

R. O. POAG & W. W. KIRK.

SHAPING FILAMENTS.

APPLICATION FILED JUNE 15, 1912.

1,057,088.

Patented Mar. 25, 1913.

2 SHEETS—SHEET 1.

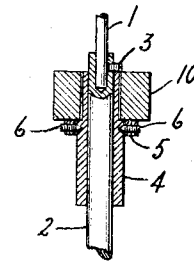
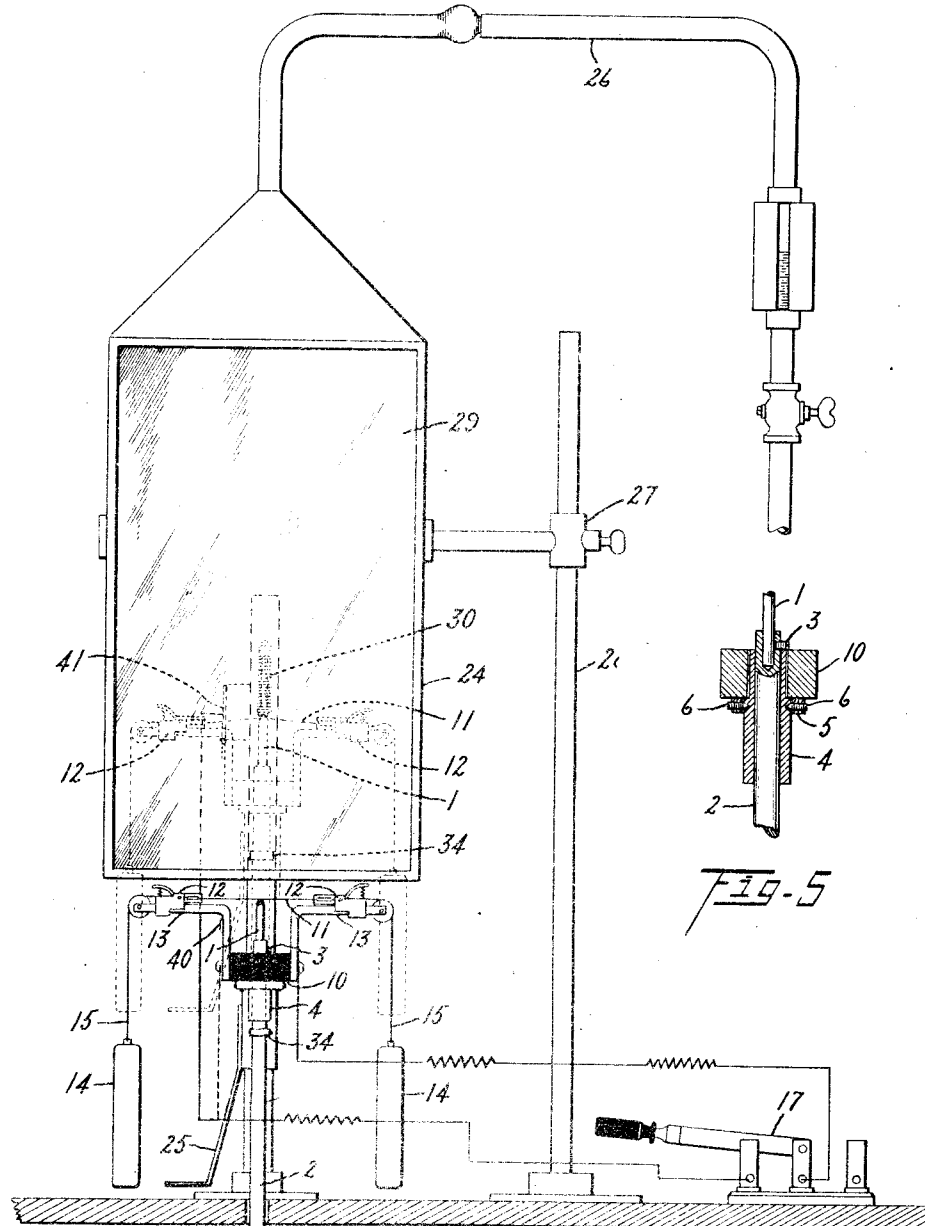


FIG-5

FIG-1

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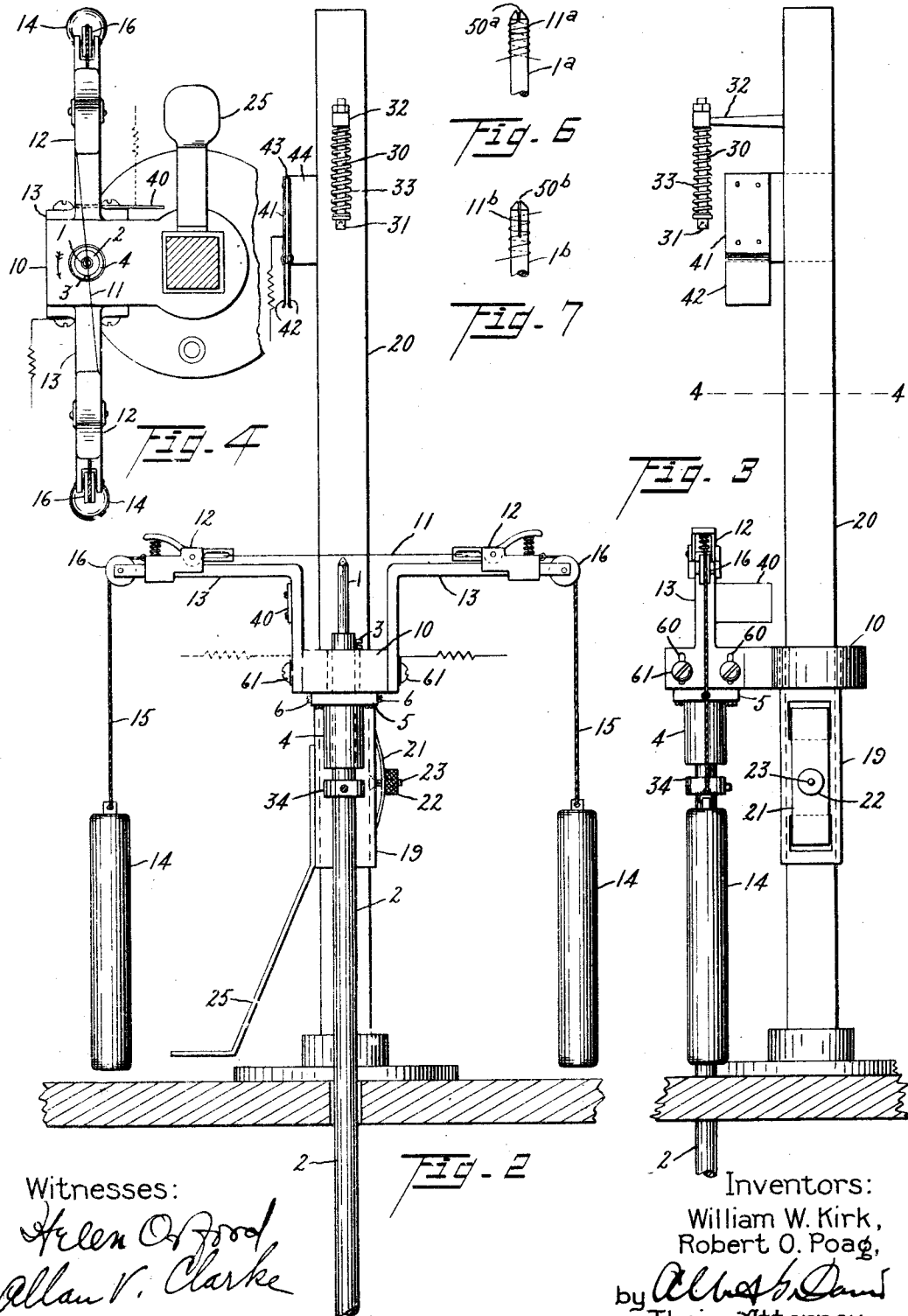
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Their Attorney.

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UNITED STATES PATENT OFFICE.

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SHAPING FILAMENTS.

1,057,088.

Specification of Letters Patent.

Patented Mar. 25, 1913.

Application filed June 15, 1912. Serial No. 703,951.

To all whom it may concern:

Be it known that we, ROBERT O. POAG and WILLIAM W. KIRK, citizens of the United States, residing at Cleveland, in the county of Cuyahoga, State of Ohio, have invented certain new and useful Improvements in Shaping Filaments, of which the following is a specification.

Our invention relates to the shaping of filament or filamentary wire (whether produced by squirting, drawing, or rolling methods, or in other ways) to forms such as are desirable for the light-emitting bodies of incandescent electric lamps and the like,—including particularly automobile and miniature lamps,—and its object is the provision of practical and effective means for this purpose.

The practical utility of our invention and various advantages obtainable in connection therewith can best be made apparent through the description of shaping mechanism embodying it. Such a shaping mechanism may in a general way be described as comprising devices adapted to be rotated with reference to one another so that the filament shall be wound or coiled on one of them, these devices engaging the filament and exerting upon it sufficient force to produce this effect, and also yielding to allow it to take place. In the simple machine hereinafter described in detail, the device upon which the filament is wound rotates, and the means co-acting with it to produce the winding of the filament holds the latter rather tightly and first yields by approaching the rotating device or means, at the same time offering sufficient resistance to the pull of the filament to insure uniformity in the winding. In this machine, furthermore, the means which rotates is adapted to engage an intermediate portion of a length of filament thus held at both ends and extending between more or less separated parts of said means, and the action is such that a double winding may be produced. It is to be understood, however, that while our invention extends to such specific features of the particular structure hereinafter described in detail and to other features of construction and operation and combinations and arrangements of parts comprised in it,—this structure being the best embodiment of the invention at present known to us, so that many of its specific details are of

importance because of their specific advantages,—yet the invention is not confined to this structure and its details, but can be otherwise carried out and embodied.

In the accompanying drawings, Figure 1 is a general view showing in a somewhat diagrammatic way one form of the shaping mechanism and a gas chamber that may be used with it, and illustrating the operation thereof. Fig. 2 shows the shaping mechanism by itself, and upon a larger scale. Fig. 3 is a view of the same parts when looked at sidewise. Fig. 4 is a view from above, the upper part of the device being cut away at a plane corresponding to the line 4—4 in Fig. 3 and removed to avoid confusion of the drawing, and a portion of the base plate on which the machine is mounted being broken away. Fig. 5 is a fragmentary detail section illustrating the mounting of a bearing. Fig. 6 is a broken view, upon a larger scale than Figs. 2, 3, and 4, of one form of shaping device proper with a filament wound upon it; and Fig. 7 is a similar view of another form of shaping device.

The shaping device or part upon which the filament is wound is a round spindle or mandrel 1, notched or slotted at one end, which fits in a hole in the upper end of a rod 2 and is held by a set-screw 3. The rod 2 has a bearing or guide 4 which is itself mounted in a bearing part 5 so as to be capable of a limited rocking movement in all directions with respect thereto. As shown in Figs. 2, 3 and 5, two screws 6 which are threaded through the part 5 have conical points which engage loosely in conical seats in the sides of the guide sleeve 4, and four screws serve to secure the part 5 to the lower side of the bracket 10. Two spring clips 12 which are adapted to slide on ways consisting of horizontal rectangular portions of brackets 13 form the holding means of the holding device for the length of filament 11 in which a coil is to be formed. The pull of the clips 12 on the filament is produced by weights 14 connected to the clips by cables 15 which pass over pulleys 16 at the outer ends of the brackets. It is desirable that the filament 11 should be arranged in the clips so as to extend diagonally from the front corners of the jaws of one clip to the rear corners of the jaws of the other as shown in Fig. 4. Such an arrangement of the filament is in

practice more easily reproduced with accuracy than any other that is symmetrical with respect to the axis of the mandrel, so that its employment tends to result in the production of more uniform shaped filaments than would otherwise be obtained. It also results in the filament having a better and more regular shape, as will hereinafter appear.

In dealing with filamentary wire of drawn tungsten, tantalum, or other refractory metals which possess a considerable degree of resilience (or consisting, for example, of ordinary "pressed" tungsten filament, which is brittle and cannot be permanently bent when cold), it may be desirable to heat the filament after it has been coiled in order to set it and prevent it from uncoiling when it is removed from the shaping device 1, or to wind it while in a heated condition. To provide for this, the brackets 13 are, as shown, insulated from one another and from all other parts, which is accomplished by making of insulating material the bracket part 10 to which they are attached and which carries the bearing 5 of the sleeve 4. Suitable current leads may be secured to the brackets 13 according to the dotted line arrangement shown in Fig. 1, so that current may be passed through the length of filament between the clips 12 to heat it, a switch 17 in the circuit allowing the operator to do this at any desired state of the operations upon the filament.

If the heating is to be done after the coiling is completed, it will be necessary that the mandrel 1 be of insulating material to prevent short circuiting of the coil; but if the heating is done during the coiling, such short circuiting will merely result in the cooling of the filament as it is coiled and will be unobjectionable. Of course in this latter case the heating circuit will include resistance of such magnitude (five, six, or seven times that of the length of filament to be dealt with, for example) that the decrease in the resistance offered by the filament due to this short-circuiting will not result in an excessive rise of current.

It may sometimes be necessary or preferable to have the filament in an environment other than the air while it is heated. To provide for this, the bracket 10 may be mounted on a sleeve 19 which is adapted to slide on a square standard 20, a spring 21 whose ends bear against the standard 20 with a degree of pressure that can be controlled by a nut 22 adjustable on a screw 23 secured in the sleeve 19 serving as a friction device to keep the bracket 10 in any position on the standard 20 in which it may be placed, and the rectangular shape of the standard 20 preventing the bracket 10 from turning. After the filament has been placed in the clips 12, the whole mechanism may be raised into an open bottomed gas chamber 24 by means of the arm or handle 25, the chamber 24 being supplied with suitable gas (hydrogen or forming gas, for example, in the case of filament of tungsten) through a flexible pipe 26 and supported by the bracket 27 adjustable on the rod 28, and having a front 29 of transparent or suitably colored glass which allows the operator to see what she is doing. As shown, there is an abutment 30 having in its lower end a conical seat or bearing 31 in which the upper end of the mandrel can be seated by raising the rod 2 after the bracket 10 has been elevated to its intended uppermost position. In the structure shown, this abutment is a yielding spring pressed member so arranged that the mandrel 1 shall seat in it and push it upward through the bracket 32 against the spring 33 until a collar 34 adjustable on the rod 2 strikes the lower end of the bearing 4. When employed, such an abutment will serve to insure that the mandrel shall be kept in an accurately vertical position during the coiling operation, and can also be made to aid in giving the filament a specially advantageous shape, as will presently be explained.

A means of preventing injury to the filament by premature passing of current through it while in the air is afforded by the arrangement of electrical connections illustrated in full lines in Figs. 1, 2 and 3. As here shown, there is a contact 40 attached to the left-hand bracket 13. In the upward path of this contact as the bracket 10 is raised is a switch 41 consisting of two springy pieces of sheet metal 42 at opposite sides of a plate 43, a block 44 of insulating material intervening between the plate 43 and the standard 20. Then when the operator raises the device into the gas chamber current will begin to flow through the filament as the bracket 10 approaches the upper end of its travel, the contact device or switch 41 serving as a stop to arrest it in its intended uppermost position. The bracket 10 having been elevated to its uppermost position, as shown in dotted lines in Fig. 1, the rod 2 is slightly raised from the lowered position which it ordinarily occupies (the set-screw 3 ordinarily resting on the bearing 4 as shown in full lines in Figs. 1 and 2 and so preventing the rod from dropping) and manipulated until the filament 11 is in the notch or slot between the upper end portions or parts of the mandrel. If the bottom of the notch were straight from one side of the mandrel to the other, it would only be necessary to further raise the rod 2 until the adjustable collar 34 struck against the lower end of the bearing 4, so that the middle of the filament would be bowed or bent upward above the level of the clips 12 and then revolve

the rod. In order, however, that the completed filament coil may have the form best adapted for mounting in the lamp, it is preferable for the bottom of the slot or notch to slant upward from each side of the mandrel to its middle. As shown in Figs. 4 and 6, the sloping sides of the conical upper end of the mandrel 1^a may make an angle of 60° with one another while the oppositely sloping portions of the bottom of the slot 50^a may make an angle of 90° with one another. Then as the rod 2 is raised until the collar 34 strikes the lower end of the bearing 4, the part of the filament that lies over the end of the mandrel will be raised above the level of the clips 12 and will be forced up into the conical seat 31 and given a V-shape. The filament being at the same time bowed or bent upward as shown in Fig. 1 so that the portions of it extending from the mandrel to the clips make acute angles with the axis of rotation of the mandrel, it can be wound into the double threaded screw-like coil shown in Fig. 6 by merely revolving the rod 2 with the hand in the direction indicated by the arrow in Fig. 4 until the clips 12 strike against the mandrel. Further revolution of the mandrel will result in the ends of the shaped filament 11^a being pulled out of the clips 12, whereupon the latter will return to their extreme outward positions under the influence of the weights 14, and the completed filament 11^a will thus be left free to be removed from the mandrel. The filament being engaged in the jaws of one clip at their front corners and in those of the other clips at their rear corners, the portions which extend between the mandrel and the clips when the clips have approached very close to the mandrel and are about to strike against it will lie about parallel with the direction of the ways 13 and the terminal or end portions of the completed filament will be at least fairly straight; whereas if the filament were initially placed in the middle of the clips these end portions would when the clips strike the mandrel extend slantwise at a very great angle to the direction of the ways and the end portions of the completed filament would have an irregular bent form. Of course the revolution of the mandrel can be stopped before the clips strike the mandrel if it is desired to produce a filament having a shorter coil portion and longer straight terminal portions.

The apex of the V-shaped portion of the coil 11^a will be found to lend itself especially well for engagement with the anchor support commonly employed in incandescent lamps having coiled refractory metal filaments.

Instead of a double threaded screw coil having both its terminals at the same end,

it is easy to produce a single threaded double screw form of coil having its terminals at opposite ends. For this purpose the horizontal portions of the brackets 13 may be arranged at different elevations,—say the right-hand one above the left-hand one,—and a mandrel 1^b having a deeper notch or slot 50^b may be employed, such as that shown in Fig. 7. The brackets 13 may, as shown in Fig. 3, have slots 60 through which extend the screws 61 by which they are secured to the brackets 10, and by shifting one bracket upward and one downward to a proper extent any desired difference in elevation can be produced. The mandrel 1^b will be so arranged with reference to the brackets that when the clips 12 are at their outer positions and the mandrel is raised so that the collar 34 strikes the bearing 4 the filament 11 will be at or near the bottom of the deep slot 50^b between the parts of the mandrel, and the portions of it extending from the mandrel to the clips will, again, make acute angles with the axis of the mandrel. Then when the rod 2 is rotated the portion of filament extending to the higher clip will be wound upward on the mandrel and the portion extending to the lower clip will be wound downward, in the manner shown in Fig. 7. When the coiling has been completed and the filament has been disengaged from the clips 12,—either after the striking of the clips against the mandrel 1^b as above described or otherwise,—the completed filament 11^b can be removed.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. Mechanism for the production of filament coils comprising a vertical shaping device upon which the filament is wound and a device which co-acts therewith in holding the portion of filament that is being wound under tension sufficient to produce uniform winding, said devices being relatively rotatable to cause winding of the filament upon the former of them and yielding and coming closer together as the winding progresses.

2. Mechanism for the production of filament coils comprising relatively rotatable devices one of which is adapted to engage the length of filament in which a coil is to be formed so that the rotation shall cause the filament to be wound upon it, and the other of which is adapted to hold the portion of filament that is being wound under tension sufficient to produce uniform winding while yielding to allow the winding to take place, said mechanism also comprising means for maintaining a protective atmosphere about the portion of filament operated upon and means for passing current through such portion of filament to heat it and cause it to retain the form imparted to

it and for preventing injury to the filament by passage of current when it is not thus surrounded by the protective atmosphere.

3. Mechanism for the production of filament coils comprising relatively rotatable devices which are also relatively movable in the direction of the axis of rotation and one of which can by such relative movement of the devices in the axial direction be caused to engage an intermediate point of the length of filament in which a coil is to be formed in such manner that with the coaction of the other as holding means for the portions of filament not in engagement with said shaping device the rotation shall cause the filament to be progressively wound upon the shaping device, said holding means coacting with said shaping device in maintaining on the filament tension sufficient to cause uniform winding.

4. Mechanism for the production of filament coils comprising relatively rotatable devices one of which comprises two holding means which hold the ends of the length of filament in which a coil is to be formed and maintain the filament under tension and the other of which is arranged between said holding means and comprises separated portions between which the filament extends, so that when rotation occurs the portion of filament extending on each side of said latter device to the holding means will be wound upon said device.

5. Mechanism for the production of filament coils comprising two yielding holding means that hold the length of filament in which a coil is to be formed under tension and a shaping device arranged intermediate said holding means and adapted to initially engage the filament at a point so located with reference to the holding means that the portions of filament extending from said shaping device to said holding means make acute angles with the axis of rotation, the engagement of the shaping device with the filament being such that when rotation occurs these portions of filament will be wound upon the shaping device after the manner of a helix.

6. Mechanism for the production of filament coils comprising relatively rotatable devices one of which is adapted to hold a length of filament under tension and the other of which is adapted to engage with said length of filament at an intermediate point displaced in the direction of the axis of rotation with reference to a common plane perpendicular to said axis in which the ends of the length of filament lie, so that

when rotation occurs the portions of filament on opposite sides of the latter device will be wound upon it in the same direction along its axis.

7. Mechanism for the production of filament coils comprising a vertical rotatable mandrel mounted between horizontal insulatively separated ways, holding means for the length of filament in which a coil is to be formed comprising clips adapted to slide on said ways and tending to move in opposite directions with reference to said mandrel so as to maintain the filament under tension, current connections for said ways whereby current can be passed through the filament to heat the same, said mandrel having there- in a notch in which the filament can be engaged and being adapted to occupy such a position with reference to the ways that the portions of filament extending from it to the clips make acute angles with the axis of rotation of the mandrel, so that when the mandrel is rotated these portions will be wound on the mandrel after the manner of a helix.

8. Mechanism for the production of filament coils comprising a vertically movable part on which are mounted devices adapted to be relatively rotated to produce winding of the filament, an open-bottomed gas chamber mounted so that the said part can be elevated into it for the winding operation, and connecting means comprising a relatively fixed contact device and also a contact device carried by said vertically movable part which when said part is elevated into the chamber puts the length of filament in which a coil is to be formed in circuit with a source of heating current.

9. Mechanism for the production of filament coils comprising a vertically movable part on which are mounted devices adapted to be relatively rotated to produce winding of the filament, an open-bottomed gas chamber arranged so that the said part can be elevated into it for the winding operation, and connecting means which when said part is elevated into the chamber puts the length of filament in which a coil is to be formed in circuit with a source of heating current.

In witness whereof, we have hereunto set our hands this 12th day of June, 1912.

ROBERT O. POAG.
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Witnesses:

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