

INTERNET INLINE CONTROL APPARATUS FOR KNITTING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to an inline control apparatus that employs
5 Internet to control knitting machine and particularly a control
apparatus that uses Internet to monitor knitting machines utilization
status at user sites and perform remote control function.

Conventionally, knitting machine manufacturers produce the
knitting machines and ship to customers or users site for installation.
10 Users are responsible for knitting machine operation to fabricate
fabrics or other products desired. Users generally also take care of
routine machine maintenance and trouble shooting. However when
there is serious machine malfunction or breakdown, producers will
be requested to dispatch skilled and experienced people for doing
15 onsite repairs and maintenance to minimize users' operation
interruption. When the machines are installed at remote locations or
overseas, onsite visit of producer's people could become difficult to
arrange or could cause delay due to travel and transportation
problems. This could cause a prolonged machine outage and result
20 in great loss to users.

In order to remedy this problem, some knitting machine
manufacturers have used Internet to link the users at remote
locations to get machine operation status, and to advise users regard
the maintenance and adjustment issues. Onsite visit for repairs and
25 maintenance will be arranged only at the critical and necessary

condition. Although this approach may resolve a lot of communication problem between the manufacturers and users, it still cannot directly control or adjust the knitting machines through the Internet. Users have to do most of the repairs and adjustment
5 work under the direction of manufacturers.

Moreover, the Internet linking knitting machines and peripheral devices have specific station identification number (ID number). In the event of the peripheral device malfunction or disorder, the peripheral devices connected to other stations cannot be switched
10 for backup operation due to control software cannot recognize different ID number. This could result in prolonged machine outage and cause serious damage to the users.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an Internet
15 inline control method for knitting manufacturers to directly monitor and adjust user's knitting machines and peripheral devices installed at remote locations so that user's problems may be fixed rapidly, and the peripheral devices installed at every station may be mutually backup or interchanged to effectively resolve the machine
20 malfunction or outage problems.

In order to achieve aforesaid object, the Internet inline control apparatus of this invention includes a producer computer processor, an user computer processor, an intelligent communication unit, a human machine interface, a control unit and a peripheral device.
25 Through Internet, this apparatus enables the producer to monitor

and directly adjust knitting machines installed at the remote locations of the user site.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, as well as its many advantages, may be further understood by the following detailed description and drawings.

FIG. 1 is a process flow of an embodiment of this invention.

FIG. 2 is a process flow of another embodiment of this invention

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 for an embodiment of this invention, the Internet inline control apparatus according to this invention includes a producer computer processor 1, an user computer processor 2 linked to the producer computer processor 1 through Internet, an intelligent communication unit 3 (ICB900, 901), a human machine interface 4 linked to the intelligent communication unit 3, a control unit (PLC) 5, a roller 6 and an inverter 7 and other knitting machine peripheral devices 8 linked to the control unit 5. The apparatus uses a Recommended Standard-485/232 (RS-485/RS-232) converter as a communication interface to link to Internet so that knitting machine producer may monitor utilization status of the knitting machines and perform remote control and adjustment desired.

The producer computer processor 1 is the computer processor used by the knitting machine producer, and may be a desk top computer, a notebook computer, a handheld computer, or the like. The producer computer processor 1 is installed at the office or plant of the knitting machine producer and links to Internet through a

modem 11.

The user computer processor 2 is the computer processor used by knitting machine user, and may be a desk top computer, a notebook computer, a handheld computer, or the like. The user computer
5 processor 2 is installed at the plant of the user site where the knitting machines are installed and links to Internet through a modem 21 for communicating with the producer computer processor 1 for remote control purpose.

The intelligent communication unit 3 uses a first interface element
10 31 formed by the RS-485/RS-232 converter to link to the user computer processor 2 for serving as a data communication control center for the computer processor 2 and its peripheral devices. The intelligent communication unit 3 includes a setting unit (not shown in the figure) which has finger activating switches for setting station
15 identification number of the producer or user thereby for the computer processor 1 and 2 to monitor operation status of every unit.

The human machine interface 4 uses a second interface element
41 formed by the RS-485/RS-232 converter to link to the intelligent
20 communication unit 3. Operation instructions may be entered at the face panel of the human machine interface 4 and transmitted through the intelligent communication unit 3 to every connecting unit to perform function desired.

The control unit 5 is a procedure language control (PLC) software
25 which links to the intelligent communication unit 3 through a third

interface element 51 formed by the RS-485/RS-232 converter. The control unit 5 receives the instructions transferred from the intelligent communication unit 3 and controls the operation of every unit connected to the control unit 5, or transmits operation status of every unit to the computer processor 1 or 2 through the intelligent communication unit 3 so that producer or user will be informed of the operation status of every unit.

The roller 6 is a roller used in the knitting machine and links to the control unit 5 through a fourth interface element 61 formed by the RS-485/RS-232 converter to receive control of the control unit 5, or transmit operation status to the control unit 5.

The Inverter 7 is an inversion unit of the knitting machine which uses a fourth interface element 61 formed by the RS-485/RS-232 to link to the control unit 5 for receiving control therefrom or transmitting operation status to the control unit 5.

The peripheral devices 8 of the knitting machine include, but not limited to, oil injector, driving motor of the knitting machine, signal detectors, or the like. They also link to the control unit 5 through the fourth interface element 61 for receiving control therefrom or transmitting operation status to the control unit 5.

When in use, users enter instructions through the human machine interface 4, the intelligent communication unit 3 receives the instructions and issues commands to the control unit 5 which in turn controls the operation of the roller 6 and inverter 7 and other peripheral devices 8. The operation and control status of the roller 6

and inverter 7 and other peripheral devices 8 will also be transmitted through the control unit 5 to the intelligent communication unit 3 and to the user computer processor 2 for displaying on the display screen.

5 When the producer wants to know the utilization status of the knitting machines at user sites, the producer may access Internet through the producer computer processor 1 and modem 11 and link to the user computer processor 2 for getting the operation and control status. In the event of machine malfunction or disorder
10 happens, the producer may issue commands directly from the computer processor 1 to adjust or correct the knitting machines to a desired condition.

For instance, if the producer detects that motor rotation speed of user's knitting machine is wrong, the producer may issue
15 adjustment or correction commands directly from its own computer processor 1 and transmits the commands through the intelligent communication unit 3 to the control unit 5 for making necessary correction or adjustment of the motor rotation speed in the inverter
7.

20 In the event that user's knitting machines have operational problems, user may log on Internet through user computer processor 2 and modem 21, and transmit the problems related data to the producer. The producer may figure out the solution and inform the user through the Internet for the user to fix the problems.
25 Hence problem reporting and resolution cycle may be greatly

shortened thereby to reduce machine down time. This approach may be adapted to users located in the country or abroad equally well.

Referring to FIG. 2 for another embodiment of this invention
5 which includes a plurality of intelligent communication units 3. Each intelligent communication unit 3 has an assigned station identification number (ID number) such as 001, 002, 003, 004 or the like. And devices at each station has an assigned serial number (SR number), such as the control unit 5 has a SR number F1, the
10 human machine interface 4 has a SR number F2, the roller 6 numbered F3, the Inverter 7 numbered F4, peripheral device 8 numbered F5, and the like.

Once all the ID and SR numbers are assigned and input into the computer, user or producer can enter the ID or SR number to get the
15 machine operation status. For instance, enter ID 001 and SR F1, the operation status of knitting machine 001 and control unit F1 will be shown on the computer processor 1 or 2. Hence producer or user can take prompt action to adjust or correct any abnormal condition timely.

20 Furthermore, as the serial number assignment for each unit at every station is same, in the event that station 002, 003 or 004 are not being used, and the control unit F1 at the station 001 is malfunction or broken down, the F1 unit at the station 002 (or 003, 004) may be disconnected to replace the damaged F1 unit at the 001
25 station for backup operation, while the damaged F1 of the station

001 may be removed for repair. As a result, machine down time may be minimized. Such mutually backup function and capability can greatly improve productivity.

5 In addition to enable the producer to control and adjust machines installed at user sites, this invention also enables users to control the knitting machine operation installed at remote sites. As a result, it can save a lot of troubles and inconveniences that might otherwise happen to the producers and users.

10

15

20

25



What is claimed is:

1. An Internet inline control apparatus for a knitting machine,
comprising:
 - a first computer processor;
 - 5 a second computer processor linked remotely to the first
computer processor through Internet;
 - a least one intelligent communication unit linked to the
second computer processor through a first interface element to
serve as data communication center for the first and second
10 computer processor and every device;
 - at least one human machine interface linked to the intelligent
communication unit through a second interface element for
entering instructions;
 - at least one control unit linked to the intelligent
15 communication unit through a third interface element; and
 - at least one peripheral device linked to the control unit
through a fourth interface element;
 - wherein the apparatus enables the knitting machine producer
to monitor utilization status of the knitting machine for remote
20 control and adjustment through Internet.
2. The Internet inline control apparatus of claim 1, wherein the
first computer processor is a computer processor for the producer or
an user.
3. The Internet inline control apparatus of claim 1, wherein the
25 second computer processor is a computer processor for an user.



4. The Internet inline control apparatus of claim 1, wherein the first, second, third and fourth interface element are formed by RS-485/RS-232 converter.

5 5. The Internet inline control apparatus of claim 1, wherein the first and second computer processor respectively link to a modem for linking to Internet or another computer processor.

6. The Internet inline control apparatus of claim 1, wherein the intelligent communication unit has a setting unit for assigning workstation identification number.

10 7. The Internet inline control apparatus of claim 6, wherein the setting unit is a finger activating switch.

8. The Internet inline control apparatus of claim 1, wherein the control unit is a procedure language control software.

15 9. The Internet inline control apparatus of claim 1, wherein the peripheral device is a roller, an inverter, an oil injector, a driving motor of the knitting machine, or a signal detector.

10. The Internet inline control apparatus of claim 1, wherein the unit of the same type has the same serial number for mutually replacement use.

20

25