Sept. 21, 1943. B. J. FIX 2,329,710

MEANS FOR SECURING A HAIR SPRING TO AN ARBOR

Filed Jan. 23, 1939

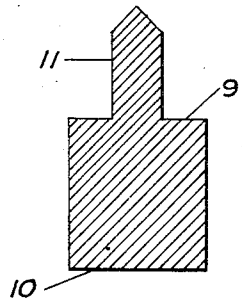


Fig-2-

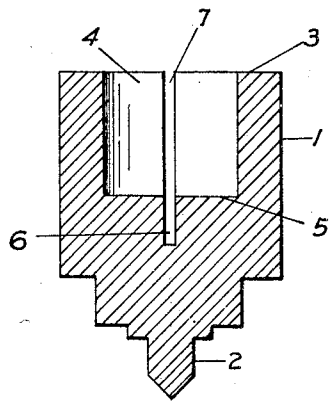
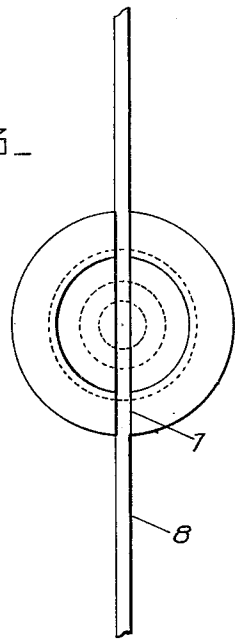


Fig-1-

Fig-3-



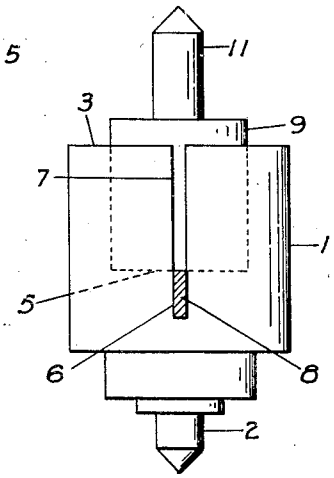


Fig-4-

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MEANS FOR SECURING HAIRSPRINGS TO ARBORS

Eugene J. Fix, Philadelphia, Pa., assignor to the United States of America, as represented by the Secretary of War

Application January 23, 1939, Serial No. 252,418

7 Claims. (Cl. 58—115)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a method and means for securing a straight length hair spring to the escapement arbor of a timing mechanism, and more especially the timing mechanism of a mechanical time fuse.

Owing to the sturdiness of construction and higher frequency of vibration afforded by hair springs of rectangular cross-section and straight length, hair springs of the helical or similar type have been largely supplanted by the former type in the prior art.

In utilizing straight length hair springs the commonplace method of securing the hair spring to the escapement arbor has been to bore the arbor to provide a passage of circular form extending therethrough normal to its axis, insert the straight length hair spring of rectangular cross-section within the passage to a position where its opposed ends protrude from the corresponding opposed ends of the passage substantially equal amounts, and secure the hair spring in position by means of a circular wedge driven into the passage. To properly secure the hair spring to the arbor against relative displacement by means of a circular wedge it is necessary to drive the wedge within the passage to a point where it deforms the portion of the hair spring within the passage into arcuate shape having a convex surface on a radius closely approximating the radius of the passage. As a result of the deformation of the medial portion of the hair spring and the fact that the spring tends to assume its normal rectangular cross-sectional shape beyond the deformed portion, compound bends or stresses are developed in the spring adjacent the arbor, upon vibration or flexure of the spring which rapidly fatigues the same and introduces an omnipresent factor of non-uniformity of action and/or failure.

Of prime importance among the desiderata of a mechanical time fuse is simplicity of construction and positive, precise functioning of operating parts, and therefore it is an object of this invention to simplify the method of attaching a straight length hair spring, normally of rectangular cross-section, to an escapement arbor.

It is a further object of this invention to provide simple means to effectively secure a straight length hair spring normally of rectangular cross-section, to an escapement arbor without the necessity of deforming any part of the spring or employing extraneous steps or means to preserve the balance of the arbor.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing in which:

Fig. 1 is a sectional view of one of the pivot sections of an escapement arbor;

Fig. 2 is a sectional view of the other pivot section of the escapement arbor;

Fig. 3 is a top plan view of the pivot section of Fig. 1 with the hair spring in the position in which it will be secured by the pivot section of Fig. 2;

Fig. 4 is a view in elevation showing the pivot sections of Figs. 1 and 2 assembled to form an escapement arbor with the hair spring attached.

Referring now to the drawing wherein the same elements are identified by the same characters of reference throughout the views, there is shown in Fig. 1 an escapement arbor pivot section 1 provided with the usual projecting bearing portion 2 adapted to oscillatably support the pivot section when properly seated in the cooperating bearing portion of an arbor support, not shown.

The escapement arbor pivot section 1 may have any desired exterior contour; but is preferably, to facilitate machining and balance, symmetrically arranged about an axis coinciding or forming a prolongation of the axis of bearing portion 2 and of circular cross section throughout its axial extent. At its end 3 opposed to bearing portion 2 the arbor pivot section 1 terminates in a plane normal to its axis and is axially cylindrically bored or otherwise suitably hollowed out in any desired peripheral configuration to form a recess 4 having a flat end defining surface 5 parallel to the plane of end 3. A slot 6 of substantially the same geometrical cross-section as the hair spring 8 to be employed, here shown of rectangular cross-section, and preferably of such width as to frictionally engage and securely hold the hair spring in place, is extended diametrically across the arbor pivot section 1 and axially toward bearing portion 2 beyond surface 5 a distance closely approximating the corresponding dimension of the hair spring. Access to the slot 6 is provided for by diametrically disposed openings 7 leading from the end 3 of the arbor pivot section to the slot 6.

The escapement arbor pivot section 9 shown in Fig. 2 cooperates with the escapement arbor

pivot section 1 of Fig. 2 to complete the escapement arbor as shown in Fig. 4 and comprises a body portion 10 of the same configuration and adapted to be snugly fitted, by application of force, within the recessed portion 4 of pivot section 1 to lock hair spring 8 in slot 6 against accidental movement axially of the escapement arbor assembly. The pivot section 9 is provided with a projecting bearing portion 11 adapted to be seated in a cooperating bearing portion of an arbor support, not shown, and to act with bearing portion 2 to preserve alignment of the escapement arbor assembly in oscillation.

It will be observed, that although I have shown the slot 6 in pivot section 1 that this has been done merely for the purpose of illustration, in as much as it is functionally immaterial whether the slot 6 be located as shown in Fig. 1 or in the body portion 10 of pivot section 9. If the slot 6 is located in body portion 9, then the openings 7 serve to permit the insertion of the body portion 10 of pivot section 9 and the hair spring 8 secured in the slot within recess 4 of pivot section 1. In other instances it may be desirable to form the slot 6 partially in pivot section 2 and partially in the body 10 of pivot section 9 so as to compel the assembly of the two pivot sections in a predetermined certain position relative to each other by employing the hair spring as a key extending between the slotted portions of each pivot section. This latter method may at times be desirable to facilitate balancing of the arbor.

In the use of the escapement arbor the usual escape pallets will be suitably secured to the assembled arbor shown in Fig. 4 for regulating the running of the escape wheel of the timing mechanism of the fuse, and the opposed terminal portions of the hair spring 8 will be anchored to the fuse mechanism support at such points as will give the spring an effective working length corresponding to the frequency of vibration that gives a desired rate of running of the escape wheel.

Having particularly described what now appears to me as a preferred embodiment of the invention I claim and desire to secure by Letters Patent of the United States:

1. An escapement arbor comprising two pivot sections, one of said sections comprising a bearing portion and being recessed inwardly from its end opposed to said bearing portion, the wall defining the recess being cut-away to provide oppositely disposed openings extending axially inward at least as far as the recess, the other of said pivot sections having a body portion inserted into said recess and a bearing portion in axial alignment with said first named bearing portion, said pivot sections being formed to provide a passage of substantially uniform cross-section intercommunicating with said openings.

2. A device for securing a transverse member in position comprising two sections, one of said sections being recessed inwardly from one end, the wall defining the recess being cut-away to provide oppositely disposed openings extending axially inward at least as far as the recess, the other of said sections having a body portion inserted into said recess, said sections being formed to provide a passage intercommunicating with said openings within which said transverse member may be secured to project through either of the openings.

3. A device for securing a transverse member in position comprising two sections, one of said sections being recessed inwardly from one end, the wall defining the recess being cut-away to provide oppositely disposed openings extending inward at least as far as the recess, the other of said sections having a body portion inserted into said recess, said sections being formed to provide a passage intercommunicating with said openings, and a transverse member within said passage.

4. In an escapement arbor comprising two pivot sections, one of said sections being recessed inwardly from one of its ends, the wall defining the recess having opposed removed portions to form openings extending axially inward substantially the same distance as the recess, said section being slotted inwardly beyond the recess from one opening to the other to frictionally engage a transversely positioned straight length hair spring of uniform cross section, said other pivot section including a body portion of a configuration similar to the recess frictionally engaged in said recess.

5. An escapement arbor comprised of two pivot sections of which one section is substantially circular in cross-section throughout its axial length and is provided with a bearing portion projecting axially of the section, said one section being cylindrically axially bored from its end opposite the bearing portion to form a recess terminating in a plane normal to the axis of the section and being diametrically slotted axially inward from said plane to receive a transverse hair spring of substantially uniform cross-section, opposite portions of the wall of said one section defining the recess being removed to provide openings extending to the slot to facilitate insertion of the hair spring within the slot, the other pivot section of said arbor including a body section of substantially the same configuration as said recess frictionally inserted therein and having a projecting bearing portion in axial alignment with said first named bearing portion.

6. An escapement arbor pivot section comprising a section of circular cross-section throughout the axial length and a bearing portion projecting axially of the section, said section being cylindrically axially bored from its end opposite the bearing portion to form a recess terminating in a plane normal to the axis of the section and being diametrically slotted inward from said plane to receive a transverse hair spring of uniform cross-section, the wall of said section forming the recess being removed to form opposed openings leading to and communicating with the diametrical slot to provide means whereby the hair spring may be inserted in the slot.

7. In an escapement arbor, a recessed pivot section provided with a bearing portion, the wall defining the recess having opposed openings extending axially inward at least as far as the recess, a second pivot section having a body portion frictionally engaged within the recess of the first pivot section, and a bearing portion on the second pivot section in axial alignment with the bearing portion of the first section.

EUGENE J. FIX.