(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 300 517 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88200978.0**

(51) Int. Cl.4: **H01C 17/04**

(22) Date of filing: **17.05.88**

The title of the invention has been amended (Guidelines for Examination in the EPO, A-III, 7.3).

(30) Priority: **21.05.87 IT 2062087**

(43) Date of publication of application: **25.01.89 Bulletin 89/04**

(84) Designated Contracting States: **AT BE CH DE ES FR GB GR IT LI LU NL SE**

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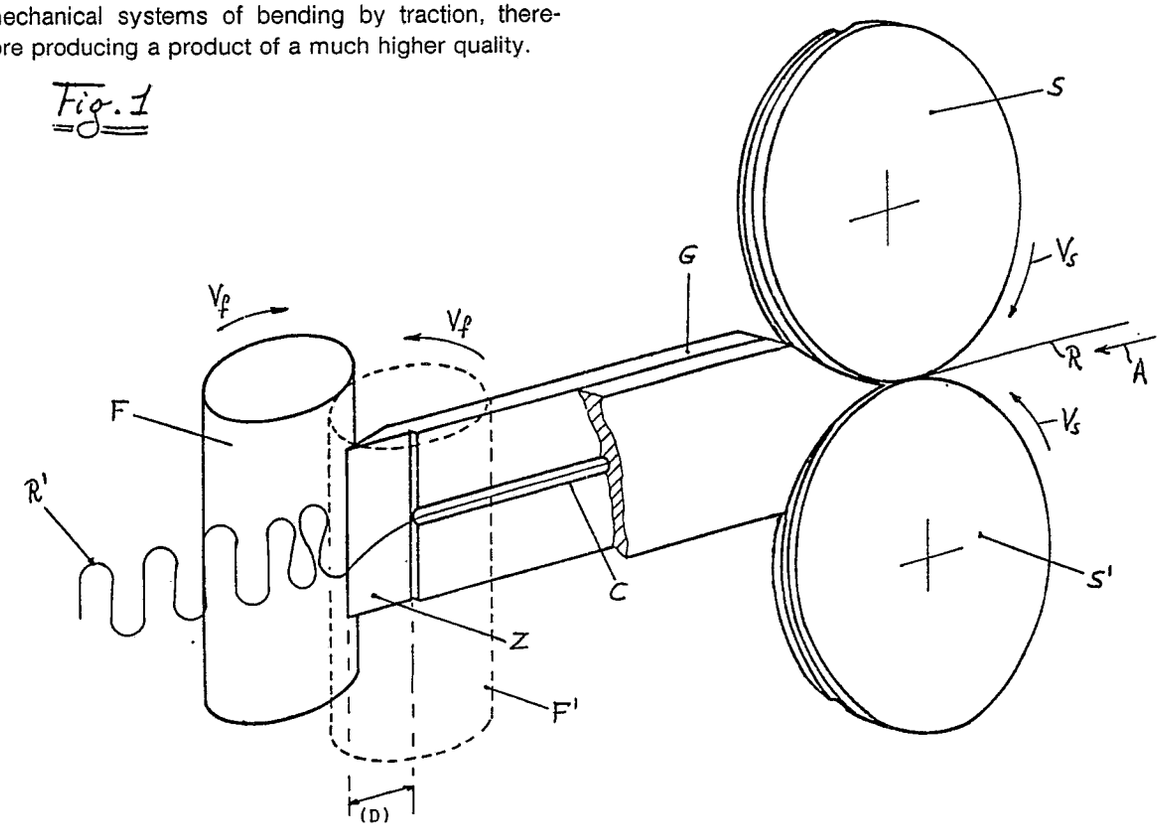
(54) Machine for shaping undulations in resistance wire.

(57) A machine for shaping resistance wire based on the principle of forming undulations on the wire by means of axial thrust thus bending the wire without causing it to stretch or buckle, as happens with mechanical systems of bending by traction, therefore producing a product of a much higher quality.

Fig. 1



EP 0 300 517 A2

"MACHINE FOR SHAPING UNDULATIONS, USING THE PRINCIPLE OF INJECTION, IN RESISTANCE WIRE FOR THE CONSTRUCTION OF ELECTRICAL RESISTANCES AND OTHER SIMILAR PRODUCTS"

The invention relates to a machine for shaping resistance wire which permits a high quality product to be obtained and is based on an original shaping principle which is highly innovative compared to techniques in current use and eliminates the relative disadvantages.

The machines which are currently used to shape resistance wire into undulations for the construction of electrical resistances for household equipment generally employ a shaping system constituted by gears or disks into which wedges have been inserted. When they rotate, these gears on disks with inserted wedges drag and pull the resistance wire and shape it in accordance with the parameters of the resistance to be constructed.

Generally, the action of pulling the resistance wire causes stretching and also buckling of the wire, creating considerable disadvantages during the construction stage because of cracks in the wire and during utilisation because of the production of hot spots and a consequent interruption in the flow of electricity in the apparatus.

The machine of this invention brilliantly eliminates the disadvantages of the technique currently used, since it is based on the original principle of injecting the resistance wire instead of pulling it and thus does not use gears or disks with wedges for shaping.

Thus the technical problem is brilliantly solved by the invention of this claim, in which the wire is pushed and not pulled, feeding it in at a speed higher than the speed at which it exits from the machine, so that the wire is forced to bend at a precise point, determined by the parameters which can be changed as requested, and defined by the conformation of the elements which guide the wire inside the machine, and thus the wire does not come into contact with any mechanical part which can damage it at the point at which is undergoes bending.

These and other advantages, characteristics and scopes of the invention of this claim will be more clearly understood and made more evident by the following description of an example of one embodiment, provided purely as an illustration of the working principle of the machine and with reference to the attached highly schematic drawings, in which:

Figure 1 is a schematic representation of the working principle of the machine for shaping wire according to the invention of this claim; and

Figure 2 is a diagram of the detail of the wire guide and the bending area of the machine in question.

Referring now to the figures in the attached drawings, the machine according to the invention of this claim basically consists of an injection system constituted by two counter-rotating disks S and S′ of a suitable shape, which form the thrust wheels for the resistance wire R coming from an appropriate feeding system which is not shown in the drawings; a wire guide G provided with a channel C for the injection of the wire R at the terminal part of the guide which is shaped to form a chamber or free outlet zone Z in which the bending of the wire R takes place, and having a dimension D equal to the distance between the exit of channel C of wire guide G and a point of tangency with the braking system, constituted by two braking rollers or cylinders F and F′ which are also counter-rotating at a peripheral speed which is appropriately lower than that of the direction of rotation of counter-rotating thrust disks S and S′. The direction of rotation of counter-rotating disks S and S′ is indicated by the arrows V_s, that of counter-rotating rollers F and F′ is indicated by the arrows V_f, the direction in which the wire R is fed and the thrust direction is indicated by the arrows A, the direction of the resistance forces which are created on the wire R inside the free zone are indicated by the arrows D_r, E is the elastic spring-back of the wire at the exit from the braking rollers F and F′ and R′ is the shaped wire which is obtained as the end product of the machine.

To obtain this undulated form, forces D_r are induced on the wire R in such a way as to oblige the wire to bend at a precise point. The wire is pushed by two thrust wheels S and S′ into an obligatory path, in other words channel C of guide G and carried in proximity to the braking wheels F and F′ which are also rotating and constitute a partial obstacle because their peripheral speed is lower than that of the thrust wheels S and S′. This obstacle can be fixed or mobile according to requirements.

This impedes the linear passage of the wire R, which is thus forced to discharge the surplus from the apposite free zone Z of the guide, situated between the guide and the braking rollers F and F′.

Now the wire R will acquire the special undulating shape, which is produced by the combined forces of the speed and the bending resistance of the wire which come into play at all the points involved in the bending zone, as well as the walls of the guide.

The bending parameters or variables can be simply stated in the following equation:

V_r = relative speed $V_s - V_f$

where:
V_s = the peripheral speed of the thrust wheels
V_f = the peripheral speed of the braking wheels
Let E = the spring-back due to the elasticity of the wire
V_f-E = determines the quantity of the final product of undulated wire R' in m^{-1}
Finally, since D is the bending distance it determines the magnitude of the undulation produced and these parameters are directly proportional one to another. Therefore if the parameters are changed, undulated wire R' of a different pitch and depth is produced, according to what is required.

This description clearly shows that the machine according to the invention of this claim fully solves the problems outlined above and successfully achieves the pre-set scopes but it must also be emphasised that numerous modifications, variations, additions and/or substitutions can be made to the machine while still remaining within the spirit and the scope of the invention of this claim and within its scope of protection, as defined in the claims attached hereto.

Claims

1. Machine for shaping undulations in resistance wire for the construction of electrical resistances and similar devices, characterised by the fact that it has means of shaping the wire by injection, by means of the application of axial thrust to the wire and the transformation of the thrust into a force of deformation and thus without the utilisation of mechanical bending systems.

2. Machine according to claim 1, characterised by the fact that the means of shaping the wire comprise a system of injecting the wire constituted by two counter-rotating disks of a suitable shape, a wire guide provided with a channel for the injection of the wire to the shaping zone, and a braking system constituted by two counter-rotating rollers which have a peripheral speed which is lower than that of the counter-rotating disks of the injection system.

3. Machine according to claim 2, characterised by the fact that the wire is shaped in a bending zone located at the end of the wire guide, in which the surplus wire which is created by the difference in speed of the injection system and the braking system is forced to bend itself without the need for mechanical components, taking on the form of an undulation.

4. Machine according to claim 3, characterised by the fact that the distance between the exit of the channel of the wire guide and the point of tangency of the braking rollers, corresponding to the length of the free bending or discharge zone, determines the magnitude of the undulation of the wire.

5. Machine according to one or more of the preceding claims, characterised by the fact that the wire guide is shaped in such a way as to deflect the thrust forces to a precise point on the wire and thus cause the deformations of the shape.

6. Machine according to one or more of the preceding claims, characterised by the fact that the pitch and depth of the undulations on the wire are determined by the proportional dimensioning of the parameters which are utilised in the execution of the shaping, that is to say the peripheral speed of the injection disks, the peripheral speed of the braking rollers, the relative speed of the wire which is equal to the difference between the two preceding speeds, the bending distance which is equal to the length of the free bending or discharge zone and the spring-back due to the elasticity of the wire.

7. Machine for shaping undulations, on the injection principle, in resistance wire for the construction of electrical resistances and other similar products, substantially as described above and as illustrated in the figures of the attached drawings, for the scopes specified here above.

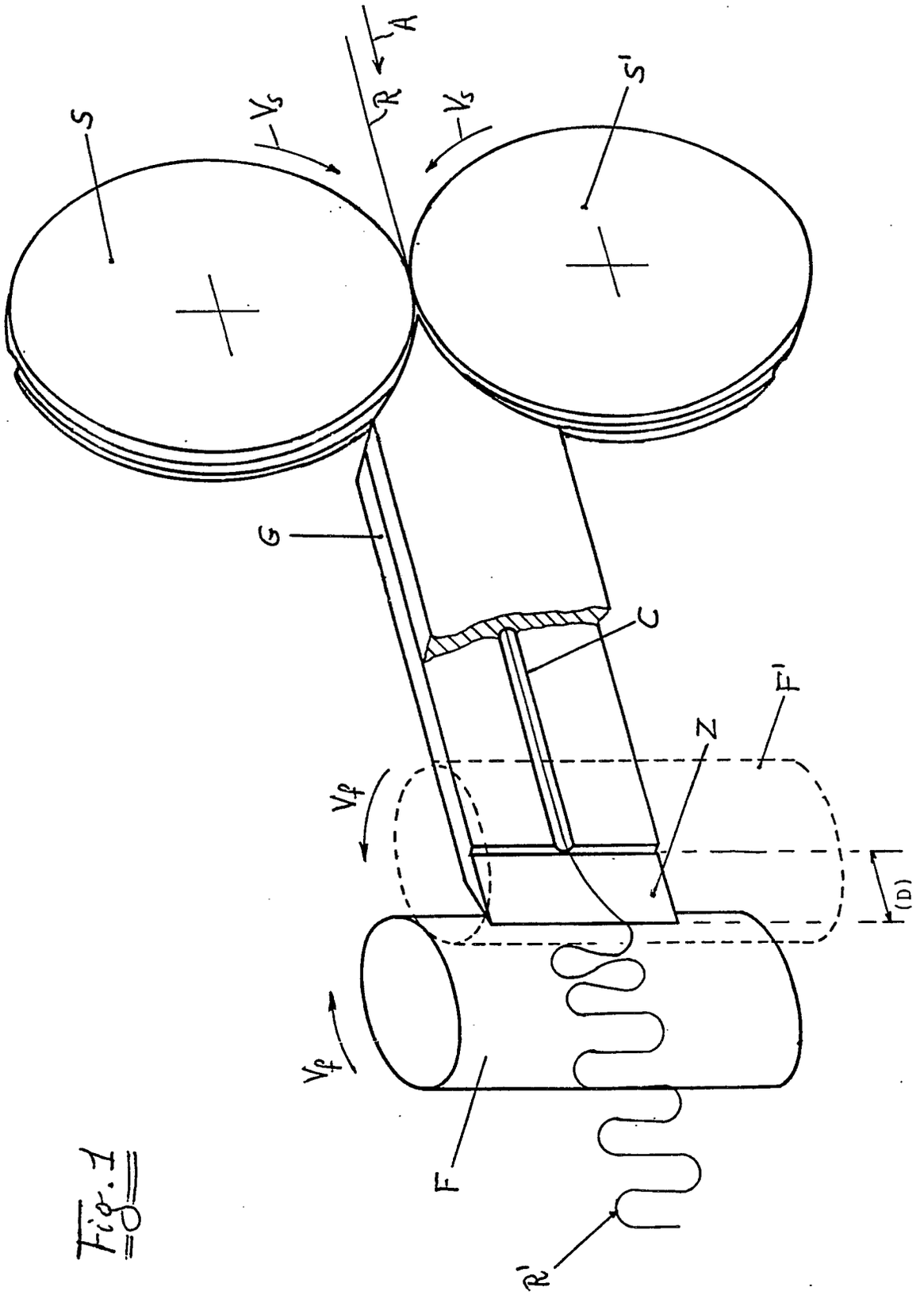


Fig. 1

Fig. 2