April 25, 1933. F. C. BLANCHARD 1,905,336

MACHINE FOR COMBING TEXTILE FIBERS

Filed Oct. 12, 1929 3 Sheets-Sheet 1

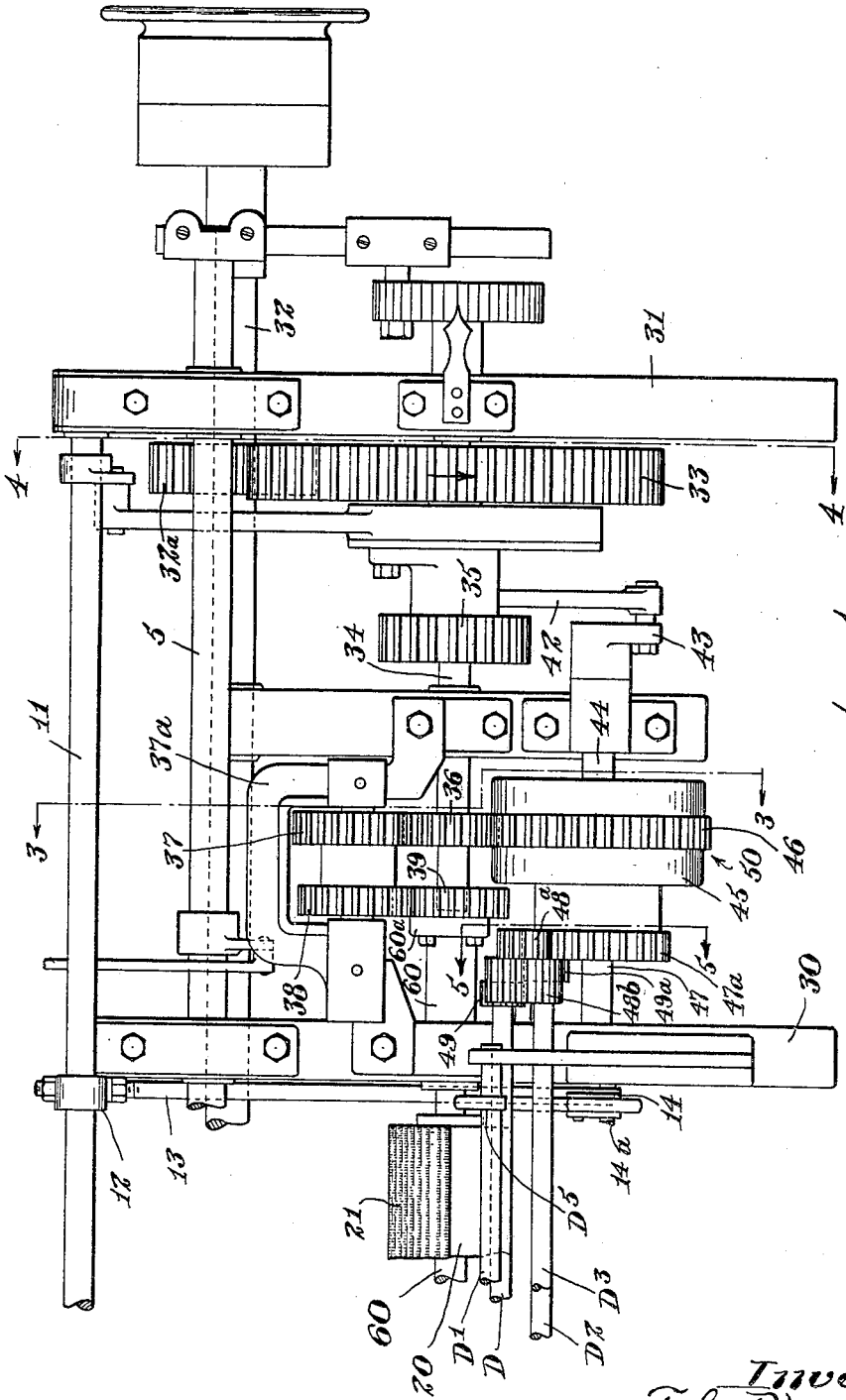


Fig. 1.

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Fig. 2.

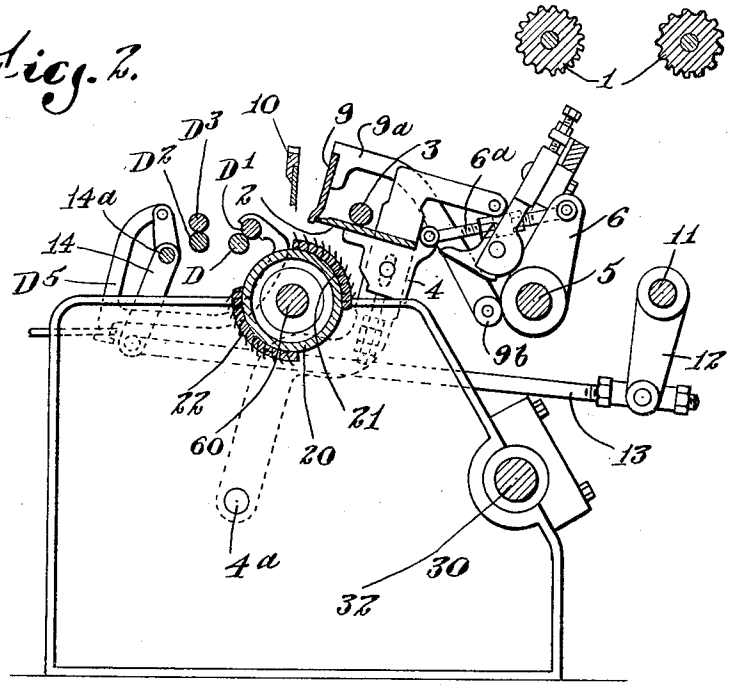
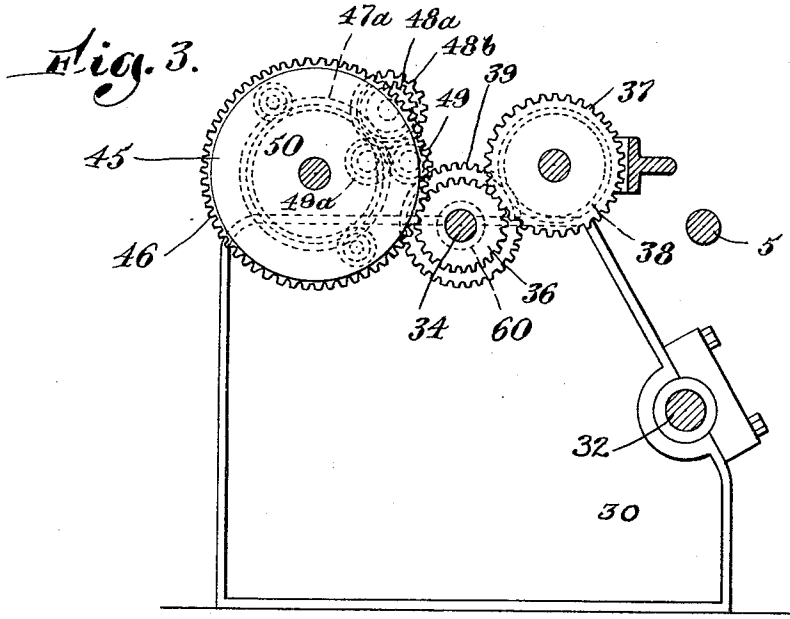


Fig. 3.



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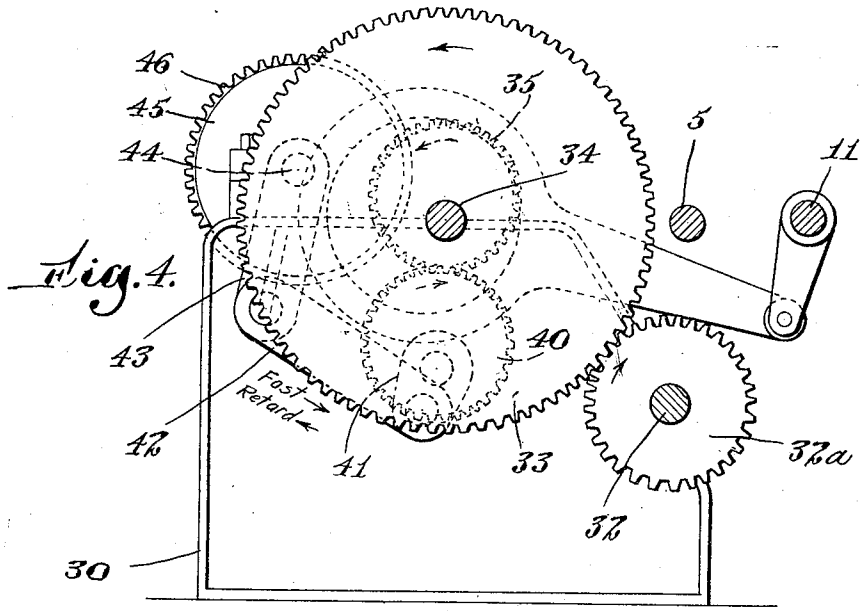


Fig. 4.

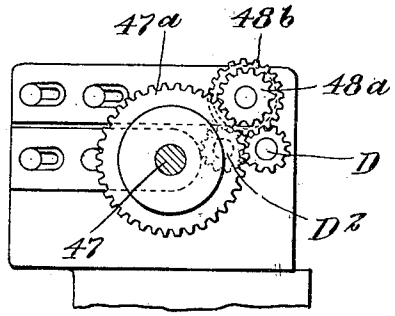


Fig. 5.

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UNITED STATES PATENT OFFICE

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MACHINES FOR COMBING TEXTILE FIBERS

Application filed October 12, 1929. Serial No. 399,198.

This invention relates to machines for combing textile fibers preparatory to subsequent operations leading to the spinning of such fibers into yarn.

It had long been recognized that proper combing contributes in a marked degree to the excellence of yarn and fabric made from such yarn, but heretofore the expense of this operation has largely prevented its use except for the more expensive grades of yarn.

The present invention has for its object the cheapening of this operation without loss of efficiency so that the beneficial results of combing may be extended to less expensive classes of goods, this being effected by a simple modification of existing combing machines which results in a very large increase of output without sacrificing the quality of the work done.

The limit of speed of operating combing machines is largely due to the fact that attempts to speed up such machines, as organized, results in inferior work, since the rushing of the comb teeth through the fibers tears the fibers as well as increases the amount of waste. In consequence of which the best practice today does not operate these machines at over 90 to 100 revolutions per minute and even this is regarded as rather fast for the best results.

The present invention overcomes this difficulty by speeding up the actuating mechanism that operates the fiber feeding means, the nipper mechanism and the detaching rolls at a much more rapid speed than heretofore, while at the same time introducing into the driving head of the machine, where heretofore the cylinder shaft that carries the combs or half-laps was coupled directly to the control or main shaft of the machine, a speed-reducing gearing that revolves the half-lap cylinder even slower than heretofore while at the same time substituting for the usual balancing segment on each cylinder an additional half-lap arranged diametrically opposite the original half-lap so that the sliver delivering the combing, the detaching and piecing-up of the half-lap or sliver is completed on each half revolution of the cylinder shaft.

As this change can be readily made in existing machines of the well known and popular Nasmith type, it is not necessary to reconstruct the whole machine and consequently at very little expense the driving head of the comber may be changed to permit an increase of production of upwards of sixty per cent without the sacrifice of efficiency or quality.

In the accompanying drawings I have illustrated more or less conventionally such parts of a Nasmith comber as are required to enable those skilled in the art to practice the present invention, in which drawings

Fig. 1 is a plan view showing the driving mechanism in the head of such a comber equipped with my improvement.

Fig. 2 is an end elevation, partly in section, illustrating the double half-lap combing cylinder in association with appropriate parts of the well known feeding, nipper and detaching roll elements.

Fig. 3 is a cross sectional elevation on the plane indicated by dotted line 3—3 of Fig. 1.

Fig. 4 is an end elevation in cross section on the plane indicated by dotted sectional line 4—4 of Fig. 1.

Fig. 5 is a cross sectional elevation on the plane 5—5 of Fig. 1.

The illustrated machine is of the type known as the Nasmith comber, such as shown and described in United States patent to Nasmith No. 724,119 dated March 31, 1903, without the improvements constituting the present invention and with some additional minor modifications.

In describing the machine, as improved by this invention, only such parts are referred to as are helpful to an understanding of the present improvement. The chief elements that deal directly with the lap or sliver are shown in their well known relations in Fig. 2 in which will be found two revoluble rollers 1 upon which the roll of sliver is supported for unwinding and delivery to the combing mechanism. From these rollers the sliver is passed over the bottom nipper plate 2, which is secured to an oscillatory frame 4 fulcrumed at 4^a which advances and retracts the nipper device, including the top or front

nipper 9, which is pivotally mounted on the supporting frame so as to advance and retract with it but which, by means not shown, is raised from and lowered to operative pinching engagement with the lower nipper by actuation of its pivotal supporting arms 9^a by which it is connected with the nipper frame. The feed roll 3 actuated as described in said Nasmith patent aids in advancing the requisite length of sliver for the ensuing combing action. The usual top comb 10 is positioned to penetrate the projecting combed end of the lap beyond the nippers, after the half-lap teeth have passed through this tuft, to complete the combing of the tuft as the detaching rolls detach the tuft from the remainder of the uncombed sliver, all in the well known manner.

The detaching rolls D and D^2 are positively driven in a manner presently to be described and, cooperating with the respective rolls are the weighted or pressure rolls D', D^3, the former of which is carried in a swinging frame D^5 to travel in a short arc forward and back around the co-acting detaching roll D, which swinging movement is effected as described in the Nasmith patent by means of a rock shaft 11, an arm 12, a connecting link 13 and a rock shaft 14^a actuated through a connecting lever 14.

The oscillation of the nipper frame with its supported nipper mechanism is effected through the medium of the usual nipper rock shaft 5 to which is secured the arm 6 connected to the nipper frame by an extensible connecting rod 6^a.

It will of course be understood that the operations performed by such a combing machine on the lap or sliver comprise the feeding in or delivery of the lap from the unwinding lap roll between the nipper plate and a co-acting feed roller 3, the pinching or gripping of the advanced or projected forward portion of the lap beyond the nipper plate by the pressure of the top nipper 9 against the nipper plate 2, the combing movement of the needles of the half-lap 21 secured to the revolving comb cylinder 20, the advancing of the entire tuft by the forward movement of the nipper mechanism during part of the combing action, the release or opening of the top nipper and the practically simultaneous penetration of the projecting tuft by the teeth of the top comb, preceded by the reverse rotation of the detaching rolls to feed back the rear end of the previously combed tuft and the piecing-up of the newly combed tuft which is overlapped upon the reversely fed portion of the previously combed tuft by the further advance of the nipper plate and feed roll so that the newly combed tuft is drawn away from the nipper as the nipper and feed rolls recede to initial position.

At the speed with which these operations are performed when utilizing the present improvement, it is necessasry that the driving trains which control the movement of the detaching rolls should at all times positively control the movement and the pause of the detaching rollers. Accordingly this connection is made through an epicyclic train comprising outer and inner driving members having epicyclic connection with the detaching roll shaft in all respects similar to that shown in the United States Patent to Chace No. 1,133,006, except that, as will presently be explained, the outer driving member of the train is driven by a peripheral spur gear instead of driven through a tubular hub, and with the further exception that the inner driving member of such element is driven by means of a crank shaft that is actuated from an eccentric gear couple.

Referring now to Fig. 1 of the drawings and the various sectional elevations shown, it will be seen that at one end of the combing machine there is provided an upright frame or standard 30 carrying the operating parts and shafts of the machine and an outside upright or frame 31, between which is located the entire driving and controlling mechanism of the whole combing machine which may comprise any number of combing units arranged side by side along the length of the machine.

In this driving head, between the two frames, is mounted the power or pulley shaft 32, which by means of a pinion 32^a meshing with a large gear 33 drives the parallel control shaft 34 by which, for the most part, the various operations of the machine are controlled except that the clearing brushes for the half-lap teeth may be driven directly from the power shaft 32.

I will first describe the driving connection between the cylinder shaft 60, which carries the cylinders 20 to which the double half-laps 21 are secured for revolution.

On the control shaft 34 is secured a pinion 36 which operates a speed-reducing gearing 37, 38 so proportioned that by meshing connection with the pinion 39 secured on the aligned end of the cylinder shaft 60 the speed of the cylinder shaft is reduced relatively just one-half of that which it previously had when the control shaft 34 was coupled directly to the end of the cylinder shaft 60. The pinion 39 can be bolted to one of the former connecting flanges 60^a so that it is merely required to insert the carrying bracket 37^a, which supports the back gears 37, 38, to establish this reduced speed ratio between the cylinder shaft and its former drive shaft. This of course means that the cylinder will turn only one-half a revolution for each complete revolution of the control shaft 34, instead of as heretofore turning equally with it. As each revolution of the control shaft produces a complete cycle of

operations of the feeding, the nipper and the detaching roll operations, the substitution of an additional half-lap 21 for the counterbalancing segment, heretofore secured opposite the old half-lap, a combing action is secured for each half revolution of the cylinder shaft, thereby permitting the comb to be operated at a speed of say only 80 revolutions per minute, while the control shaft and its control mechanism is operating at the rate of 160 revolutions per minute.

As the comb teeth of the half-lap are driving through the part of the sliver being combed even more slowly than is the usual practice, complete excellence of operation is maintained, while the output of the machine is nearly doubled because of the much higher speed of operation of the feeding, nipping, detaching and piecing mechanism, the difference being compensated for by the use of two half-lap combs on the cylinder.

I will briefly describe the train of mechanism by which the forward and backward movements of the detaching rolls for alternately detaching and piecing-up the sliver is effected.

An eccentric gear 35 secured to the control shaft 34 intermeshes with an underneath eccentric gear 40 to whose shaft is secured a crank pin arm 41, which by means of a link 42 is operatively connected with a considerably longer crank arm 43 that is secured to the shaft 44, which forms the inner member of the epicyclic element 50. This epicyclic transmission element is precisely like that shown in the aforesaid Chace patent illustrated in Fig. 7 of the drawings of said patent, except that the outer driving element instead of being driven through an elongated tubular hub enclosing the inner drive shaft of the element is driven by means of an external or peripheral gear ring 46 secured to this external element 45, which gear meshes with the pinion 36 secured to the control shaft 34. The driven shaft 47, which is driven alternately in opposite directions, according to the relative movements of the outer driving member 45 and the inner driving shaft 44 is provided with a gear 47^a for transmitting motion alternately in opposite directions to the detaching rolls D, D^2 as will presently be described.

The eccentric gear couple 35, 40 acting through the short crank arm 41 and link 42 produce a slow movement in one direction and a rapid movement in the other direction of the crank arm 43, that is secured to the inner driving element or shaft 44 of the epicyclic train. Moreover, when the crank arm 41 is at the two dead center positions beyond which the reversal of rotation of the inner driving shaft 44 takes place, there is a momentary pause attended with only a very slight or slow movement of the shaft 44 on either side of the dead center position and yet at all times the relative movement of the outer and the inner driving members of the epicyclic train are positively controlled. Since the internal construction of this epicyclic element is precisely that shown in the Chace patent and is therefore old and well known in the art, it has been thought superfluous to describe an illustrate further the details of this well known device.

The transmission of rotary motion in either direction to the positively driven detaching rolls D, D^2 from the driven shaft 47 of the epicyclic train is effected by means of the pinion 47^a secured to said shaft 47 which intermeshes with a pinion 48^a that is compounded with a wide pinion 48^b, which in turn intermeshes with the pinion 49 on the end of the detaching roll shaft D and with a pinion 49^a on the end of the detaching roll shaft D^2. Thus, it will be seen that the two positively driven detaching rolls D, D^2 are simultaneously and equally driven from a common driving pinion 48^a that is controlled from the driven shaft 47 of the epicyclic train and that the driving connection, when these rolls are rotated in either direction, is of a positive and reliable nature, thus insuring absolute precision of operation in starting, stopping and reversing these rolls for the detaching and the piecing-up operations.

It will therefore be seen that by the simple introduction of a suitable back-gearing 37 carried in a bracket 37^a and the securing of a suitable driving pinion 39 on the free end of the cylinder shaft 60, the speed of rotation of the cylinder shaft 60, which carries the half-lap, any desired ratio of cylinder shaft to control shaft speed may be obtained, provided the movement of half-laps on each cylinder head be increased in the inverse ratio. In the present drawings I have shown only two half-laps to each head and consequently the back-gearing is designed to reduce the speed one-half, which is easily possible and practicable because a single half-lap occupies a comparatively small arc of the entire circumference of the cylinder head. Increasing the diameter of the cylinder head would make it possible of course to use more than two half-laps provided the cylinder shaft speed ratio be correspondingly reduced. Thus, by a very simple and inexpensive alteration in the driving head of the machine existing combing machines can readily be changed to very largely increase their output without sacrificing excellence of work and thereby greatly reduce the cost of the combing operation and making it available for less expensive yarns than heretofore.

What I claim is:

1. A driving mechanism for a combing machine embracing in combination a revoluble combing cylinder, plural half-laps peripherally secured thereto in symmetrical relation, a main control shaft, a speed reducing gearing forming a drive connection between the control shaft and the cylinder for driving the

cylinder at reduced speed, coordinated lap-feeding means, nipper mechanism and detaching and piecing rolls driven by connections from said control shaft, the driving connection for said rolls embracing a reversible transmission uninterruptedly and positively maintaining a driving connection from the control shaft to said rolls and causing rotation of the detaching rolls forward and backward with predetermined intervals of pause whereby the action of the detaching rolls is positively coordinated with each half lap in succession without lost motion.

2. In a driving head for a combing machine, the combination with a cylinder shaft extending the length of the machine and carrying a combing cylinder on which half laps are secured in diametrically opposed pairs adapted to revolve one after the other in proximity to the lap feeding and nipping means, a timing control shaft, separate from said cylinder shaft, mounted in the head of the machine and having connections for actuating in proper coordination a longitudinal rock shaft by which the nipper mechanism is controlled and actuated and also a second longitudinal rock shaft by which the upper detaching roll shaft is oscillated toward and away from the coacting nipper mechanism, and continuously running reversible variable-speed transmission means for continuously interconnecting said time control shaft with the detaching rolls, and driving means connecting said time control shaft with the cylinder shaft and acting to rotate the cylinder shaft one-half revolution for each complete rotation of the time control shaft.

In witness whereof, I have subscribed the above specification.

FREDERICK C. BLANCHARD.