series of needle boards 32, one in advance of the other, each needle board corresponding to one of the bed beams. A multiplicity of needles 34 projects downwardly from each needle board 32, the needles being arranged in ranks and files so that together they cover substantially the entire under-surface of each needle board. The needles themselves are equipped with barbs, and are of the type commonly used in needle looms.

Each needle board 32, is carried by a needle arm 36a, 36b, which is built up of angle iron members, and which extends from end to end of its respective needle board 32.

A series of drive units 40 is supported between the top beams 14, there being one such unit 40 associated

with each pair of needle arms such as 36a and 36b illustrated in FIGS. 4 and 6. At one end of the loom, there is a gearbox 42, the input drive to which is obtained from an electric motor (not shown) which is the driving motor for the loom itself. There are two parallel output shafts 44 from the gearbox 42, and the driving arrangement is such, that these shafts 44 rotate in opposite directions, as illustrated by the arrows at the right hand end of FIG. 3. Each of the drive units 40 has a pair of parallel driving shafts 46a and 46b, as clearly seen in FIGS. 6 and 7, and these shafts are respectively coaxial with the output shafts 44 of the gearbox 42. All the driving shafts 46a and 46b of the units 40, are arranged to be coupled together and coupled to the output shafts 44, en suite by means of couplings 48. Thus, so long as the loom is in operation, all the shafts 46a and 46b are contrarotated in the direction indicated by the arrows in FIGS. 3, 4 and 6. It is the driving shafts 46a and 46b, which provide the rotary motion which has to be converted into rectilinear reciprocatory motion, for operating the needles 34.

Each of the units 40 comprises an upper housing 50, and a lower housing 52, and the latter is equipped with eight slide bearings 54 arranged in two tiers, one close to the upper portion of the housing 52, and the other extending through the bottom of the housing 52. There are in fact four such bearings 54, associated with each of the needle arms 36a or 36b one such set being completely shown in FIG. 7, and the bearings at one end of both sets, being shown in FIG. 6.

A pair of drive rods 56 is provided for each of the needle arms 36a or 36b, these drive rods, being fixed to the beams 36 near to the ends of the latter, and extending upwardly therefrom, and being received in the bearings 54. Thus, each of the drive rods 56 is able to slide vertically in a pair of bearings 54, one in each tier, and consequently, the bearings 54 provide the necessary constraint for the drive rods, which ensure that the movement of the needle arm 36, and consequently the movement of the needles 34, is in the rectilinear vertical path, required for the needles to pierce the batt 20 at right angles, as it is passing through the loom.

Each shaft 46a or 46b is received in a pair of main journal bearings 58, which are mounted in the side walls of the upper housing 50, the shaft projecting outside the end walls of the upper housing 50 and being fitted with a half coupling 48a or 48b at each end. Outside the housing 50, there are two flywheels 60 on each shaft, one such flywheel being mounted on each side of the housing. By reference to FIG. 7, it will be observed that the flywheels 60 on the shaft 46a are offset axially with respect to their shafts, so that it is possible for the flywheels of the shafts 46a and 46b to overlap each other. In this way, the flywheels 60 do not determine the spacing between the shafts 46a and 46b, which consequently can be quite close to each other.

Between the bearings 58 associated with each shaft 46a and 46b, there is an eccentric 62a or 62b, the shelve of which forms the big end of a connecting rod 64a, 64b. The connecting rod extends downwardly below the shaft 46a or 46b, through the lower open end of the upper housing 50, and into the lower housing 52. The lower end of the connecting rod 64a or 64b has a little end, in which is fitted a gudgeon pin 66a, 66b, the gudgeon pin extending on each side of the little end, and being received in bearing bushes in bosses 68 projecting inwardly from the pair of drive rods 56 associ-

ated with one particular needle arm 36. Consequently, each driving shaft 46a or 46b, is connected to a respective one of the needle arms 36, through the eccentric 62, the connecting rod 64, the gudgeon pin 66, and the pair of drive rods 56. It is an important feature of the invention, that the gudgeon pin couples the little end of the connecting rod 64, to part of the drive rods 56, which is located between the upper and lower tiers of slide bearings 54. In fact, it will be observed that it is necessary for the spacing between the upper and lower tiers of the bearings 54, to be such as to permit the bosses 68 to have the full vertical stroke of the needle arm 36, as determined by the throw of the eccentric 62.

When the loom is in operation, the shafts 46a and 46b are rotated, and this rotary motion is converted into reciprocatory and oscillatory motion of the connecting rods 64a and 64b. The latter by virtue of their pivotal coupling with the drive rods 56, produce vertical rectilinear reciprocation of the drive rods 56, and consequently reciprocate the needle arms 36 as required. However, the motion is particularly smooth, partly because of the incorporation of the flywheels to even out the torque, but largely due to the disposition of the coupling provided by the gudgeon pin 66. Any side thrust applied by the connecting rod 64, to its pair of drive rods 56, is resisted by those drive rods, which in relation to this applied side thrust, act as beams simply supported between the bearings 54. This, of course, presents a much more rigid structure, than one in which the connecting rod is coupled to an extremity of the drive rods, which projects outside the bearings. Furthermore, the balanced arrangement of the drive, whereby each connecting rod is coupled to a pair of drive rods, enhances the stability and smooth running of the driving mechanism.

It will be appreciated, that instead of using eccentrics 62, it would be possible to use crank mechanisms formed on the shafts 46, or cam mechanisms. However, eccentrics are preferred for assisting in the smooth operation of the driving mechanism at high speeds.

Reference to FIG. 4, shows that the loom is also provided with stripper plates 70 which are formed by channel members, there being one such stripper plate associated with each of the needle boards. The stripper plates 70 are perforated in similar fashion to the bed plates 30, to allow the needles 34 to pass therethrough. The two stripper plates 70 associated with a pair of needle boards 32 as shown in FIG. 4, are supported by rams 72 projecting from jacks 74, attached to the underside of the lower housing 52. These stripper plates are not described in great detail, since their construction and action is similar to that of stripper plates in conventional needle looms. It need only be mentioned, that as each needle board descends, its needles pass through the stripper plate 70 and when the needle board is retracted upwardly, any fibrous mass held on the needles is cleared therefrom by the stripper plate. Furthermore, the stripper plates may serve to compress the needed batt of fibres.

I claim:

1. For use in a needle loom, a needle board assembly comprising a needle board; a pair of drive rods spaced apart longitudinally of said needle board and attached to said needle board for movement therewith; first and second bearings for each of said drive rods, said first and second bearings of each said drive rod being spaced apart axially with respect to their associated

drive rods, said first and second bearings constraining their respective drive rod to follow a rectilinear axial path; a rotary driving shaft; a connecting rod; a mechanism for producing reciprocation of said connecting rod from rotation of said driving shaft, and coupling means coupling said connecting rod to parts of said drive rods located between said first and second bearings.

2. For use in a needle loom, a needle board assembly according to claim 1, wherein said connecting rod is positioned between said pair of drive rods and said coupling means comprises a gudgeon pin extending on opposite sides of said connecting rod and engaging in parts of said drive rods.

3. For use in a needle loom, a needle board assembly according to claim 2, which includes a pair of main journal bearings mounting said driving rod for rotation about its longitudinal axis, said mechanism for producing reciprocation of said connecting rod being located between said pair of main journal bearings, and said driving shaft extending outside each of said main journal bearings, there being a flywheel on each of said outward extensions of said driving shaft.

4. A needle board unit for use in a needle loom comprising first and second needle board assemblies each in accordance with claim 3, said first and second assemblies being arranged with their respective needle boards and driving shafts parallel with each other, there being gearing coupling said driving shafts together for contra-rotation.

5. A needle board unit according to claim 4, wherein said flywheels of said two assemblies are offset relatively to each other in the direction of the axes of the driving shafts and said flywheels on one of said driving shafts overlap said flywheels on the other of said driving shafts.

6. For use in a needle loom, a needle board assembly comprising a needle board; a pair of drive rods spaced apart longitudinally of said needle board and fixed to said needle board for movement therewith; bearings for each of said drive rods, said bearings constraining said guide rods to a rectilinear axial path of movement; a rotary driving shaft extending perpendicularly to said drive rods; a connecting rod positioned between said pair of drive rods; means connecting said connecting rod with said driving shaft comprising means for producing reciprocation of said connecting rod by rotation of said driving shaft, and coupling means coupling said connecting rod to both of said drive rods to reciprocate said drive rods and thereby reciprocate said needle board.

7. For use in a needle loom, a needle board assembly according to claim 6, wherein said coupling means comprises a gudgeon pin extending on opposite sides of said connecting rod and engaging in parts of said drive rods.

8. For use in a needle loom, a needle board assembly according to claim 7, which includes a pair of main journal bearings mounting said driving shaft for rotation about its longitudinal axis, said mechanism for producing reciprocation of said connecting rod being located between said pair of main journal bearings, said driving shaft extending outside each of said main journal bearings, and a flywheel on each of said outward extensions of said driving shaft.

9. In a needle loom, first and second needle board assemblies each in accordance with claim 8, said first and

second assemblies being arranged with their respective needle boards and driving shafts parallel with each other, and gearing coupling said driving shafts together for contra-rotation relative to one another.

10. A needle loom according to claim 9, wherein said flywheels of said two assemblies are offset relatively to each other in the direction of the axes of the driving shafts and said flywheels on one of said shafts overlap said flywheels on the other of said driving shafts.

11. In a needle loom comprising a needle board, means for guiding and reciprocating said needle board including two drive rods fixed to said needle board for

movement therewith, first and second bearings spaced apart axially with respect to each of said drive rods and constraining said drive rods to follow a rectilinear axial path, a gudgeon pin extending laterally from each of said drive rods between said bearings, a crank shaft rotatably supported with its axis perpendicular to said drive rods and connecting rod means connecting said crank shaft with said gudgeon pin on one side only of each of said drive rods to produce reciprocation of said drive rods and needle board upon rotation of said crank shaft.

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