

[54] **CARDING MACHINE DRIVE**
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[51] **Int. Cl.**..... **D01g 15/36**
[58] **Field of Search** **19/106 R, 240; 92/51, 50, 92/117 A, 118; 60/571, 576, 579**

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[57] **ABSTRACT**

A variable speed card drive for varying the speed of feed and doffing components from zero to a creep speed suitable for carrying out maintenance operations, such as putting up an end of sliver, to a predetermined operating speed, includes a variable speed mechanism, a movable control arm for controlling the output speed of the variable speed mechanism, and an assembly having a pair of fluid operated cylinders and piston rods connected to the control arm for progressively positioning the control arm in a first position responsive to the action of one of the cylinders for achieving the creep speed, and in a second position responsive to the action of the other cylinder for achieving operating speed so that the card components may be slowly accelerated to creep speed and, following servicing of the carding machine, to operating speed.

2 Claims, 4 Drawing Figures

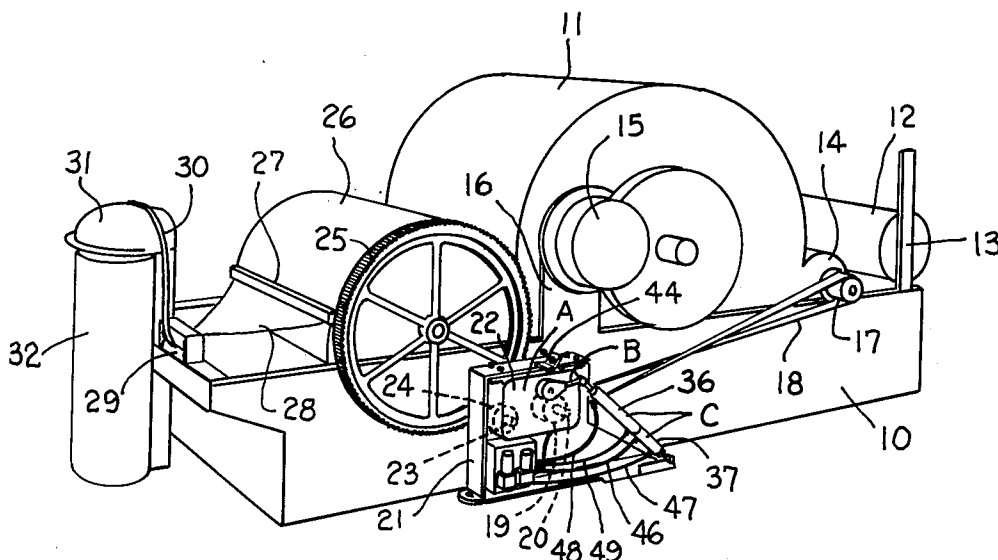


Fig. 1.

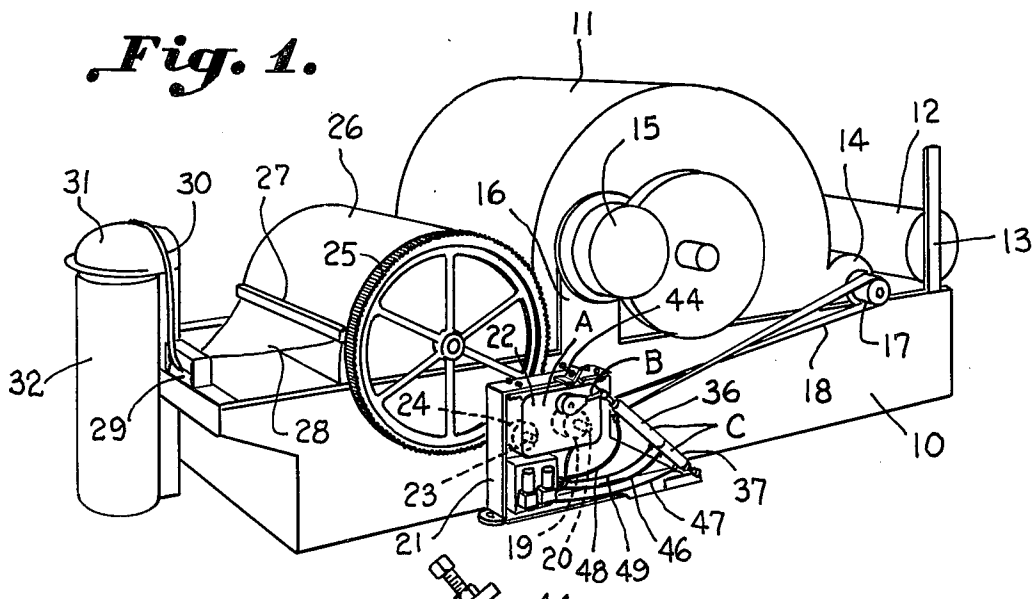


Fig. 2.

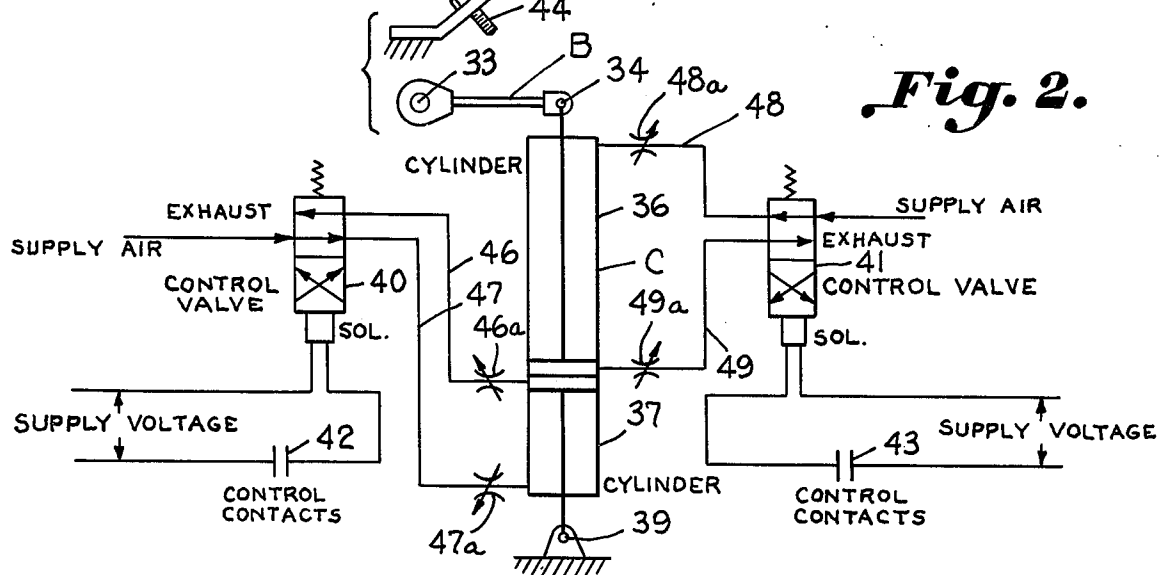


Fig. 3.

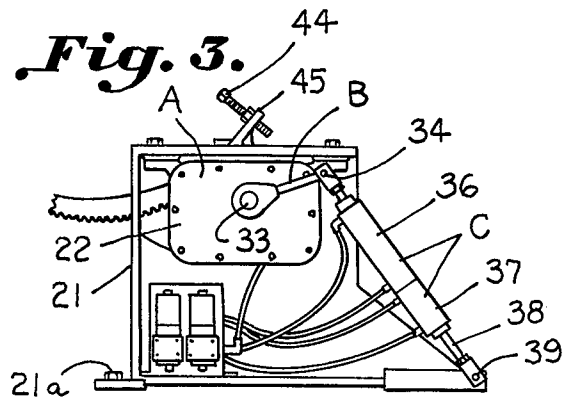
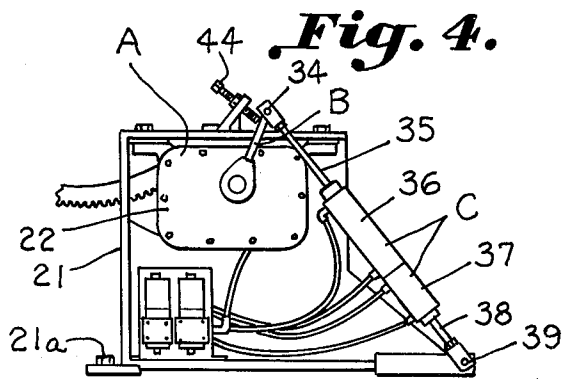


Fig. 4.



CARDING MACHINE DRIVE

BACKGROUND OF THE INVENTION

Variable speed drive mechanisms have been provided for bringing the carding components to creep speed and then to operating speed. Such devices have included mechanical components, but there has been a difficulty in achieving uniform speed transitions from one speed to the other as are necessitated by the characteristics of the carding apparatus having rotating members with high inertial forces and separated by considerable distances. The problem is aggravated by space limitations in the mill, as well as the economics of the operations.

Accordingly, it is an important object of the present invention to provide a versatile variable speed control device for bringing the carding components relating to doffing from zero to creep speed, and from creep speed to an operating speed. A uniform transition is provided wherein, variable speed mechanism is controlled by fluid operating means for progressively moving the controls of the variable speed mechanism. The variable speed mechanism itself provides a uniform output without stepping or abrupt variations.

Another important object of the invention is to provide a card drive wherein the doffing mechanism may be brought to creep speed, and from creep speed to operating speed in uniform transition, and which may be easily controlled without excessive maintenance, and with relatively low initial cost.

BRIEF DESCRIPTION OF THE INVENTION

It has been found that by employing a pair of fluid operated cylinders and pistons assembled in fixed aligned relation to each other the control arm of a variable speed mechanism may be moved at a predetermined rate to vary the output of a stepless variable speed transmission mechanism from zero to creep speed, and from creep to operating speed. In other words, a control arm of a stepless variable speed device may be moved uniformly through a predetermined first range responsive to movement of a cylinder and piston assembly, and then moved uniformly through a further predetermined range responsive thereto, to provide a further uniform speed increase.

BRIEF DESCRIPTION OF THE DRAWING

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing forming a part thereof, wherein an example of the invention is shown and wherein:

FIG. 1 is a perspective view illustrating a carding machine provided with a drive constructed in accordance with the present invention,

FIG. 2 is a schematic electrical and flow diagram illustrating the operating controls of a card drive constructed in accordance with the invention,

FIG. 3 is a side elevation further illustrating the mechanical components of the card drive in a creep speed position, and

FIG. 4 is a schematic side elevation further illustrating the components positioned for operating speeds.

DESCRIPTION OF A PREFERRED EMBODIMENT

The drawing illustrates a carding machine and the like, having means for feeding fibers to a main cylinder and means for doffing fibers from the main cylinder in the form of a web. A drive mechanism controlling the speed of each of said means comprises a drive including a variable speed mechanism A for driving connection to said feeding means and said doffing means for accelerating said means to a predetermined creep speed at a predetermined rate, and for further accelerating said means at a predetermined rate for driving same at a predetermined operating speed. A movable control arm B controls the output speed of the variable speed mechanism. A pair of aligned connected fluid operated cylinders and pistons C comprise an assembly which is connected to the control arm for positioning the control arm in a first position responsive to one action of said assembly for achieving creep speed, and in a second position responsive to another action of said assembly for achieving operating speed. Thus, the feeding and doffing means may be slowly accelerated following servicing of the carding machine to operating speed.

The carding machine illustrated has the usual frame 10 carrying a main cylinder 11. The fiber lap 12 is supported between standards 13 and the lap is fed under the usual feed roll (not shown) to the licker-in roll 14. The licker-in roll is driven in the usual manner from the main cylinder drive which includes the motor 15 carried by suitable support bracket 16. The licker-in drives a pulley 17 carried thereby which, in turn, drives a belt 18. The belt 18 drives a suitable pulley and the like, illustrated at 19. The pulley 19 is carried by an input shaft, a portion of which is illustrated at 20, which projects from the variable speed transmission mechanism A. The variable speed transmission mechanism A is carried by a vertical frame support 21 which has fixed connection with the floor of the mill as by bolts 21a (FIGS. 3 and 4), and has a casing 22 from which the shaft 20 projects. The variable speed mechanism A has an output shaft, a portion of which is illustrated at 23, projecting beyond the casing thereof. The output shaft 23 carries a gear 24, similar to the customary change gear for driving the doffer gear 25 which drives the doffer and, in turn, drives feed mechanism in the usual way. The doffer is illustrated at 26, and a suitable means for taking off the web is schematically illustrated at 27. The web 28 thus removed from the doffer passes between the customary calender rolls 29 from which it emerges as a sliver 30 which is put up into a suitable coiler head 31 from whence it is delivered to the can 32.

The variable speed transmission mechanism A may be any suitable variable speed power transmission, but best results have been achieved utilizing mechanical variable speed drives of the type provided by ZERO-MAX Industries, Inc. of 2845 Harriett Ave., South, Minneapolis, Minnesota. Such transmissions give stepless variable speed from zero to maximum responsive to movement of a control arm B. The control arm B is illustrated as having connection with a stub shaft 33 which extends through the casing 22 of the variable speed mechanism A for controlling the output speed of the mechanism. The movable control arm B has pivotal connection on its other end as at 34 with a piston rod 35 associated with the double-acting cylinder 36. The fluid operated assembly includes an additional double-acting cylinder 37 positioned in line and in end-to-end

relation therewith. The double-acting cylinder 37 has a piston rod 38 associated therewith which has pivotal connection as at 39 with the frame 21.

The schematic flow diagram of FIG. 2 illustrates two, preferably double-acting, air cylinders 36 and 37 mounted in line, end to end. These cylinders could also be connected to each other in a side-by-side aligned arrangement (not shown). The control valves 40 and 41 have suitable spring returns which, with suitable solenoids de-energized, hold the valves in the position shown in FIG. 2. Thus, the piston rods of respective cylinders are held in a fully retracted position as when the doffer is not being driven and is at rest.

The control contacts 42 and 43 represent any type of electrical or electronic switching device which controls electrical power to the valve solenoids. Such may be manually operated or operated by or in conjunction with any of a variety of available "stop motion" devices available for cards for stopping the mechanism entirely or reducing same to creep speed.

Suitable metering valves, described below, permit the speed of actuation of the cylinders to be controlled by restricting flow of air out of the cylinders by way of exhaust therefrom. In this manner, the position of the control arm B can be slowly shifted to cause a gradual change in the output speed of the variable speed drive mechanism A. The metering valves can be separate items mounted in the air lines, or they can be an integral part of the control valves as illustrated.

In FIGS. 1 and 2 both sets of control contacts 42 and 43 are open, the solenoids of both control valves are de-energized, the piston rods of both air cylinders 36 and 37 are retracted, and the control arm is in such a position as to cause the output shaft of the variable speed drive mechanism A to have no rotation.

In FIG. 3, the control contacts 42 actuating cylinder 37 would have been closed, energizing the solenoid of valve 40. The solenoid would have shifted the valve into the second position allowing air to flow into the opposite end of the cylinder. As the cylinder extends its piston rod 38, it moves the control arm into the position shown in FIG. 3 and holds it there. This is the "slow speed" or "creep speed" position and produces a rotational speed of the output shaft 23 which is approximately 10 percent of the operational rotational speed obtainable. This is approximately $\frac{1}{4}$ of the speed of the input shaft 20.

In FIG. 4, the control contacts 43 for valve 41 would have also been closed, energizing the solenoid for that valve. Valve 41 has operated allowing air to extend the piston rod of cylinder 36. The cylinder 36 gradually moves the control arm B until the arm is stopped by the high speed adjustment screw 44 and holds it there. The high speed adjustment screw is illustrated as being carried by an offset bracket 45 upon the frame 21, but any suitable "stop" would be satisfactory so long as provision is made for adjusting resulting speed. The control arm is now in the "high speed" or operating speed position

tion and produces a rotational speed of the output shaft 23 which lies between the slow speed and the maximum obtainable. It will be observed that the cylinder 37 is serviced through lines 46 and 47, respectively, connected to valve 40, and that each line has a metering valve 46a and 47a, respectively. Cylinder 36 is serviced through lines 48 and 49, each line having respective metering valves 48a and 49a.

As seen from the above description, the operation is dependent on opening and closing of the control contacts 42 and 43. The method of opening and closing these contacts can be as simple as the manual movement of a toggle switch by the machine operator, or as sophisticated as tying the system into safety sensors on the machine with special timing controls to produce any cycle of operation required by any application.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

What is claimed is:

1. For use in a carding machine and the like having means for feeding fibers to a main cylinder and means for doffing fibers from the main cylinder in the form of a web, a drive mechanism controlling the speed of each of said means comprising:

A. a frame;

B. a drive including variable speed mechanism carried by said frame for driving connection to said feeding means and said doffing means for accelerating said feeding means and said doffing to a predetermined creep speed at a predetermined rate for driving same at a predetermined operating speed;

C. a movable control arm controlling the output speed of said variable speed mechanism; and

D. first and second aligned fluid operated cylinder and piston assemblies having cylinders rigidly connected to each other, said first assembly being pivoted with respect to said control arm and said second assembly being pivoted with respect to said frame, for progressively positioning said control arm in a first position responsive to the action of one of said cylinders for achieving said creep speed and in a second position responsive to the action of the other of said cylinders for achieving operating speed;

E. whereby said feeding means and doffing means may be slowly accelerated to creep speed and following servicing of the carding machine to operating speed.

2. The structure set forth in claim 1, wherein said cylinders are double-acting and including, a valve means progressively controlling the actions of said cylinders and adjustable stop means limiting movement of said arm.

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