United States Patent

[11] 3,608,592

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[21] Appl. No. 818,686
[22] Filed Apr. 23, 1969
[45] Patented Sept. 28, 1971
[32] Priority Aug. 13, 1968
[33] Switzerland
[31] 12163/68

[54] AUTOMATIC MACHINE FOR MAKING STEEL WIRE SPRINGS

5 Claims, 4 Drawing Figs.

[52] U.S. Cl. 140/103, 72/339
[51] Int. Cl. B21f 35/00
[50] Field of Search 72/422, 339, 129; 140/103, 139, 140

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ABSTRACT: A machine for making steel wire springs has a tray on which are mounted forming tools slidable towards the center of the tray, means for moving the wire perpendicular to the tray, and means for clamping and cutting the wire. The means for moving the wire comprises two alternately operable clamps, one fixed and the other movable, and further includes a cylindrical member rotating in a fixed member integral with the tray. The movable member has an eccentric opening therein for the passage of the wire coacting with an eccentric opening in the fixed member and means are provided for rotating the movable member in such a way as to clamp in a first phase of operation and then cut the wire even with the opening of the fixed member in a second phase of operation.

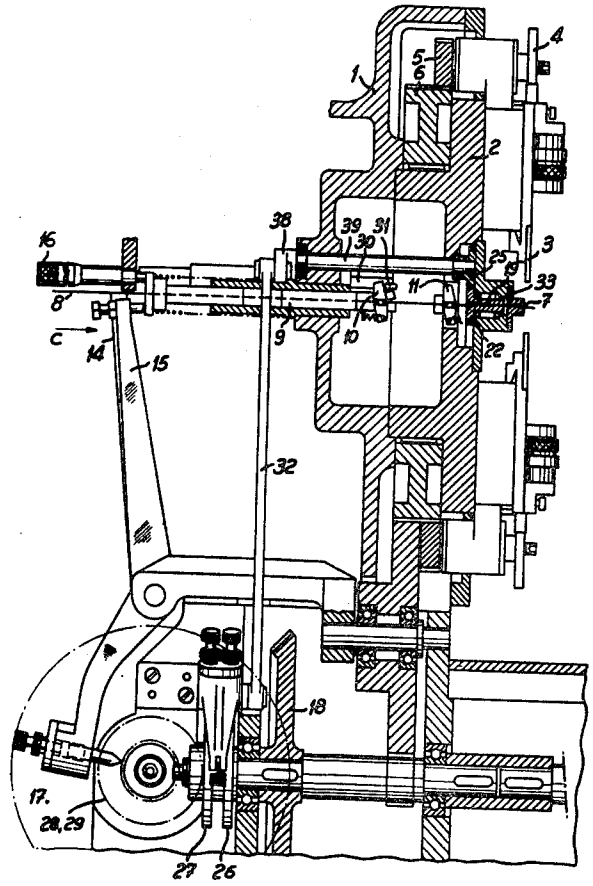
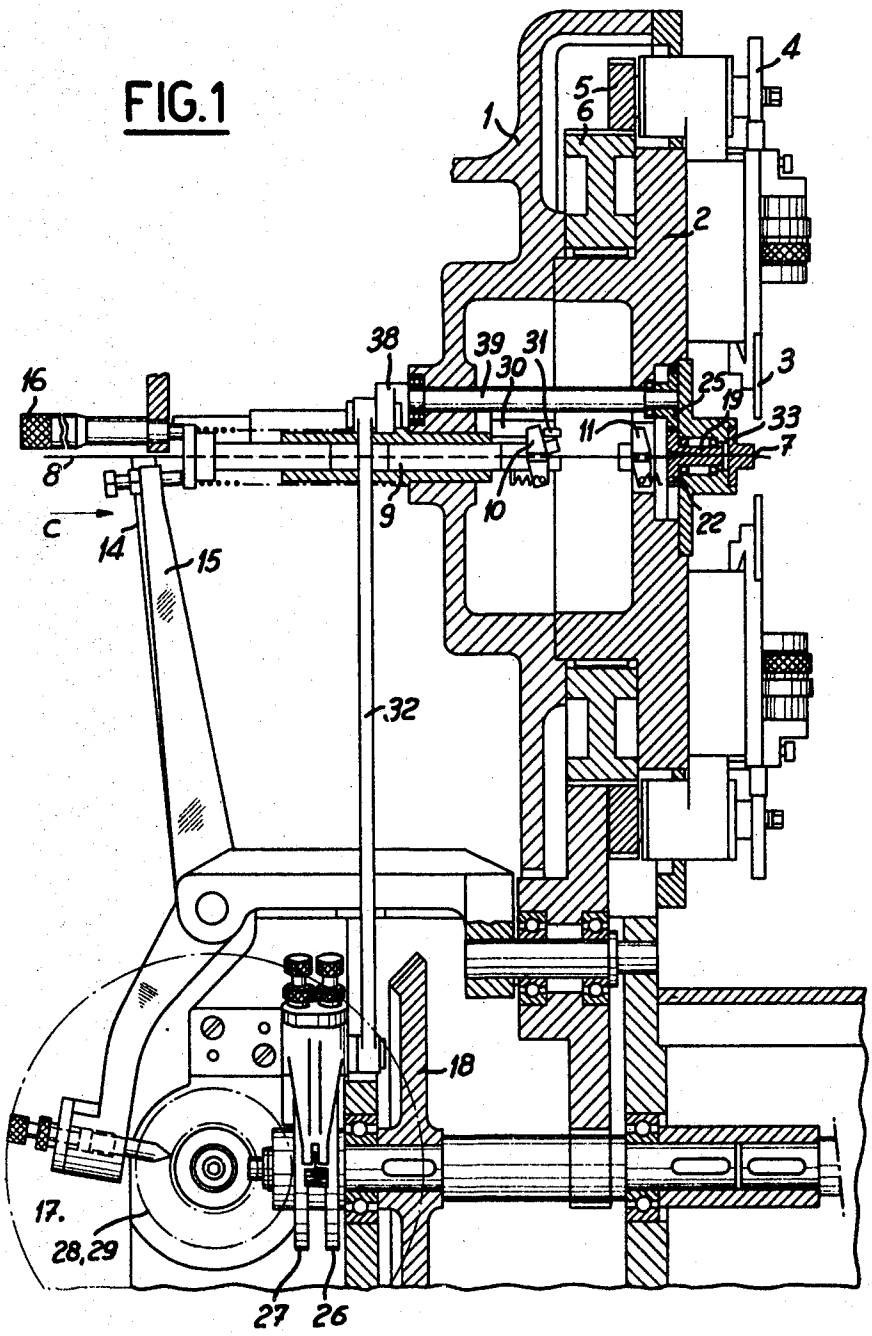


FIG. 1


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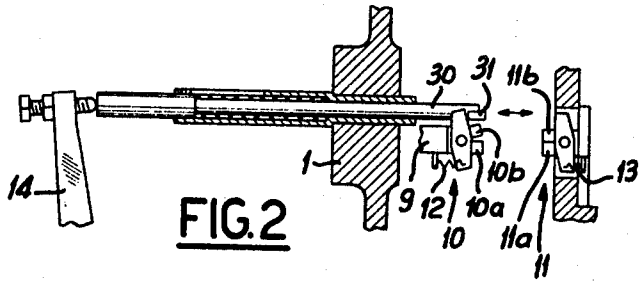


FIG. 2

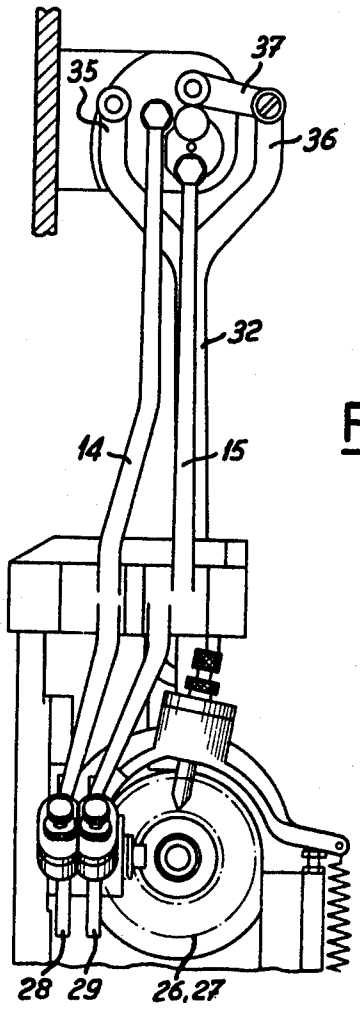
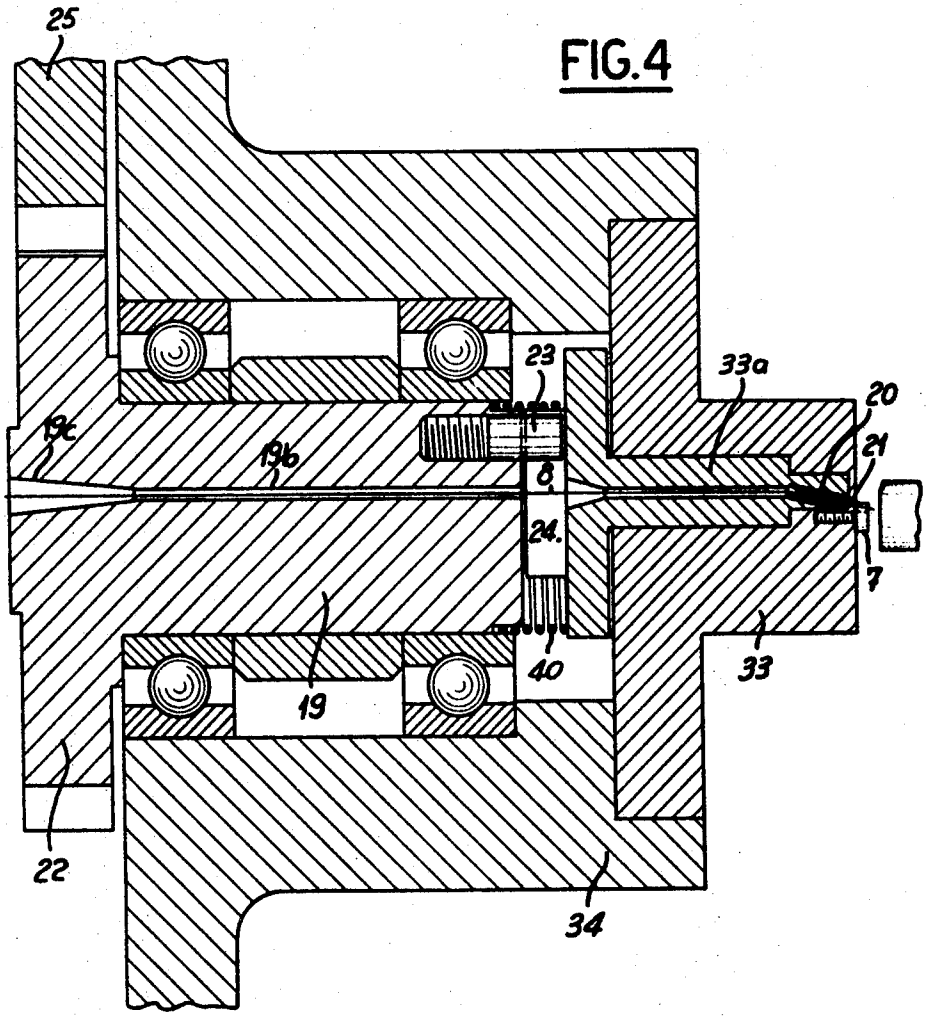


FIG. 3

FIG.4



AUTOMATIC MACHINE FOR MAKING STEEL WIRE SPRINGS

The present invention relates to an automatic machine for the making of springs in steel wire, and in particular, springs for timepieces.

The machine comprises a tray on which are mounted forming tools slidable in the direction of the center of the tray, means for making the wire advance perpendicularly to the tray, means for clamping and means for moving and cutting the wire, and the machine is characterized by the fact that the means for advancing the wire comprise two alternately operable clamps, one fixed and the other one movable, and the means for clamping and cutting comprises a cylindrical member rotatable in a fixed member integral with the tray. The movable part has means therein for the passage of the wire and an eccentric opening corresponding an eccentric opening in the fixed member, means being provided for rotating the movable member in such a way as to clamp in a first phase of operation and then cut the wire even with the opening of the fixed member in a second phase of operation.

The accompanying drawings represent by way of example one embodiment of the invention.

FIG. 1 shows an elevational and longitudinal cross section view of the machine;

FIG. 2 shows in detail the control mechanism for advancing the wire;

FIG. 3 shows a partial back view of the machine; and

FIG. 4 shows a cross section on a larger scale of the device for clamping and cutting.

The machine comprises a frame 1 on which is secured a circular tray 2 carrying thereon in circumferentially spaced-apart relationship vertical tools controlled by cam 4 through rotation of pinions 5 and gear 6. During operation, the tools work successively according to a given cycle and movement to form the spring on a rolling stud 7 on a movable spindle (not shown).

The feed of the wire 8 takes place through the center of a sliding arm 9, and through a rotatable shaft 19 having therein an eccentric hole and finally emerges in the perimeter of the forming stud 7. The feed of wire is ensured by two clamps 10 and 11, clamp 10 being secured at the end of the slidable shaft 9 and movable therewith while the clamp 11 is stationary. Each clamp has a fixed jaw 10*a*, 11,respectively and a movable jaw 10*b*, 11*b*, respectively, and a spring 12, 13 respectively urging the movable jaw against the fixed jaw. Clamps 10 and 11 are alternately opened by a sliding shaft 30 carrying at its extremity a projection 31 which, during movement of the shaft 30, alternately contacts the levers carrying the movable jaw in such a way as to alternately open the clamps. The motion of shafts 9 and 30 is ensured by a pair of cam-controlled arms 14 and 15 while the withdrawal of these shafts is ensured by springs. A micrometric adjusting screw 16 is provided for limiting the return movement of the clamp carrying shaft 9 and thus serves for adjusting the movement of the wire, the advanced position of the clamp 10 being invariably the same. The arm 14 is controlled by a cam 28 while the arm 15 is controlled by a cam 29. These two cams are mounted on a shaft carrying a gear 17 with conical teeth meshing with a similar gear 18 mounted perpendicular to the gear 17 and whose shaft carries tow cams 26 and 27 which control the clamping and cutting of the wire.

The device for clamping and cutting the wire comprises a shaft 19 mounted for rotation in ball bearings and having at one end thereof a gear 22 meshing with a pinion 25. The pinion 25 is mounted at the end of a shaft 39 actuated by an arm 32 which is subjected to the action of the cams 26 and 27. Shaft 19 has an eccentric opening 19*b* disposed parallel to the axis of the shaft (FIG. 4) and the first part of the opening 19*c* is conical to facilitate penetration therein of the wire 8 and to ensure the progressive deflection of this wire. Shaft 19 has at its extremity a sleeve-carrying shaft 33*a* which can turn or rotate in the cylindrical opening of a member 33 which is mounted on a flange 34 secured on tray 2. The sleeve-carrying shaft 33*a* has at one end a sleeve 20 positioned obliquely with respect to the sleeve-carrying shaft axis and functions to guide the wire towards an opening 21 made in the wall of the fixed member 33 and opening next to the rolling stud 7. Clamping of the wire is ensured by a slight angular movement of the sleeve-carrying shaft 33*a* relative to the opening 21. By rotating the sleeve-carrying shaft from the position shown in FIG. 4, the wire is partially cut in the contact plane of the sleeve 20 of member 33. The sleeve-carrying shaft 33*a* is not rigidly fixed to the end of the shaft 19 but is coupled thereto by means of stud 23 engaging in a diametrical slot 24 of the sleeve-carrying shaft. Precise contact between the extremity of the sleeve-carrying shaft and the front wall of flange 33 is ensured by a spring 40.

Cam 26 controls the cutting and cam 27 controls the clamping and actuate a single arm 32 which is divided into two forks 35 and 36, one of the other of these forks being adapted for coupling to a lever 37 secured on shaft 39.

The operation of the machine takes place in the following manner:

Under the urging of arm 14, the shaft 30 advances freeing jaw 10*b* of the movable clamp which then grips the wire, the projection 31 then opening the fixed clamp 11 to free the wire. This movement is ensured by the movement of shaft 9 whose clamp 10 is closed onto the wire. When shaft 30 is at the end of its path, it is no longer held and moves rearward under the urging of its return spring while freeing the movable jaw of clamp 11 which then closes onto the wire after which the projection 31 contacts the movable clamp and opens the same allowing the withdrawal of shaft 9, the wire meanwhile being retained by the clamp 11. As soon as the wire is again immobilized its extremity is clamped by the rotating action of shaft 19. The different shaping operations are then effected by tools, some of which actuate levers which rock perpendicularly to the plane of the tray to cause the folding of the spring or to extract the finished spring. The cutting of the spring by shearing is preferably effected before the extraction.

Various modifications are naturally possible in the shape of the control arms as well as in that of the clamping and cutting members.

What is claimed is:

1. Automatic machine for the manufacture of wire springs for use in watchmaking from a length of wire, comprising: a tray; a plurality of forming tools slidably mounted on said tray; means for advancing said wire perpendicularly to said tray; means for clamping and means for cutting said wire; said means for advancing said wire comprising two alternately operable clamps, one of said clamps being fixed and the other movable; said means for clamping and cutting comprising a fixed member integral with said tray and having therein means defining an eccentric opening, a cylindrical member having means therein defining an eccentric opening for allowing passage therethrough of said wire, means rotatably mounting said cylindrical member for rotation relative to said fixed member, and means for rotating said movable member relative to said fixed member to clamp in a first phase of operation said wire and to effect cutting of the wire even with said eccentric opening provided within said fixed member in a second phase of operation.

2. Machine according to claim 1 wherein said eccentric opening in said movable member has an oblique portion directed toward said eccentric opening in said fixed member.

3. Machine according to claim 1 wherein said clamps comprise a fixed jaw and a movable jaw, a spring urging said movable jaw against said fixed jaw, and a slider reciprocating between each of said movable jaws for alternately opening said movable jaws during movement of said wire.

4. Machine according to claim 1 including a sliding arm with an axial bore for guiding said wire and carrying said movable clamp.

5. Machine according to claim 4 wherein a spring is provided for urging said slidable arm rearwardly together with means for adjusting the extent of the rearward movement of said shaft to adjust the advance of said wire.