United States Patent

Gell et al.

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[54] MEANS AND METHOD OF CONTROLLING THE SPEED OF A CIRCULAR KNITTING MACHINE

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[73] Assignee: **The Bently Engineering Company Limited**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **66/56**

[51] **Int. Cl.** **D04b 9/00**

[58] **Field of Search** 66/56, 154; 60/53

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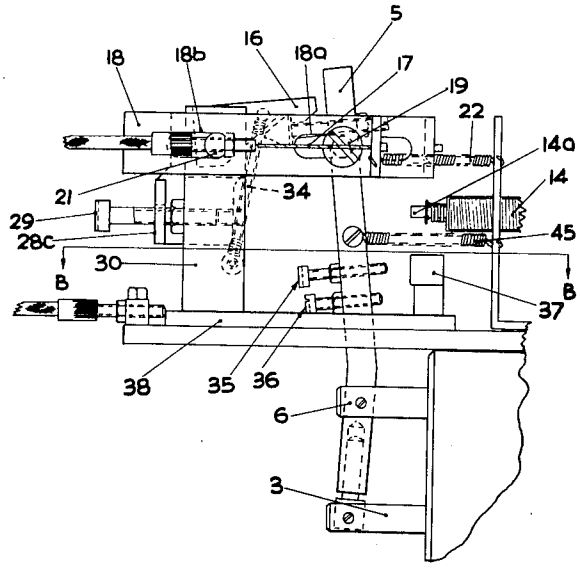
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Attorney—Paul and Paul

[57] **ABSTRACT**

A circular knitting machine is driven at any selected one of a plurality of speeds from a source of power through a variable-speed hydraulic driver of the known pump and motor type (preferably a Carter Gear) which is automatically adjusted to give the selected running speed by control apparatus actuated from the main pattern drum of the machine. The pump is driven at contact speed from the source of power and the control apparatus acts through a relay to vary the pump output and thereby to vary the speed of the motor, the motor being connected to the needle cylinder. The control apparatus comprises a mechanism having a speed control member spring biassed to move from a stop position to vary the pump output, and a limit device adjustable from the pattern drum to provide alternative limits to movement of the control member away from the stop position. The control member is latched in the stop position by a latch which is released by a start button, and provision is made for stopping the motor at the will of an operator and upon functioning of a stop motion, and for a high speed, a low speed, and at least one intermediate speed.

4 Claims, 11 Drawing Figures



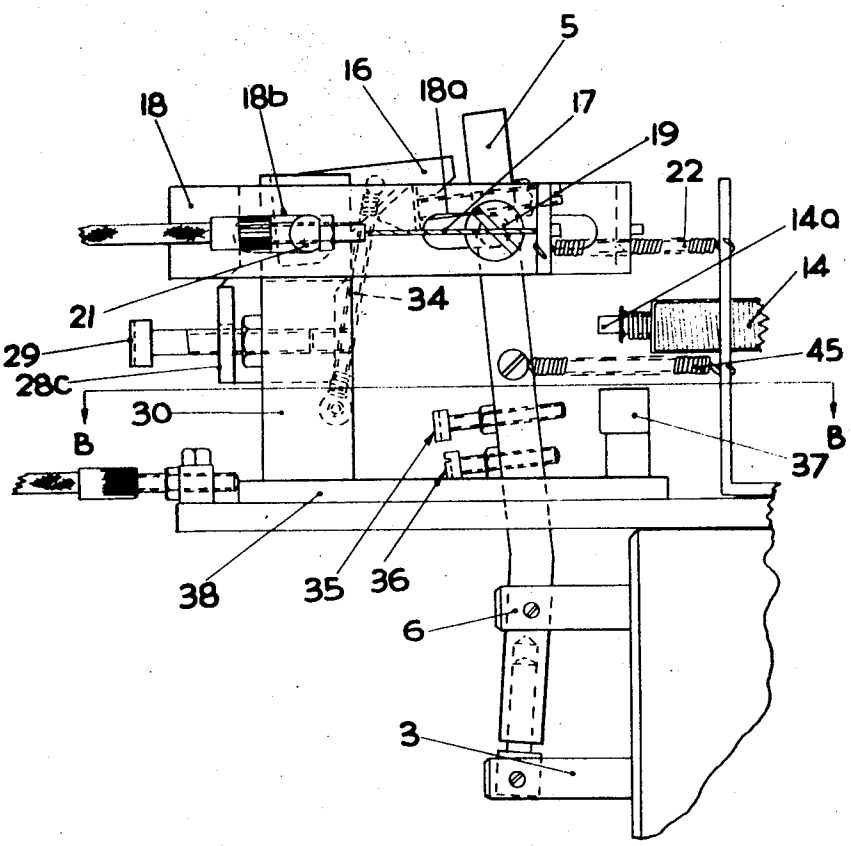


FIG. 1.

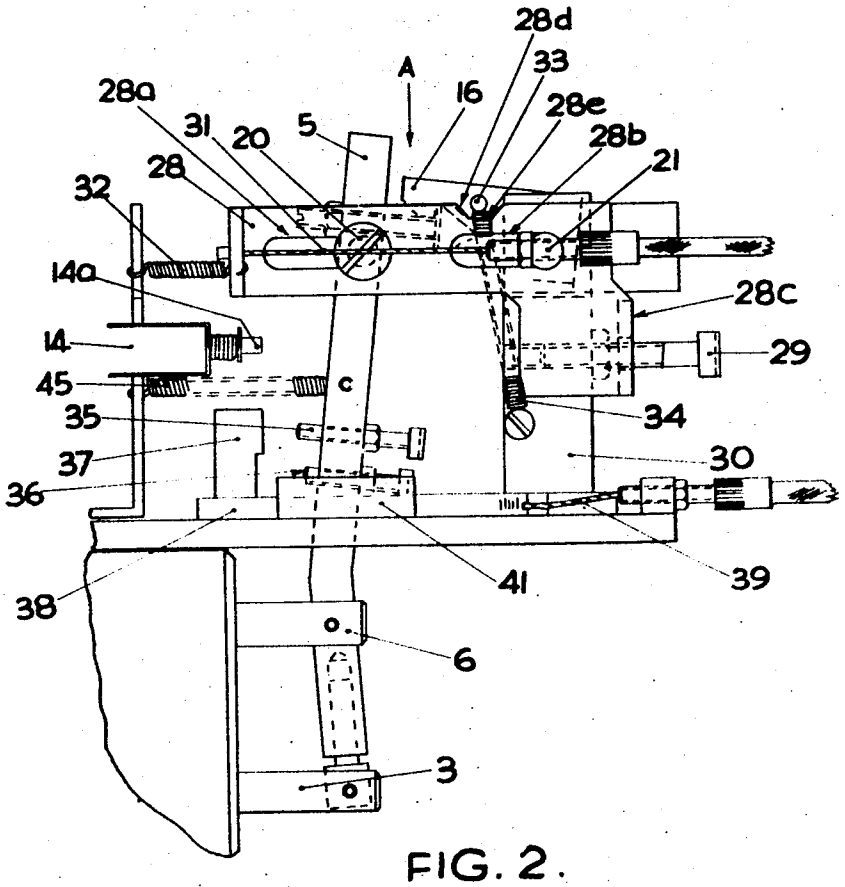

28d
33
A
16
28a
28e
31
20
5
28b
21
28
32
28c
14a
29
14
45
c
34
35
30
37
36
41
39
38
6
3

FIG. 2.

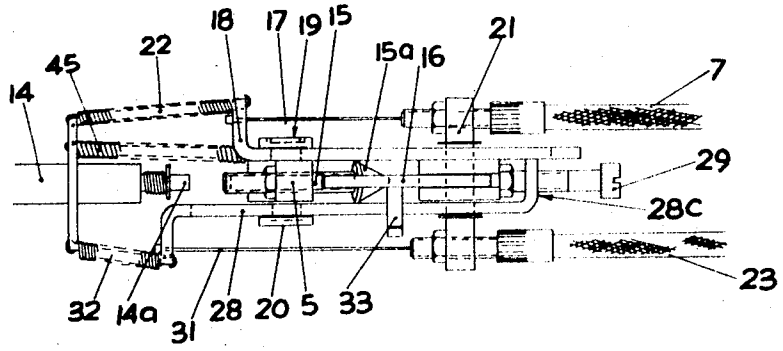

18
17
19
15
22
45
14
15a
16
21
7
29
28c
23
32
14a
31
28
20
5
33

FIG. 3

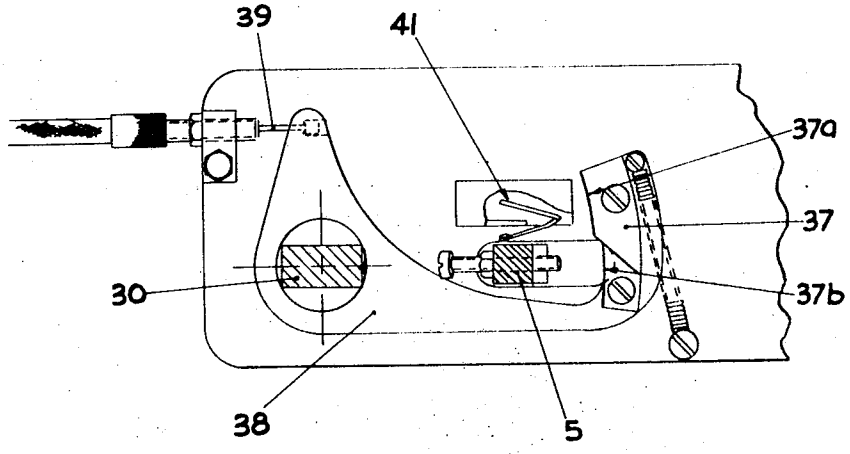

39
41
37a
37
30
37b
38
5

FIG. 4.

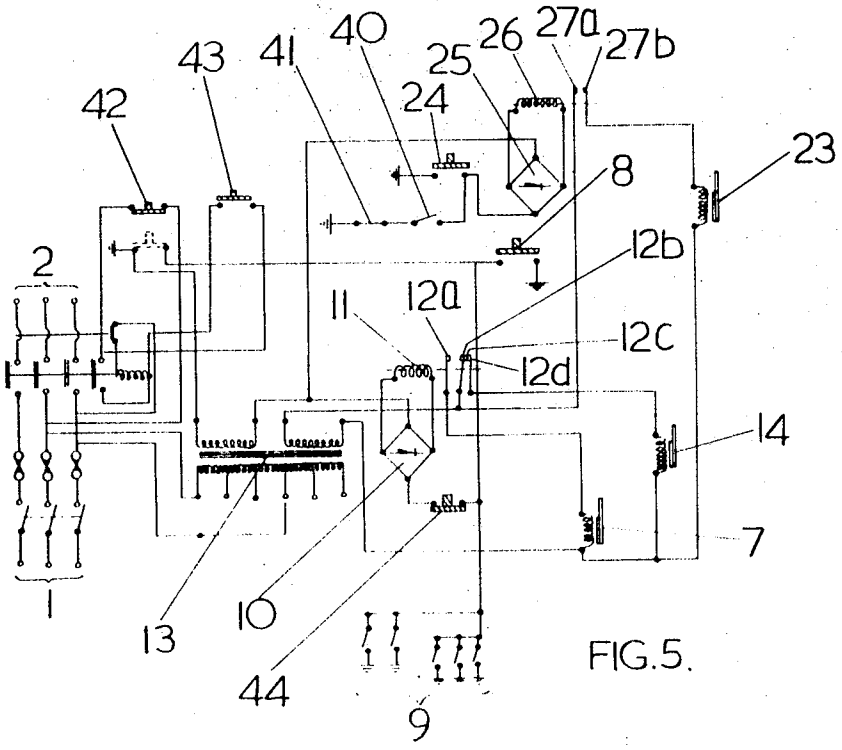


FIG.5.

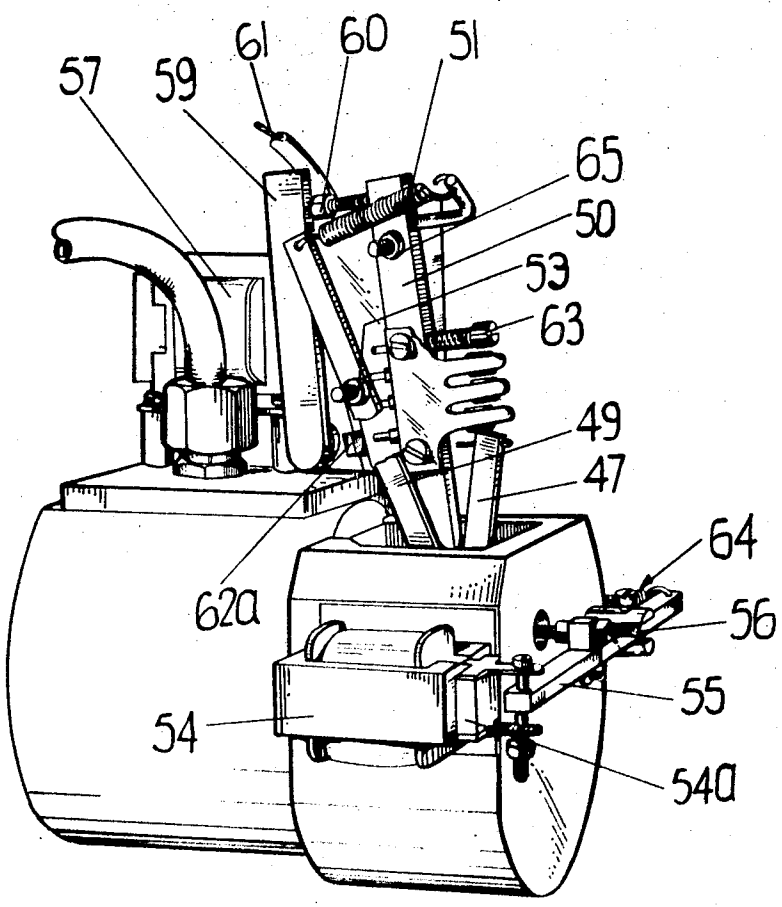


FIG. 6.

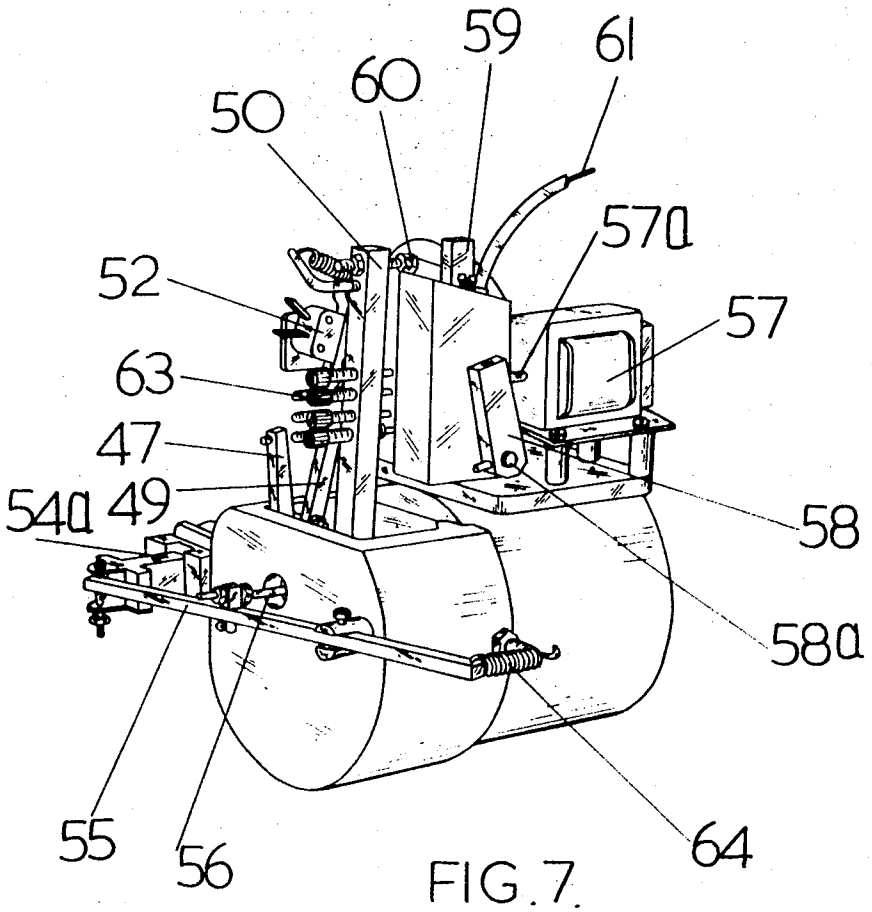


FIG. 7.

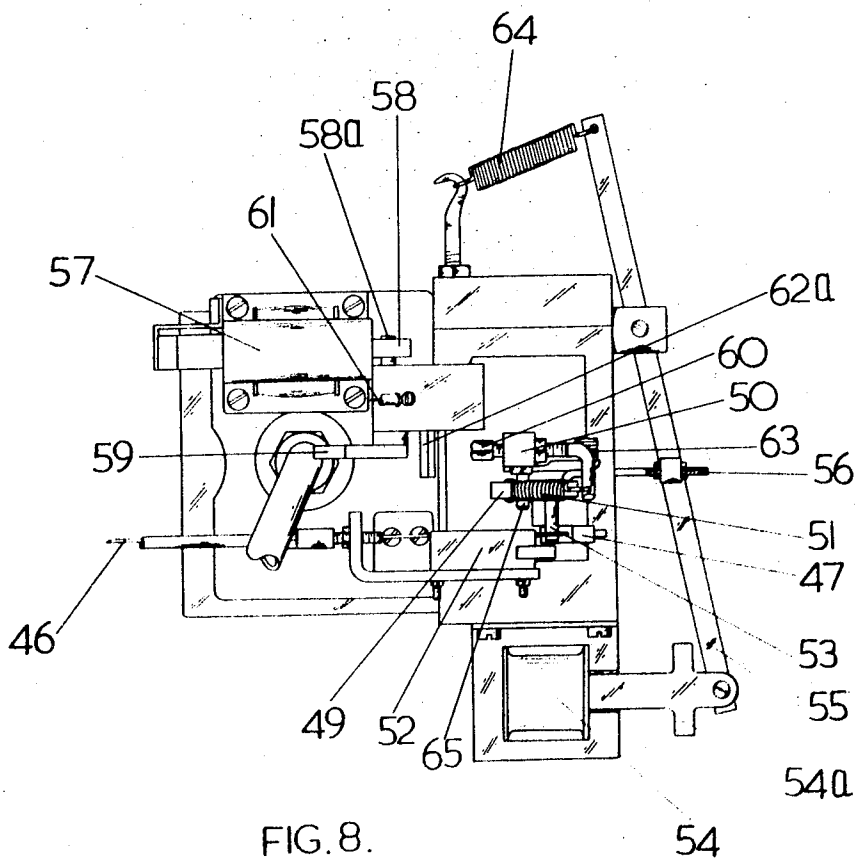


FIG. 8.

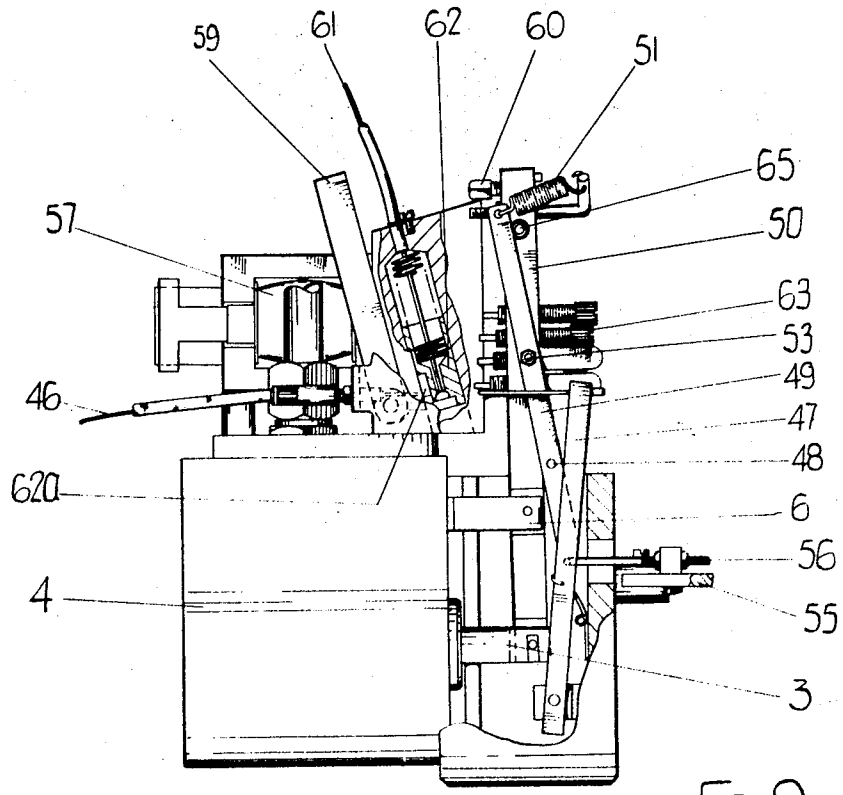


FIG 9.

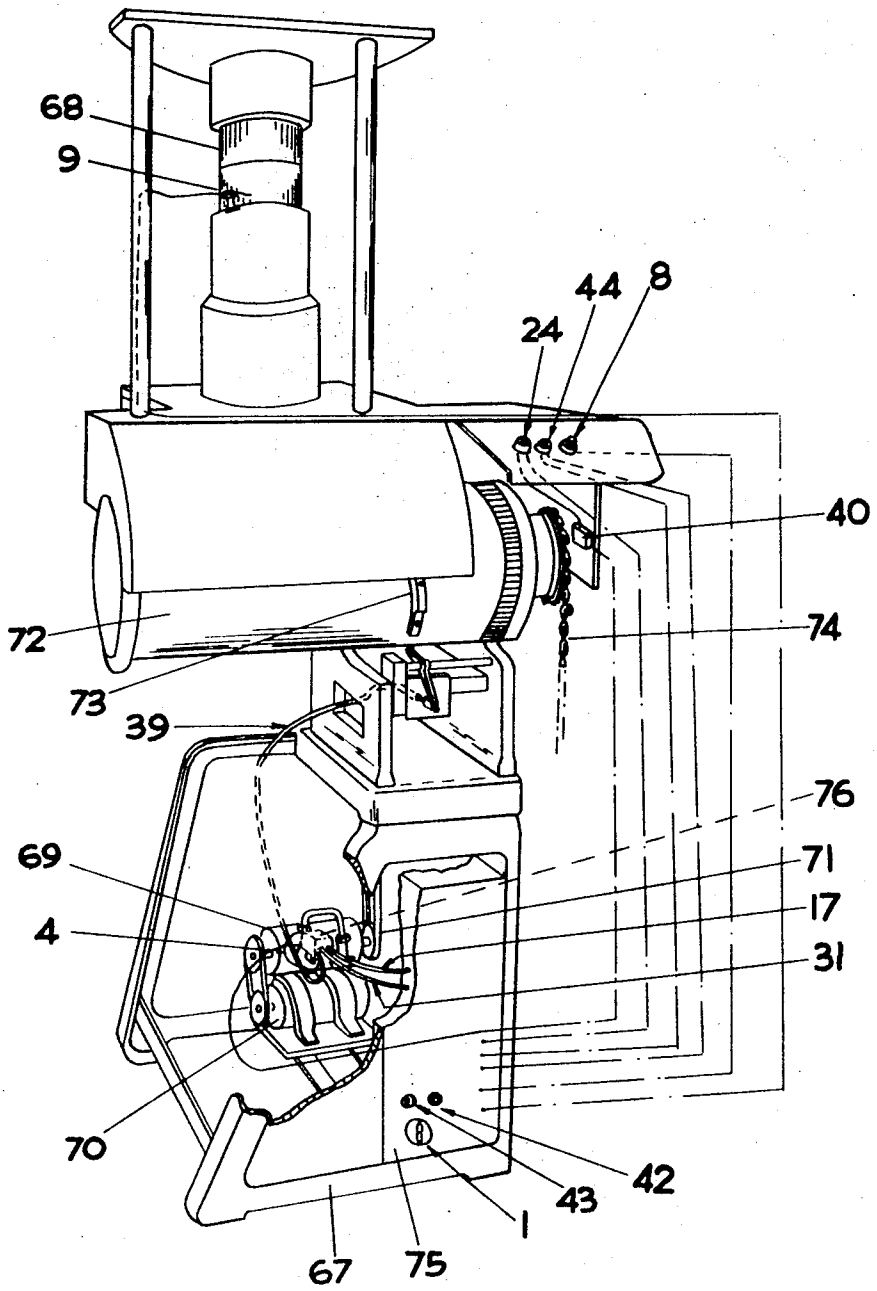


FIG. 10.

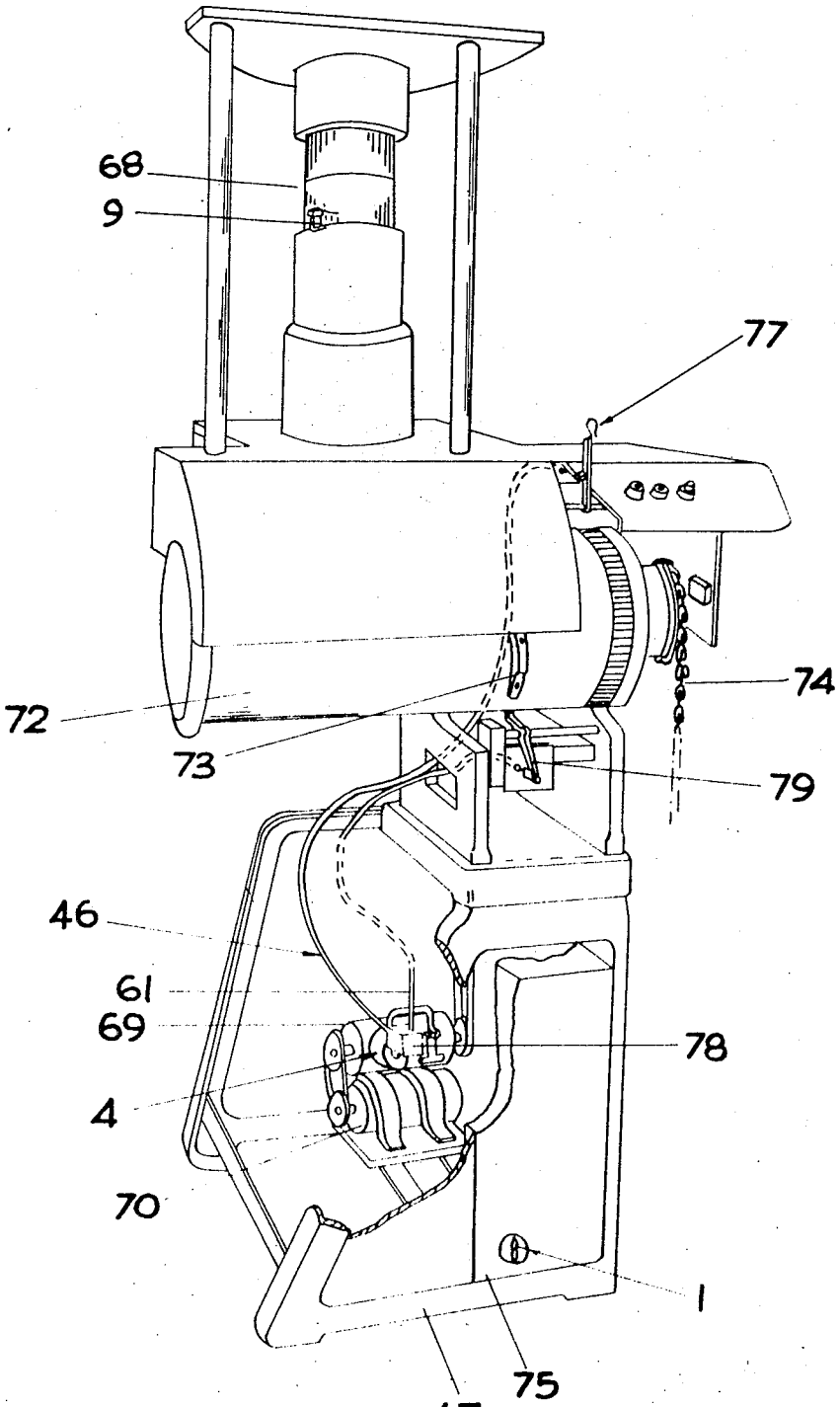


FIG. 11.

MEANS AND METHOD OF CONTROLLING THE SPEED OF A CIRCULAR KNITTING MACHINE

CROSS REFERENCES TO RELATED APPLICATIONS

Reference is made to British Patent application No. 53199/68 of 9th November, 1968, The Bentley Engineering Company Limited, from which priority is claimed.

This invention concerns circular knitting machines provided with a timing control. A timing control is a device, such for example as a timing chain or drum of a patterning chain or drum, which is capable of being pre-set to determine the occurrence and timing of various operations of the machine.

Circular knitting machines are at present driven either from a line shaft, or from individual electric motors, with a flat belt drive to the machine and belt-shifters to shift said belts across a number of independent pulleys each geared to drive the machine at a different speed. This system of drive became complicated when more sophisticated machines were introduced requiring three different speeds and therefore two motors have been used — a two speed motor and a single speed motor. This led to higher costs and more complex electric circuitry for controlling the motors as well as the complexity of having to drive one shaft from two independent motors. All of these systems worked and could drive a machine at a predetermined speed, but if any adjustment to these speeds was required, it was necessary to replace existing pulleys or gears. Further complications can be foreseen by the introduction of even more sophisticated machines, as are at present envisaged, requiring four different driving speeds.

A further disadvantage found in existing machines is that an excessive time-lag occurs between the time a yarn breakage or needle fault initiates operations of a stop motion device and the time when the machine cylinder actually stops rotating. This can cause unnecessary damage to the knitting elements and controls of the machine.

It is one object of this invention to be able to fit a circular knitting machine with a drive unit using only one electric motor and be able to select from any number of predetermined speeds accurately and rapidly.

It is a further object of this invention to be able to alter any or all of these speed settings as easily and quickly as possible. A still further object of this invention is to reduce the time lag between the operation of a fault detector and the actual stopping of the needle cylinder.

While the invention is primarily concerned with circular knitting machines in which the source of power is an independent single-speed electric motor, the invention is also applicable to circular knitting machines in which the source of power is line shafting.

The invention provides in or for a circular knitting machine, the combination of variable speed hydraulic driver of the pump and motor type for driving it from a source of power applied to the pump, and control apparatus for automatically adjusting the hydraulic driver to give any selected one of a plurality of predetermined running speeds as dictated by the timing control. The employment of a variable speed hydraulic driver for transmitting the drive from a source of power to the knitting machine itself permits speed changes to be made rapidly. It also permits the knitting machine to be rapidly brought to a standstill by adjusting the driver to a condition in which no drive is transmitted by it although the drive is applied to it.

The control apparatus preferably provides for (a) bringing the driver to a no-drive condition at the will of an operator and upon functioning of a fault detector, (b) a high speed, (c) a low speed, and (d) at least one intermediate speed. A fault detector is in itself a known device which detects the occurrence of a fault in the functioning of the machine, or in its product, or in a yarn being knitted, and, operating commonly through a device known as a stop motion, causes the machine to be brought to a standstill. The fault may, for example, be a broken yarn, a slub on the yarn running to the needles, a misplaced needle latch, or a press-off of the fabric from one or more of the needles.

According to a feature of the invention the control apparatus comprises a mechanism having a speed control member for the driver movable to and from a no-drive position to vary the output speed of the driver, and a limit device adjustable by the timing control to provide alternative limits of movement of the said member away from the no-drive position and therefore to provide alternative output speeds of the driver. This mechanism may also include a slow speed limit device which, when operative, positions the control member to provide a slow speed. Additionally, a manual control (e.g. comprising a hand lever) may be provided whereby the speed of the machine may be controlled by an operator or attendant. This control may be used to cause the needle cylinder to creep round or to move in small slow steps.

Desirably the control apparatus further includes electrical apparatus which comprises an operator's start and stop controls, a fault detector control operable upon detection of a fault to bring the control member to the no-drive position, and a slow speed control operable by the timing control.

The invention further includes a method of controlling the speed of a circular knitting machine provided with a timing control, which comprises driving the machine through a variable speed hydraulic driver of the pump and motor type from a source of power, and adjusting the driver by power-operated means to give different predetermined output speeds at times dictated by the setting of the timing control. A specific arrangement is as follows:

There is a control lever operating a piston of an hydraulic relay control, movement of which piston influences the output speed of the hydraulic drive unit. The lever operating the piston has an adjustable latch or detent which is engaged and held by a latch lever should a machine stop button or a fault detector on the machine be operated. The machine can then only be started by pressing a start button which operates the latch lever to release the latch and also provides means whereby, while the start button is held down, only slow speed is obtained. Immediately the start button is released the lever is sprung to a higher speed position to select a higher speed. The lever is provided with a number of adjustable stop screws which co-operate with an equal number of stop positions arranged on a slide. Normal selection of the slow speed is made from a signal from the main timing control of the machine and is made to over-ride all other speed selections except a stop signal which must stop the machine. A safety feature of the apparatus is a solenoid which is always energised whilst electric power is supplied to the machine but which, upon failure of this supply, pushes, (by means of a spring) the catch on the control lever into the catch lever, where it will be held until the start button is pressed.

In order that the invention may be better understood reference will now be made to FIGS. 1–5 or the drawings accompanying the Provisional Specification and to FIGS. 6–10 of the accompanying drawings, in which:

FIG. 1 is a side elevation of the control mechanism comprised in the control apparatus;

FIG. 2 is a further elevation thereof, looking from the opposite side;

FIG. 3 is a plan view of the mechanism as shown in FIG. 2, while

FIG. 4 is a sectional plan view of a part of this mechanism, taken on the line B—B in FIG. 1,

FIG. 5 is a schematic diagram illustrating the electrical apparatus comprised in the control apparatus;

FIG. 6 is a perspective view of an alternative form of mechanism according to the invention;

FIG. 7 is a further perspective view, looking in a different direction;

FIG. 8 is a plan view of the apparatus as shown in FIG. 6;

FIG. 9 is an elevation, partly in section, looking in the direction of the arrow IX in FIG. 8;

FIG. 10 is a view illustrating the incorporation of the apparatus of FIGS. 1–5 in a circular knitting machine;

FIG. 11 is a similar view, illustrating the incorporation of the apparatus of FIGS. 6–9.

The circular knitting machine to which the apparatus shown in the accompanying drawings is to be applied, is driven from a source of power through an infinitely variable hydraulic driver of the pump and motor type, the pump input shaft of which is coupled to the source of the power and the motor output shaft of which is coupled to the machine proper. Driving units of this type are known so the driver is not illustrated. It consists of a positive displacement multi-piston pump the output of which is applied to a multi-piston motor, the effective stroke of the pump pistons being variable by an appropriate control. A suitable unit (and hydraulic relay) is manufactured by Carter Gears Limited, the unit being known as the "F type Carter Gear".

The adjustment of the stroke of the pump pistons to vary the output speed or to bring the motor to a standstill (the no-drive condition aforesaid) is preferably effected through a relay, which may be electrical but is preferably an hydraulic relay which derives its pressure fluid from the driver, and consists of an actuating piston which is movable to adjust the stroke of the pump pistons under the control of a valve having an exposed part to which the required movement may be applied. Such an hydraulic relay is indicated at **4** in FIG. **1**, and its piston plunger at **3**. This plunger **3** is movable to the right in FIG. **1** to reduce the output speed and eventually to stop the unit (and by continuing to move the plunger further to the right the direction of rotation of the unit may be reversed) and to the left to start the unit and to increase speed.

The main piston plunger **3** is moved by a speed control lever **5** which is pivoted to the valve rod **6** of the actuating valve. The arrangement is such that upon movement of rod **6** and its valve to either side of a neutral or no-flow position, hydraulic fluid is admitted to one side or the other of the main piston so that the latter moves in the opposite direction to that in which the actuating valve rod **6** has been moved. Because of the mechanical connection between valve rod **6** and piston plunger **3**, by the lower end of lever **5**, this results in the actuating valve being re-set in the neutral position. The lever **5** is movable towards the stop (or no-drive) position by the plunger **14***a* of a solenoid **14** (see also FIG. **5**) which plunger is ejected by a spring when the solenoid is de-energized. As hereinafter appears solenoid **14** is a fail safe device which is de-energized upon a power failure. Movement towards the stop position is effected against the action of spring **45**.

The lever **5** carries a screw **15** having a conical head **15***a*, and when the lever reachs the stop position this conical head is engaged by a latch or detent **16** which retains the lever in that position until the latch is released. This latch **16** is pivoted in a cleft in the top end of an upright **30** by means of a cable post **21**, and is urged towards the engaged position by a spring **34**.

Lever **5** also movable towards the stop position by a slide **18** which is connected by a cable **17** to the plunger of a stop solenoid **7** (see also FIG. **5**) hereinafter referred to. When stop solenoid **7** is energized its plunger pulls cable **17** and causes the slide **18** to be moved towards the left in FIG. **1** against the action of a spring **22**.

Slide **18** is formed with two longitudinal slots **18***a*, and **18***b*. Slot **18***a* is transfixed by a shoulder screw **19** screwed into one side of lever **5**, while slot **18***b* is transfixed by one protruding end of the cable post **21**. On movement of slide **18** to the left in FIG. **1** the right hand end of slot **18***a* makes contact with the screw **19** and moves the lever **5** to the stop position in which it is latched by latch **16**. Upon solenoid **7** being deenergized the slide **18** can move to the right in FIG. **1** leaving the lever **5** still latched in the stop position.

At the opposite side of the lever **5** and the upright **30** from the slide **18** there is a second slide **28**, also formed with longitudinal slots **28***a*, **28***b* which are transfixed respectively by a headed screw **20** protruding from lever **5** and the other protruding end of the cable post **21**. The slide **28** is movable to the left in FIG. **1** and to the right in FIGS. **2** and **3** against the action of spring **32** by means of a cable **31** connected to the plunger of a start solenoid **23** (FIG. **5**) so that when the start solenoid is energised slide **28** is moved to the right in FIGS. **2** and **3**. The upper edge of slide **28** has a notch **28***e* provided with an inclined flank **28***d*. In this movement to the right flank **28***d* lifts a peg **33** on the latch **16** and disengages the latter from the head **15***a* of the screw **15**, thus releasing lever **5** for movement from the stop position under the influence of spring **45**. The movement of slide **28** to the right is terminated when an end face **28***c* on it comes in contact with the head of a slow running adjustment screw **29**. The movement of lever **5**, by slide **28** from the stop position is limited by engagement of the headed screw **20** with the left hand end (FIG. **2**) of slot **28***a* and therefore the setting of screw **29** determines the slow running speed of the machine.

When the start solenoid **23** is de-energized spring **32** pulls the slide **28** to the left, FIGS. **2** and **3**, into the idle position shown. As slide **28** moves, lever **5** is moved by spring **45** towards the running positions unless solenoid **14** is de-energized and its plunger is in the projected position.

The extent of movement of lever **5** away from the stop position is selectively determined (to give a choice of high speeds) by the setting of the timing control of the machine. The lever carries two adjustable screws **35**, **36** disposed to engage with faces **37***a*, **37***b* respectively of a cam **37** carried by a lever **38** which latter is movable, by a cable **39** from the main control drum of the machine, to bring either of these faces into operative position.

It will therefore be understood that the mechanism so far described provides, when suitably actuated, for stopping and starting the driver, a slow running speed, and a choice between two alternative higher speeds. Further speeds could obviously be catered for.

Turning now to the electrical apparatus shown in FIG. **5** the main supply for a single speed electric motor is shown at **1**, the motor being connected to terminals **2**. The motor drives the driver through a V belt at a speed as high as, or higher than, the maximum machine speed required. Push buttons **42**, **43** are stop and start buttons for stopping and starting the electric motor. However, it is to be understood that this motor normally runs continuously, the stopping and starting of the circular knitting machine and its speed changes being effected solely by control of the variable speed hydraulic driver. To stop the machine the solenoid **7** is energised, either by pressing stop button **8** or by the operation of a fault detector switch **9**, thereby earthing the circuit through the rectifier **10** and de-energizing relay **11** and causing contacts **12***a*, **12***b* to be closed so completing the circuit from transformer **13** through contacts **12***b*, **12***a* to solenoid **7** and back to the transformer. As already explained energising solenoid **7** results in the slide **18** being pulled towards the stop position.

Simultaneously the contacts **12***c*, **12***d* of relay **11** are parted thereby breaking the circuit to the safety stop solenoid **14** which is thus de-energized As already explained the plunger **14***a* of this solenoid **14** is thereupon projected by a spring and forces lever **5** into the stop position in which it is latched by the catch **16**. It may here be pointed out that the solenoid **14** is a fail safe device, for should a power failure occur its resultant de-energisation results in the lever **5** being moved to the stop position in which that lever is retained by catch **16** even if the power supply is reestablished. The machine cannot be restarted until both the motor start button **43** and then the machine start button **24** have been operated.

Solenoid **7** is de-energized either by releasing the stop button **8** or re-setting the said detector switch **9**. It may here be mentioned that switch **9** is representative of a plurality of such switches in a plurality of fault detectors for detecting different faults.

To start the machine the start solenoid **23** is energized by pressing the start button **24** which earths the supply from transformer **13** to the rectifier **25** thereby de-energizing relay **26** and causing contacts **27***a*, **27***b* to close. This permits current to flow from the transformer **13** through contacts **27***a*, **27***b*, the solenoid **23**, and back to the transformer. Slide **28** and lever **5** are thus moved to the slow speed positions and the machine is started at slow speed and continues to run at slow speed while the start button **24** is held pressed.

When the start button 24 released, solenoid 23 is de-energized thereby releasing slide 28 for movement by spring 32 towards the idle position. Lever 5 will also move towards the position determined by cam face 37*a*, or 37*b* unless at this time the solenoid 7 is energised or solenoid 14 is de-energized as already described.

During the operation of the machine it may be necessary to select slow speed several times, for example, in order that the main control drum, not shown, or other control mechanism may be racked round and specifically to permit the cam 37 to be adjusted to provide for a different high speed. To do this the micro-switch 40 is closed at the appropriate time and for the appropriate period by the timing control. Closure of the micro-switch 40 has the same effect as pressing the start button 24, and results in the slide 28 and lever 5 being moved to the slow speed position. When the micro-switch is re-opened these parts move towards the high speed position.

If the stop button 8 is pressed or if fault detector switch 9 is closed during the time that the slow speed is being selected from the timing control, then because peg 33 cannot drop into the recess 28*e* the machine will only remain stopped while the stop button 8 is held down, or switch 9 remains closed, slow speed being immediately re-selected upon release of the stop button or opening of switch 9. To avoid this a further micro-switch 41 FIGS. 4 and 5 is connected in series with micro-switch 40. This micro-switch 41 is normally closed, but on movement of lever 5 to the stop position the micro-switch is opened by this lever as illustrated in FIG. 4. This breaks the earthing circuit created by closing micr-switch 40 and de-energizes solenoid 23, thus allowing slide 28 to return to its idle position and permitting peg 33 to drop into recess 28*e* so that catch lever 16 latches the lever 5 in the stop position.

44 is a push button which if pressed will break the circuit to the stop push button 8 and to the fault detector switch 9 so that the machine can be operated whilst button 44 is held pressed without first setting all the fault detectors, as for example, when first knitting on fabric.

FIG. 5 is schematic in the sense that it illustrates the control of the drive unit but does not show the electrical supply connections for fault detector indicating light, oilers and inspection lights, such as are commonly provided in circular knitting machines.

FIGS. 6–9 illustrate an alternative form of the control mechanism. This alternative form has certain advantages in that it is more easily adaptable to a greater number of speed changes, it requires fewer solenoids of less power, and incorporates a hand control for the gradual increase of speed from zero. The latter is simply a utilization of one of the facilities available with hydraulic driving mechanisms of the type previously referred to.

To start the machine (after first starting the electric motor) a hand speed control lever (see 77, FIG. 11) on the front of the machine must be operated to pull the cable 46. This will gradually increase the machine speed from zero by pulling forward the start lever 47 which latter engages a peg 48, FIG. 9, on the intermediate stop lever 49 which in turn pulls forward the main speed control lever 50 by means of spring 51 thereby moving plunger 3 of the hydraulic relay 4 from the stop position. Lever 49 is connected by a link 56 to a lever 55 which is therefore rocked to push the core 54*a* (FIG. 8) into the solenoid 54. As the lever 49 reaches the end of its anti-clockwise travel, FIG. 9, it operates the micro-switch 52 (FIG. 8) by means of peg 53. This switch energizes the solenoid 54 to retain its core 54*a* which has previously been pushed in by lever 55. The solenoid therefore only requires sufficient power to hold its core 54*a* and associated levers in the drive position.

The hand lever 77 affords the important faculty of being able to turn the machine under power at any desired speed up to the speed for which the machine is programmed. This is important when trying to detect a fault.

To change speed automatically, the first operation is always to select a low speed by closing a micro-switch operation from the main timing chain of the machine which energises a solenoid 57. (See FIG. 7) This pushes out peg 57*a* to move the lever 58 which is secured to a rock shaft 58*a*. Also secured to the rock shaft is a low speed lever 59 which also moves and engages and pushes against an adjusting screw 60 in the main speed control lever 50 as shown in FIG. 6, thereby positioning lever 60 and plunger 3 in the low speed position. Having selected low speed, any one of a number of higher speeds can be selected automatically in the following way. A lever operated by different height cams on the main control drum of the machine (see lever 79, cams 73, and drum 72, FIG. 11) operates cable 61 which, as shown in FIG. 9, is connected to a spring loaded piston 62 having an attached stop plate 62*a* which is pulled up to any selected one of a number of positions. Each of the positions of the stop plate 62*a* is in register with one or other screw of a group of adjustment screws 63 which are adjusted to different extents, so that by appropriate positioning the stop plate 62*a* the speed control lever 50 may be located in various positions. The stop plate 62*a* is contacted by one of the speed adjustment screws 63 upon opening of the micro-switch by the main timing chain which releases the lever 59, thus cancelling the low speed selection.

To stop the machine by any one of the known methods of fault detectors or by the stop button the solenoid 54 is de-energized thereby releasing its core 54*a* and by the action of spring 64 the core-operating lever 55 pulls the link 65 which immediately pulls the intermediate stop lever 49 which pushes the main speed control lever 50 to its rest position by means of pin 65. These operations also result in the electric motor being stopped.

The machine will not restart except by pressing the start button to start the electric motor and then by pulling the hand control lever. If the low speed solenoid 57 was energised before the machine stopped no higher speed will be engageable upon restarting the machine and this solenoid will immediately become re-energized by pressing the start button.

The solenoid 54 acts as a safety device, in that any continued operation of a fault detector keeps the solenoid 54 de-energized and the machine can only be turned by operating the hand speed control lever which will be sprung back to stop the machine when it is released. If a failure of electrical supply to the machine occurs solenoid 54 will become de-energised and the intermediate stop lever 49 will be sprung out of operative position thereby opening the micro-switch 52. Not until the micro-switch 52 is again closed by pulling the hand speed control lever will the solenoid 54 become re-energized to retain the main speed control lever 50 in an operative position. The machine will not therefore re-start automatically simply by resotring the electrical supply.

FIG. 10 illustrates a circular knitting machine (shown, by way of example, as an opposed needle cylinder machine) incorporating the invention. This Figure shows the stand or pedestal 67, needle cylinders 68, hydraulic driver 69, constant-speed electric motor 70, driving connections 71, main pattern drum 72, cams 73 thereon which control the position of cam 37 through lever 79 and cable 39, timing chain 74, and cabinet 75 containing the main parts of the electrical apparatus shown in FIG. 5. The mechanism according to FIGS. 1–4 is indicated generally at 76.

FIG. 11 similarly illustrates a machine incorporating, at 78, the mechanism of FIGS. 6–9. The hand speed control lever is shown at 77 at the front of the machine.

It will be understood that, in either arrangement, the driver 69 may be arranged to drive the needle cylinder or cylinders 9 unidirectionally in the case of a machine which does not reciprocate, but in the case of a machine which periodically goes into reciprocatory knitting (as for example in knitting heel and/or toe pouches) the drive for reciprocation may be transmitted through the conventional quadrant mechanism.

We claim

1. A knitting machine having in combination a variable delivery hydraulic pump of the type adapted for having drive connection with a source of power and to have a constant input speed, a motor having drive connection with said pump and with the knitting machine for driving the latter, a control

member operably connected to said pump and adapted for movement to and from machine-starting, stopping and running positions, a manual stop control and a timing stop control operably connected to said control member for moving the latter to its machine-stopping position, releasable detent means for releasably holding said control member in its machine-stopping position, a manual start control and a timing start control operably associated with said detent means for releasing the latter from holding said control member and for moving the latter to a low-speed position, spring means biassing said control member towards a high-speed position, adjustable stop means for locating said control member in said low and high speed positions and in an intermediate speed position, and a timing speed control for automatically changing control between said adjustable stop means for the high and intermediate positions.

2. A machine as claimed in claim 1 having a first solenoid arranged for moving said control member to a machine-starting position, a second solenoid arranged for moving said control member to a machine-stopping position, and a third solenoid arranged for permitting, when energized, movement of said control member to its high speed position and preventing such movement when de-energized.

3. A knitting machine having in combination, a variable speed hydraulic driver of the type comprising a hydraulic pump adapted for having drive connection with a source of power and for permitting variable delivery adjustments of it while maintaining its input speed constant, a motor having drive connection with said pump. and the knitting machine for driving the latter, control mechanism including a control member operably connected to said pump for effecting the latter's variable adjustments so that the motor drive is thereby controlled for starting and stopping the knitting machine and for running the latter at variable speeds, operating members operably connected to said control mechanism to provide that said starting and stopping of the knitting machine and said running of the latter at said variable speeds, occur at required times, and having a manually adjustable operating member operably associated with said control mechanism for starting the machine and increasing its speed at will of an operator, and a solenoid and associated mechanism operable under control of a limit operation of said adjustable operating member for maintaining the machine running and permitting release of the adjustable operating member.

4. A knitting machine having in combination, a variable speed hydraulic driver of the type comprising a hydraulic pump adapted for having drive connection with a source of power and for permitting variable delivery adjustments of it while maintaining its input speed constant, a motor having drive connection with said pump and the knitting machine for driving the latter, control mechanism including a control member operably connected to said pump for effecting the latter's variable adjustments so that the motor drive is thereby controlled for starting and stopping the knitting machine and for running the latter at variable speeds, operating members operably connected to said control mechanism to provide that said starting and stopping of the knitting machine and said running of the latter at said variable speeds, occur at required times, and having a manually adjustable operating member arranged for moving said control member to start the machine and increase its speed, a first solenoid and associated mechanism arranged for the purpose of releasably holding said control member in its increased speed position, said first solenoid being energizable for said purpose by limit operation of said manually adjustable operating member, fault-detecting means and a stop control arranged to de-energize said first solenoid, for stopping the machine, and a second solenoid and associated mechanism arranged for moving said control member to reduce the machine's speed.

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