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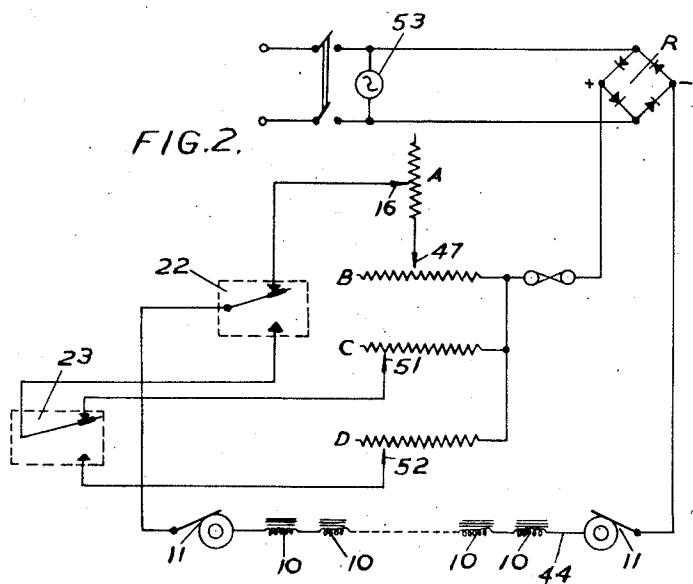
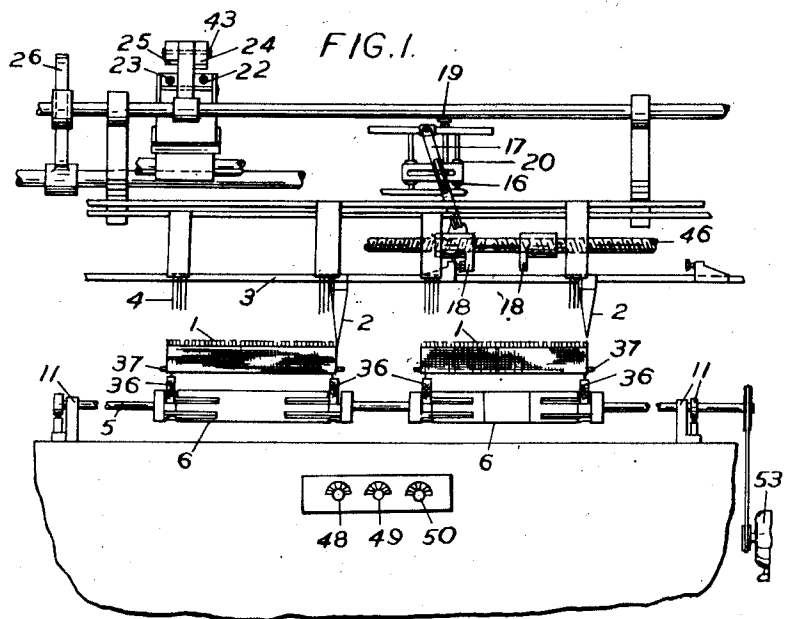
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2,655,801

KNITTING AND OTHER TEXTILE MACHINE

Filed Aug. 24, 1949

3 Sheets-Sheet 1



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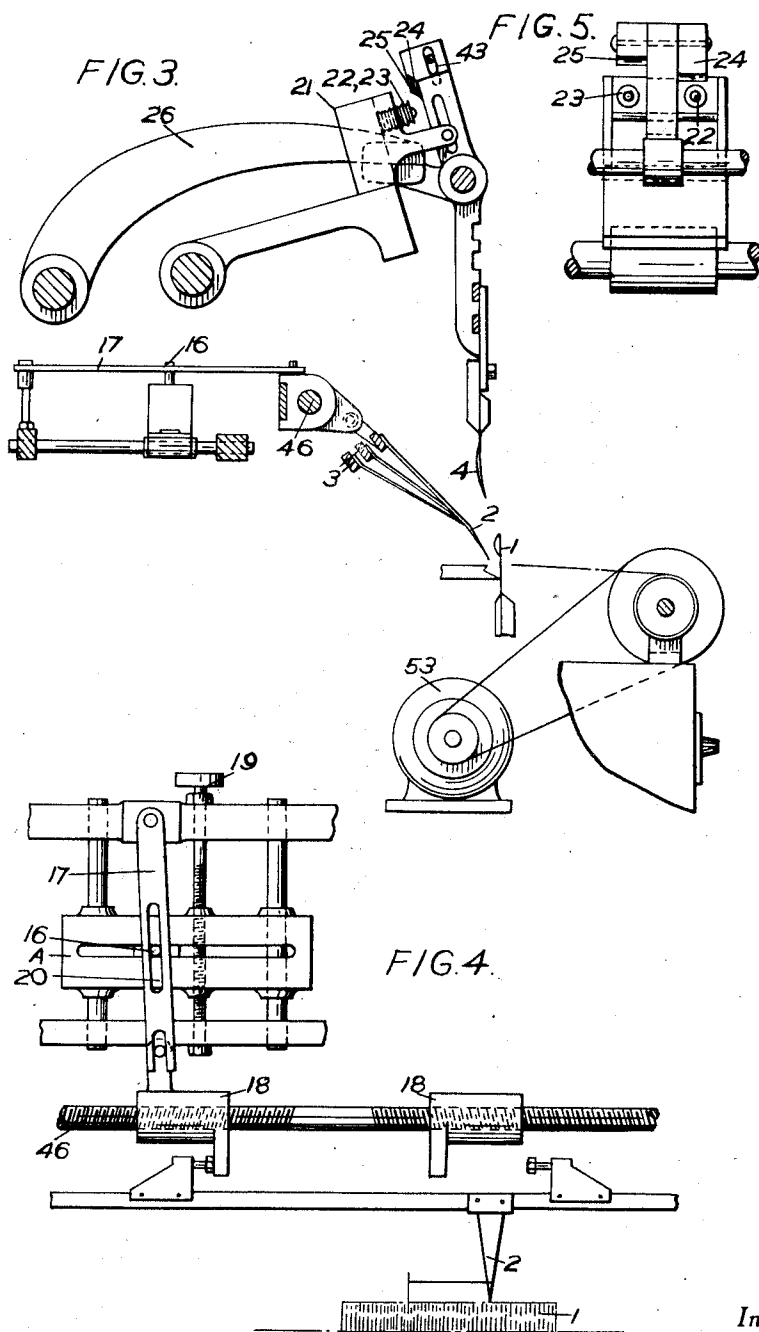
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3 Sheets-Sheet 2



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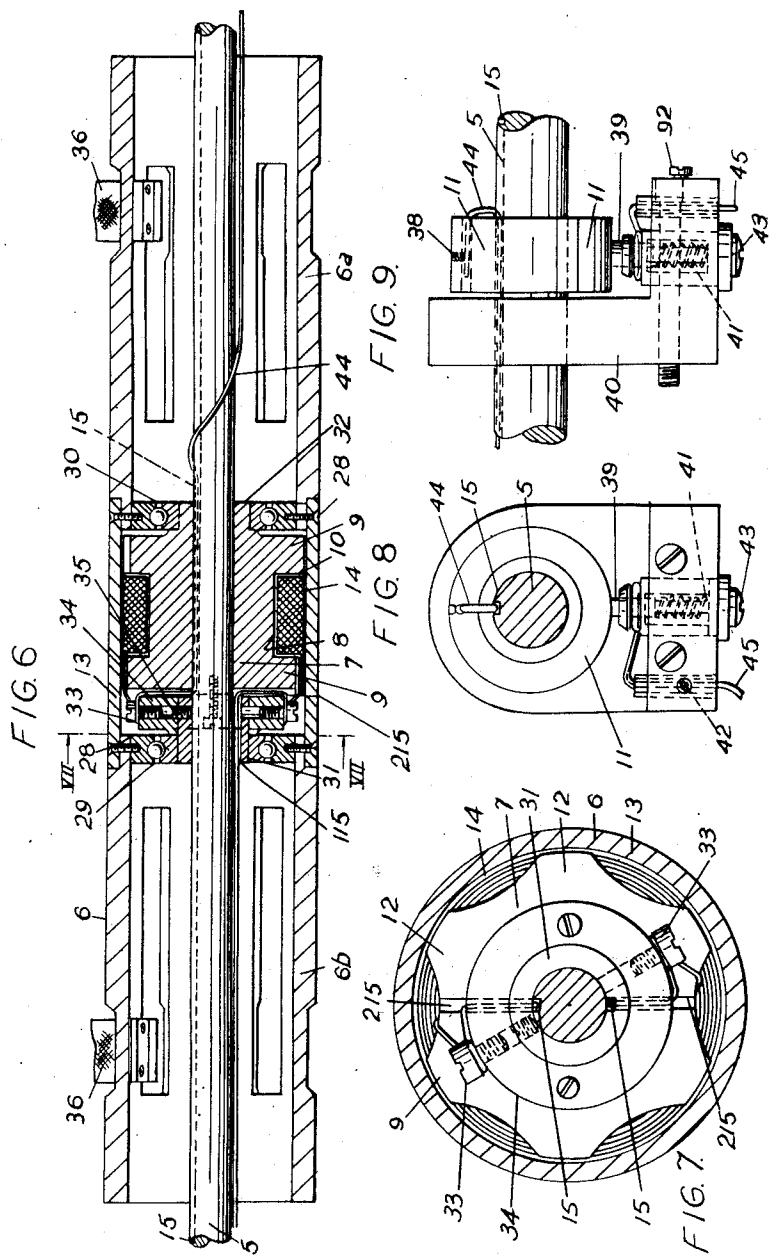
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KNITTING AND OTHER TEXTILE MACHINE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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KNITTING AND OTHER TEXTILE
MACHINE

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6 Claims. (Cl. 66—149)

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This invention is for improvements in or relating to knitting and other textile machines. In Cotton's patent and other straight bar knitting machines it is common practice to provide a plurality of divisions of needles so that a plurality of widths of fabric (e. g. fashioned widths such for example as stocking blanks or portions of underclothing) are produced simultaneously. These several widths of fabric are "drawn off" the needles, as knitting proceeds, by take-up or draw-off mechanism consisting of a shaft which extends for the full length of the machine and is provided with a roller for each division of needles. This shaft is rotated by means of a cord and weight so that all the rollers are rotated in unison. Each roller is provided with straps which are connected, either to a bar or rod having hooks which engage the initial course of the fabric, or the bar or rod which is located in the turned welt of a stocking blank or the like.

It will be appreciated that since all the rollers are rotated in unison by the mechanism just described, all the fabrics are drawn off from the needles at the same rate. It frequently so happens, however, that fabric is not produced at the same rate in all the divisions of the machine. As a result at least one piece of the fabric may be placed under a greater tension than the remainder and is stretched accordingly; as a corollary, at least one piece of fabric may have insufficient tension applied to it. It is undesirable that this should happen, for (especially in the case of the blanks for fine-gauge ladies' stockings knitted of silk or nylon) a correct draw-off tension is an important factor in achieving good quality fabric. Moreover, it is not possible to discern, either during the knitting process or immediately after the blank has been taken from the machine, whether any of the blanks have been stretched more than others, and so it is not possible readily to regulate the machine in such manner as to cause all the blanks to be produced at substantially the same rate. As a result, after the goods have been subjected to the usual finishing process some of them are longer than others and in connection with stockings considerable time has to be spent in matching up the stockings length for length. Furthermore, at this stage it is not possible to decide which division of the machine is responsible for the production of the short stockings or long stockings and so the regulation of the machine is rendered difficult.

It is an object of this invention to obviate

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or minimise the difficulties above discussed; another object is to provide an improved take-up or draw-off mechanism suitable for use in textile machines including machines other than multi-sectioned straight bar knitting machines.

The invention therefore provides in or for a textile machine, fabric take-up or draw-off mechanism comprising a rotary draw-off member, a rotary driver for rotating it in the draw-off direction, coupling or clutch means for normally transmitting drive from the driver to the draw-off member, the arrangement and disposition of the parts being such that when resistance to the normal rotation of the draw-off member exceeds a predetermined value the rotation of said member is automatically retarded which coupling or clutch means transmits the drive solely or partly by magnetism.

By this means, if at any time greater resistance is offered by the fabric to the draw-off roller than is normally desired, rotation of the roller is automatically slowed down or is stopped whilst the driver continues to rotate; therefore the draw-off tension applied to the fabric remains substantially constant irrespective of the rate of production. This result is of advantage in any knitting machine, but it is of special advantage in straight bar knitting machines, having more than one division of needles, for it ensures that irrespective of the rate of production of fabric, the draw-off tension applied to each piece of fabric is substantially the same as that applied to each other piece of fabric; thus the mechanism may be designed or adjusted to give that draw-off tension which produces fabric of the best quality. Moreover, it permits each piece of fabric to be drawn off at a rate which is determined by its rate of production. This in turn results in it being possible to see whether the fabric is being produced at the same rate in all divisions; by looking along the machine the attendant can see at any moment whether the welt bars or welt rods of all divisions are in substantial alignment. If one bar is in advance of or is lagging behind the others, it shows that the rate of production of this division differs from that of the others. Hence the rate of production of this division may be adjusted in known manner by adjusting the quality mechanism which governs the stitch length.

It will be appreciated that the speed of the driver is preset to a speed which is at least equal to the highest possible speed of draw-off of the fabric.

55 fabric.

It will therefore be appreciated that an important subsidiary feature of the present invention comprises in or for a Cotton's patent or other straight bar knitting machine having a plurality of divisions of needles, fabric take-up or draw-off mechanism of the nature referred to for each division and characterized in that the rotary drivers are constituted by a single rotary driver common to all the divisions.

Specifically, in one arrangement the coupling means comprises means for producing a rotating electro-magnetic field, and a rotatable armature (connected to the roller or other rotary draw-off member) to be acted on and rotated by the field but capable of rotational slip in relation to the said means. In effect such a coupling is a clutch adapted to slip under a predetermined load.

Means may also be provided for automatically varying the connecting force between the driver and the draw-off member at desired and/or predetermined times, and such means may be manually preset if desired.

The above and other features of the invention are set forth in the appended claims and are disclosed in the detailed description, given by way of example of the particular embodiments, illustrated in the accompanying drawings in which:

Figure 1 is a diagrammatical elevation of the relevant parts of a multi-section Cotton's patent knitting machine represented by two sections.

Figure 2 is a circuit diagram of the electrical circuit.

Figure 3 is a cross sectional view of Figure 1.

Figure 4 is an enlarged detail of part of Figure 1.

Figure 5 is an enlarged side view of part of Figure 3.

Figure 6 is an enlarged sectional view of a take-off roller according to the invention.

Figure 7 is a cross sectional view thereof on line VII—VII of Figure 6.

Figures 8 and 9 are sectional and front views respectively of electrical slip ring apparatus.

Referring now to Figure 1 the machine incorporates, in known manner, beds of needles 1 to which yarn is fed by yarn carriers 2 mounted on carrier rods 3, and transfer points 4. The machine is also provided with a horizontal reel shaft 5 which extends along the front of the complete machine in the known manner and at the usual location. This shaft 5 is positively driven, either from the driving motor of the machine itself or from a separate source of power such for example as an electric motor 53. If it is driven from a separate source of power, matters may be so arranged that it rotates at a constant speed irrespective of the speed of the knitting machine.

At each division of the machine a roller 6 (which is connected by customary straps 36 to the customary welt rod, bar or wire 37) is mounted in a freely rotatable manner on the shaft 5 but for each roller there is provided a magnetic coupling for connecting it to the shaft in such manner that rotation of the shaft produces rotation of the roller. Each coupling is in the form of an eddy current unit. This unit consists of a mild steel bobbin 7 (Figure 6) secured to the shaft 5 and turned with a deep peripheral channel 8 thereby providing side cheeks 9. A field coil 10 is wound around the bobbin within this channel 8 and this coil 10 is supplied with direct current through any suitable means such for example as slip rings 11 (Figures 8 and 9). The periphery of each side cheek 9 is relieved at in-

tervals (Figure 7) that are equally spaced circumferentially so as to provide between the reliefs a series of equally spaced poles 12.

Surrounding this bobbin 7 there is a mild steel sleeve 13 which constitutes the armature aforesaid and is attached to the roller 6, there being a small air gap 14 between the periphery of the side cheeks 9 and the interior periphery of the sleeve 13.

It will therefore be appreciated that the coil 10 sets up a magnetic field. This magnetic field rotates as the shaft 5 rotates, and the result is to produce rotation of the sleeve 13 and the attached roller 6. If however, the resistance to rotation of the roller 6 exceeds a predetermined amount, the roller will lag behind the shaft 5 although a predetermined torque is still applied to the roller. Conveniently the roller 6 is formed in two parts 6a, 6b, as shown in Figure 6 connected together by the sleeve 13 (through the medium of screws 28) which constitutes a continuation of or part of the roller. The roller 6 is also conveniently mounted on ball bearings 29, 30 and the two bearings are mounted on bosses 31, 32 respectively of bobbin 7. Terminals 33 for the wire coil connections are provided, mounted in a ring 34 fixed on the sleeve 31 by grub screws 35 (Fig. 6).

The following data has been found suitable for the couplings of a twelve division Cotton's patent knitting machine. The windings of the twelve couplings are connected in series and supplied with current at not more than 100 volts (i. e. about 8 volts, or less, for each coupling).

35	Diameter of side cheeks.....	2 3/4"
	Thickness of side cheeks.....	5/8"
	Base diameter of bobbin channel.....	2"
	Width of bobbin channel.....	1"
	Number of poles	4
40	Number of turns in the winding.....	280 approx.
	Wire, enamelled or single covered cotton wire	28 S. W. G.
	Radial width of gap.....	0.005"
45	External diameter of sleeve.....	3 3/8"

The gauge of the wire will be varied in practice according to the number of couplings used and the voltage applied to the circuit.

The torque can be controlled if so desired by providing a rheostat or adjustable resistance in series with the windings. In the example illustrated in Figure 2 power is drawn from an A. C. supply and a rectifier R is provided to convert to D. C. at, say, 100 volts, 2 amperes.

The coils 10 of the several couplings may be connected in series (as shown in Figure 2) or in parallel, the supply voltage being of appropriate value. They may be fed by slip ring apparatus provided adjacent to each coupling, or by single slip ring apparatus 11 provided at each end of the shaft 5 as indicated at Figure 1, leads 44 being taken from this apparatus lengthwise of the shaft 5 and the latter being made hollow to accommodate such leads or provided with grooves as indicated at 15 in Figure 6; the sleeve 31 may be also provided with a groove 115 for leads 44 and the end face of the bobbin 11 is similarly grooved as shown at 215 (see also Figure 7). A convenient form of slip ring apparatus is shown in Figures 8 and 9 wherein the ring 11 is fixed on shaft 5 and has a lead 44 fixed to it at 30. A brush or wiper 39 is carried by a fixed bracket 40 and is pressed by spring 41 into engagement with the ring; a lead 45 is fixed by screws 42, 43 to the bracket and wiper.

In Cotton's patent knitting machines it is desirable to suspend the operation of, or relax the pull of the take-up mechanism at certain phases, for example in the operations of:

(a) Turning the welt on a machine provided with automatic welt turning apparatus.

(b) Narrowing the fabric by adjusting the carrier rods.

(c) Transferring the fabric sideways during the narrowing operation.

(d) Boxing, or covering, the needles during the narrowing operation.

The present invention permits this suspension or relaxation to be effected very simply. For this purpose switching mechanism is provided controlling the current supply to the couplings, such switch mechanism being operated at the appropriate time by the moving parts of the machine, by the main chain or by any other patterning device.

More specifically, in the arrangement illustrated, four resistances A, B, C, D (Figure 2) are provided in the circuit. For ordinary plain knitting, the circuit from the rectifier R is through the slip ring apparatus 11 and the coils 10, the switch 22, resistances A and B, and back to the rectifier. The value of the resistance B may be adjusted manually by means of a hand control 48, Figure 1, which adjusts the wiper or variable tapping 47 of the resistance, so as to predetermine the pull of the take-up rollers 6 for plain knitting. The value of the resistance A is automatically adjusted during narrowing so as to adjust the pull of the take-up rollers 6 to the varying width of fabric being produced. For this purpose the wiper 16 of the resistance is movable by a lever arm 17 when carrier stops 18 are adjusted (in the customary manner, for narrowing, by the usual screw 46) thereby automatically adjusting the resistance A and consequently adjusting the pull of the take-up mechanism. The wiper 16 may be preset to operate between predetermined limits by a hand screw adjustment or the like 19 which moves the wiper relatively to the slot 20 in the lever arm 17.

It may further be desirable to modify the pull of the take up rollers 6 temporarily during the transferring and boxing phases of the fashioning operations. For this purpose a fixed part 21 (Figure 3) is provided carrying two micro switches 22, 23 which, as indicated in Figure 2 are associated respectively with the resistances C and D. For actuating these switches at desired times to vary the pull on the take-up mechanism during transferring and boxing there are provided two ramps 24, 25 carried by the customary arms 26 which move the points 4 in known manner. The ramps 24, 25 are conveniently adjustable by pin and slot connections indicated at 43.

One descent of the narrowing machine causes ramp 24 to operate switch 22, thereby cutting out resistances A and B and bringing switch 23 into the circuit. This switch 23 is so set that normally it connects resistance C in the circuit, but the boxing motions of the narrowing machine operate switch 23 so that it temporarily substitutes resistance D for resistance C. The wipers 51, 52 of resistances C and D may be preset by hand controls 49, 50 (Figure 1).

I claim:

1. In a straight bar knitting machine of the type having needles, carrier rods movable to feed

yarn thereto, and a narrowing mechanism for narrowing by transferring loops sideways, and organized to perform the following operations (a) welt turning (b) adjusting carrier rods endwise in narrowing (c) transferring the fabric sideways during the narrowing and (d) boxing or covering the needles during narrowing; the combination of a rotary draw-off member for drawing fabric away from the needles, a rotary driver for rotating it in the draw-off direction, a coupling of variable power for transmitting the drive from the driver to the draw-off member by electro-magnetic means, and means for automatically varying said power—for at least one of the aforesaid operations.

2. Apparatus according to claim 1 wherein the machine has adjustable stops for the carrier rods, wherein the last-said means comprises an electric resistance, a co-operating wiper, and means for producing relative movement between the resistance and the wiper in conformity with adjustment of the stops.

3. A draw-off roller for a textile machine, comprising a hollow cylindrical metal armature, a metal bobbin rotatable therein, which bobbin is formed with side cheeks and a peripheral channel between them and which side cheeks are relieved at intervals to provide poles, a field coil wound around the bobbin within the channel to set up, when fed with electric current, a field which rotates with the bobbin and tends to cause the armature to rotate also, and means for supplying current to the coil during rotation of the bobbin.

4. In fabric draw-off mechanism for a textile machine having a fabric take-up roll, an electro-magnetic coupling for driving the roll; and means automatically operative to vary the current flow to the magnetic coupling and so change the torsional influence of the latter for variation in the tension imposed upon the fabric during different predetermined stages in the knitting cycle of the machine.

5. In a textile machine, take-up mechanism comprising a rotary take-up member, a rotary driver for rotating it in the take-up direction, and an electro-magnetic coupling for transmitting drive from the driver to the take-up member but for slipping under a predetermined load and wherein the machine incorporates automatic means for varying the connecting power of the coupling at predetermined times.

6. Apparatus according to claim 5 wherein the rotary driver consists of a shaft, the take-up member consists of a hollow member mounted to rotate freely on the shaft, and the coupling comprises an electro-magnetic bobbin fixed on the shaft and an armature consisting of a sleeve transfixed by the bobbin and fixed to the hollow member.

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