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DRIVING MECHANISM FOR REVOLVING NEEDLE BARS OF COMBING AND GILLING MACHINES

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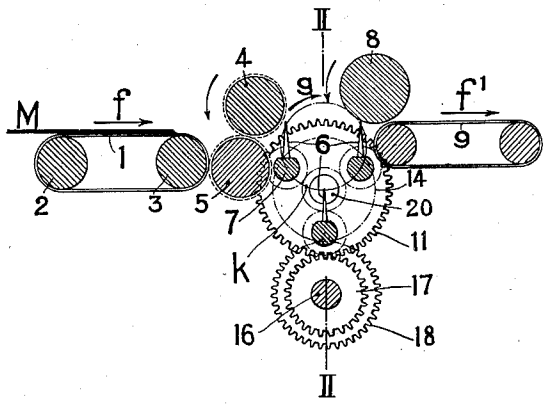
Fig. 1.



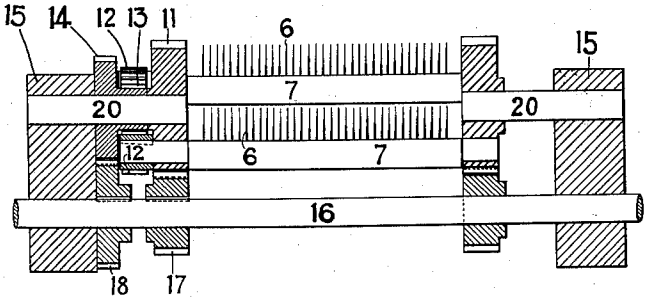


Fig. 2.

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DRIVING MECHANISM FOR REVOLVING NEEDLE BARS OF COMBING AND GILLING MACHINES

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1 Claim. (Cl. 19—115)

The object of the present invention is a differential mechanism for driving revolving needle bars of combing machines and gill boxes used in the combing and drawing fibrous materials.

By means of a new application of a differential gear, this mechanism overcomes the disadvantages of the present combing or preparing machines, particularly those with needle bars traversing a circular path (the so called "sun" machines) and the ordinary gill boxes with screw operated needle bars.

The improvements obtained by the application of a differential gear are that the simplicity and robustness of the mechanical means used enable the revolving needle bars to be given a practically unlimited speed and the needles secured in the various bars to be maintained always parallel with themselves (for example vertical) during the course of their revolution and motion through the material, which is not the case with the mechanisms employed hitherto particularly in the so called "sun" machines and in the usual screw operated gill boxes. The constant parallelism of the needles facilitates their penetration into and withdrawal from the material and results in more regular and efficacious working of the material.

In the known "sun" type of machine the ends of the needle bars engage in more or less radial grooves in the adjacent faces of two discs or "suns", the bars also sliding upon cams. The needles being guided by the bars engaging in the grooves in the discs are constrained constantly to change their inclination so that owing to their radial direction they do not properly penetrate the material to be combed and drawn, but pass through it at angles which constantly change, and disengage it too soon. The operation is therefore defective and rather slow owing to the friction of the needle bars in the grooves and on the cams, this friction leading moreover to considerable wear.

In the known screw operated gill boxes the ends of the needle bars are engaged alternately with two screws; one of the latter terminates in a cam which raises each bar and engages it with the thread of the other screw which feeds it in the opposite direction and also terminates in a cam which again lowers each bar into engagement with the first screw. Here again, only a low speed can be used in practice and the risk of breakage of the cams is considerable when the screw threads or cams show signs of wear.

Drawing and combing is also done by the aid of a single needle bar. This method employs a crank shaft or eccentric provided with levers carrying the said bar at one end and two hinge joints at the other. The crank gives the bar an ellipsoidal motion which it is difficult to balance. Further, since there is but a single needle bar, the output is low.

The improved driving mechanism consists of a kind of differential gear. Specifically it comprises a main driving shaft, a toothed wheel having a journal for each needle bar and arranged to impart thereto a rotary movement around a central axis so as to cause the bar needles to penetrate into, to comb and to be withdrawn from the material to be worked, a stationary shaft carrying said toothed wheel loose thereon, a couple of different pinions loosely mounted on said shaft, a pinion fixed on the driving shaft and meshing with one of the pinions of said couple and a pinion fixed on the needle bar and meshing with the other pinion of said couple, the different gears having such ratios that the bar needles in revolving remain parallel with themselves throughout their translation.

The accompanying diagrammatic drawing will facilitate comprehension of the invention and illustrates an embodiment thereof, applicable in particular to the combing of wool.

Figure 1 is a sectional elevation through a set of three needle bars revolving around a central axis and provided with material feeding and evacuating means.

Figure 2 is a fragmentary section on the line II—II of Figure 1.

The material M to be drawn and combed is fed by an endless band or belt 1 moved in the direction of the arrow *f* by the rotation of two rollers 2, 3. The material, as it advances, is then seized between two feed rollers 4, 5 of known type which rotate in opposite directions, and carried thereby into the region of operation of the needles 6 set in bars 7 of which three are shown in the drawing as constituting the combing or gilling system. The needle bars 7 move in a planetary path about the geometric axis O of the system in such a manner that the needles 6 remain constantly parallel with themselves (vertical in the example illustrated). The rotation of the needle bar set is indicated by the arrow *g*.

In rotating the needles 6 of the successive bars 7 first penetrate the material, then through a certain course produce the combing of the material and finally again disengage therefrom, the points of the needles following a circular

path indicated by the circle *k* in Figure 1. Owing to the constant parallelism of the needles 6, the work (parallelization, drawing and combing) on the material is effected under the best conditions.

Beyond the needle bar system the material is seized between an evacuating roller 8 and an endless belt 9 moved in the direction of the arrow f^1 by means of driving rollers. The treated material can now be collected in any convenient manner.

In a practical example, the rollers 4 and 5 can have a peripheral speed of 10 meters, the needle bars 7 may have a speed of 36 meters and the roller 8 cooperating with the belt 9 a speed of 40 meters. It will be understood that these figures are only given as an example and are not limitative.

The differential mechanism, maintaining the constant angular position of the needles is diagrammatically shown in Figure 2. The ends of the bars 7, the number of which may vary and in which the needles 6 are set, turn in bearings in supporting "sun" wheels 11 which rotating about the geometric axis of wheel 11 give the bars a bodily rotation about this axis. On one end of each bar 7 is keyed a pinion 12 meshing with a common pinion 13 rigid with a pinion 14. These pinions 13 and 14 and the pinion 11 are loosely mounted upon a shaft 20 coaxial with the axis and which is fixed in side plates 15 forming part of the frame of the machine.

Preferably, such a driving gear is arranged at both ends of the needle bars in order to avoid twisting; on the right hand in Figure 2, for sake of simplicity, only one part of the gear is represented.

On the driving shaft 16 which is journalled in the plates 15 of the frame are keyed pinions 17 and 18 which mesh respectively with the pinions 11 and 14.

The different gear ratios are as follows:—

Between pinions 17 and 11, 1: 2

Between pinions 18 and 14, 1: 1

Between pinions 13 and 12, 1: 1

The differential gear operates as follows:—

The driving shaft 16 entrains the pinions 17 and 18. The pinions 11 therefore rotate in opposite direction to the shaft 16 and at half the speed, while the pinions 13 and 14 rotate in opposite direction to the shaft 16, but at the same speed as the latter. Owing to this arrangement of gears and the respective ratios, the needles 6 set in the bars 7 remain parallel with themselves throughout their translation in their circular path about the axis O. Regulation of the meshing enables the needles 6 to be set vertically with a view to engaging the material perpendicularly to the lap or sheet thereof assuming the latter travels horizontally.

The arrangement of the differential planetary gearing can obviously be varied without departing from the invention. Thus the pinions 13 could be replaced by hollow internally toothed pinions meshing with the pinions 12 which would then be located within said hollow pinions.

The invention is applicable to textile machines designed to operate upon the most various fibres, for example for opening, sorting, drawing, parallelization or combing, wherever comb needles have to penetrate a lap or mass of fibres.

What I claim is:—

A driving mechanism for revolving needle bars of combing and gilling machines, comprising a main driving shaft, a toothed wheel having a journal for each needle bar and arranged to impart thereto a rotary movement around a central axis so as to cause the bar needles to penetrate into, to comb and to be withdrawn from the material to be worked, a stationary shaft carrying said toothed wheel loose thereon, a couple of different pinions loosely mounted on said shaft, a pinion fixed on the driving shaft and meshing with one of the pinions of said couple and a pinion fixed on the needle bar and meshing with the other pinion of said couple, the different gears having such ratios that the bar needles in revolving remain parallel with themselves throughout their translation.

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