

nm / T1M 51
Singapore

PATENT SPECIFICATION

1,187,005¹⁰

DRAWINGS ATTACHED.

Date of Application (No. 382/69) and filing Complete Specification: 2 Jan., 1969.

Application made in United States of America (No. 699,823) on 23 Jan., 1968.

Complete Specification Published : 8 April, 1970.

1,187,005



Index at acceptance:—G3 T(A7B, A7D).

International Classification:—G 04 b 31/00.

COMPLETE SPECIFICATION.

Watch Construction.

We, THE UNITED STATES TIME CORPORATION, a Corporation organized under the laws of the State of Connecticut, United States of America, of Waterbury, Connecticut, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the construction of a watch movement.

The manufacture of pocket watches and wrist watches is one of the oldest industries. For hundreds of years watch movements have included a number of gears. Such gears are used to transmit power and to reduce the rapid movement of an oscillator—a balance wheel or vibrator—to the relatively slow rotation of the time indicating hands. The gears are mounted on staffs. The ends of the staffs rotate in bearings, which may be jewels. One end of each of the staffs usually rotates in a frame plate and the other end in a second frame plate or in a bridge; a bridge is a supporting structure fixed to a frame plate. The frame plates are separated by pillars and held to the pillars by screws.

This type of construction, in some respects, is costly. It involves many parts, for example, the various bridges, pillars, screws and staffs, all of which must be carefully and accurately assembled.

The problem of providing a simple, accurate and inexpensive assembly procedure for watches is as old as the industry itself. This problem has sought to be solved by process techniques, for example, by the use of jigs or fixtures. It has been known, as a means of reducing the skill required in and the cost of assembly procedures, to use jigs or fixtures to hold parts temporarily in posi-

tion until they are fixed in place by other parts added to the assembly. For example, one or more of the staffs may be held by a fixture having extending fingers, which are closed on the staff from two sides, while a bridge is being fastened to the plate. The fingers are then withdrawn. But even using such jigs, it still requires care and time to fix the parts in place.

If a watch can be designed using fewer parts, it may result in a saving in the cost of the parts themselves and also a saving in the time and money involved in the assembly process.

It is an object of the present invention to provide a watch movement construction which is adapted for relatively rapid, simple and accurate assembly.

It is a further object of the present invention to provide a watch movement construction which has fewer parts, thereby effecting a saving in cost of the production of parts and of assembly.

In accordance with the present invention there is provided a watch movement construction including a frame plate having a plurality of bearing means, a bridge having at least one bearing means, a spacer block positioned between and separating said plate and said bridge, means to secure said frame plate, spacer block and bridge together, a plurality of gears mounted on staffs with at least some of the ends of said staffs rotating in said bearing means, and an oscillator and means to power said oscillator, said spacer block having at least one bearing means in which a staff rotates.

A preferred embodiment of watch movement, which is designed especially for ease and accuracy of assembly, includes an oscillator and a plurality of gears mounted on staffs. One end of each of the staffs rotates in a bearing in a frame plate. The spacer

[Price 5s. 0d.]

block has bearings for the other ends of some of the staffs. The spacer block, as one of its functions, replaces one or more of the conventional bridges. The spacer block, during assembly, is positioned on the frame plate. The block, as another of its functions, has one or more holes which are adapted to temporarily position staffs during the assembly operation and act as a replacement for a jig or fixture. The holes are sufficiently large so that the staff does not contact its wall after final positioning of the staff. It performs the function of a jig or fixture, but without the trouble of removing it from the watch. The spacer block, after assembly, is left in place in the watch. The spacer block in the watch, as a third of its functions, acts to correctly separate and position the frame plate from one or more bridges. In this last function it replaces a plurality of pillars or the expense of machining a solid block of material.

Other features and advantages of the present invention will be apparent from the following detailed description, given by way of example, of an embodiment of the invention, and to be read in conjunction with the accompanying drawings, in which:—

Figures 1 and 2 are side sectional views of a watch movement embodying the present invention;

Figure 3 is an underneath plan view of the underside of the train bridge and balance bridge shown at the top of Figure 5;

Figure 4 is a plan view of the spacer block mounted on the frame plate, the lines 1—1 and 2—2 indicating the views (but without the train bridge and the balance bridge) of Figures 1 and 2 respectively; and

Figure 5 is an exploded view of the frame plate (bottom), the spacer block (centre), and the train bridge and balance bridge (top).

The watch movement, as shown in Figures 1 and 2, is mounted on a frame plate 1. The frame plate is preferably stamped from a sheet of brass or other metal, avoiding an expensive machining processing such as milling. A plurality of jewel bearings 2, 3, 4, 4b, 5 and 5a are pressed into, and held in a series of, holes drilled through the frame plate 1.

A spacer block 6, having outer portions 7 and 8, is positioned on frame plate 1. Preferably the spacer block 6 is stamped and machined from metal. The outer portions 7 and 8 of spacer block 6 are thicker than its interior parts. A train bridge 9 is positioned on the spacer block 6. Thick portions of the spacer block 6 act like pillars, to accurately determine the separation between the frame plate 1 and train bridge 9.

The spacer block 6 has a number of holes into which jewel bearings 10 and 34 are press-fitted. The train bridge 9 also has a number of holes into which jewel bearings

4a, 12, 13 and 14 are press-fitted, see Figures 1 and 2. A separate balance bridge 15 holds the balance staff bearing 2a, see Figure 1. A balance wheel 16 is carried by balance wheel staff 17. The balance wheel staff rotates between balance jewel bearings 2 in the frame plate and 2a in the balance bridge. The balance wheel 16 has attached to it one end of the watch hairspring. A forked lever pallet 18 is carried by pallet lever staff 19 which rotates between pallet staff jewels 3 in the frame plate and 10 in the spacer block. The pallet lever 18 has a safety lever (dart) which co-operates with a safety roller. The pallet lever's pins (or jewels) receive the impulse and time the movement of escape wheel 20, which is carried by escape wheel staff 21. The staff 21 rotates between escape pinion jewels 4 in the frame plate and 4a in the train bridge. The escape wheel staff 21 also carries escape pinion 22. The escape pinion 22 meshes with the fourth wheel (seconds wheel) 23. The escape wheel staff 21 may rotate freely in a hole 24 within spacer block 6.

The fourth wheel 23 is fixed to the seconds staff 24a which also carries a fourth pinion 25 and a seconds hand 26, see Figure 2. The fourth pinion 25 meshes with a third wheel 27. The third wheel 27 and third pinion 28 are carried by a third wheel staff 29 which rotates between third pinion jewels 5 in the frame plate and 12 in the train bridge.

The third pinion 28 may freely rotate within a hole 41 of spacer block 6, the hole 41 being larger than the pinion 28. The walls of the hole 41 hold pinion 28, and its staff 29, upright during the assembly process. The walls of the hole 41 do not perform any further function after assembly.

The third pinion 28 meshes with a centre wheel 30, which is carried by a centre arbor 31. The centre arbor 31 is a frictional fit within a minute wheel tube 32. A minute hand 33 is carried by the minute wheel tube 32. The bottom of the centre arbor 31 rotates in a centre arbor jewel 34 pressed into and held by the spacer block 6. In this function the spacer block acts like a bridge member in that it holds a jewel in position, the jewel acting as a bearing for a staff. The bottom portion of the seconds staff 24a rotates in the fourth pinion end-shake jewel 11. Jewel 11 is positioned next to jewel 34.

The centre arbor 31 has external gear teeth 35 which mesh with the external gear teeth 36 of a mainspring barrel 37. A mainspring 38 in the barrel 37 is wound up to power the watch. One end of the mainspring 38 is attached to the barrel 37 and the other end to a mainspring arbor 39. One end of arbor 39 rotates in jewel 14 in the train bridge and the other end in hole 40 in the frame plate.

The bottom of the minute tube 32 has external gear teeth which form a cannon pinion 42. The cannon pinion 42 meshes with a minute wheel 43 which is fixed to a minute pinion stud 44. A minute pinion 45, also fixed on the minute pinion stud 44, meshes with an hour tube 46. The hour tube 46 carries, at its end, an hour hand 47.

The various functions of the spacer block 6 are also illustrated by a description of the assembly process of the watch. The assembly commences by placing the frame 1, with its dial side down, in a fixture. The staffs for the centre wheel, pallet lever, escape wheel and barrel are inserted through their respective holes and jewels in the frame. The spacer block 6 is then positioned on the frame. The third wheel assembly, i.e., pinion 28, wheel 27, and their staff 29, is placed within the hole 41 in spacer block 6 and in jewel 5. The endshake jewel 11 is then positioned and the fourth wheel 23 and its staff 24a are placed in hole 50 of the centre arbor 31. The spacer block 6 acts as a jig to temporarily hold the escape wheel staff 21 and the third wheel staff 29 upright. The train bridge 9 is then assembled to the spacer block 6 by screws such as screw 51, which passes through the block. The watch is then assembled with the remainder of its components. One of the last of the assembly steps is the location and fixing of the balance bridge 15. A spacer block hole 52 has a tubular insert 53 which protrudes upwards and locates the balance bridge 15 by being positioned in a hole 55 of the bridge, see Figures 1 and 5. A screw 56 passes through holes 55 and 52 and is threaded in a hole 57 in frame plate 1. A spring 58 completes the balance bridge adjustment arrangement. Preferably the spacer block is made slightly smaller, in its outer dimensions, than the frame plate. An edge of the frame plate 1 protrudes to form ledge 58 of the plate 1 (see Figure 1) which provides a seat for the case. This eliminates a milling operation, conventionally performed, of the frame block to provide a ledge for the seating of the case.

Modifications may be made in the present invention within the scope of the subjoined claims. For example, the spacer block may be used only for the functions of spacing the frame plate from bridge members or to act as a jig to hold parts temporarily, or both. The spacer plate may be injection moulded from plastic.

WHAT WE CLAIM IS:—

1. A watch movement construction including a frame plate having a plurality of bearing means, a bridge having at least one

bearing means, a spacer block positioned between and separating said plate and said bridge, means to secure said frame plate, spacer block and bridge together, a plurality of gears mounted on staffs with at least some of the ends of said staffs rotating in said bearing means, and an oscillator and means to power said oscillator, said spacer block having at least one bearing means in which a staff rotates.

2. A watch movement as claimed in Claim 1 wherein said spacer block has at least one hole in which a staff freely rotates without touching the wall of said hole, said wall acting as a jig during assembly of said movement.

3. A watch movement as claimed in Claim 1 or Claim 2 wherein the spacer block is smaller than the frame plate thereby to provide a ledge on the plate for the seating of a watch case.

4. A watch movement as claimed in any one of Claims 1 to 3 wherein the oscillator is a balance wheel mounted on a staff and the watch includes a balance wheel bridge, wherein one end of the balance wheel staff rotates in a bearing means in said frame plate and the other end rotates a bearing means in said balance wheel bridge, and wherein said spacer block is positioned between said balance wheel bridge and said frame plate.

5. A watch movement as claimed in Claim 4 wherein said balance wheel bridge is held to said spacer block by an adjustable screw acting against a spring to provide the endshake adjustment of said bridge.

6. A watch movement as claimed in Claim 4 or Claim 5 wherein the power means is a spring positioned in a barrel.

7. A watch movement as claimed in any one of Claims 1 to 5 wherein the power train includes a mainspring, a mainspring barrel, a pallet lever, an escape wheel and an escape wheel pinion, and wherein the pallet lever is mounted on a staff one end of which rotates in a bearing means fixed in said spacer block.

8. A watch movement constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.

9. A watch incorporating the watch movement as claimed in any one of the preceding claims.

STEVENS, HEWLETT & PERKINS,
Chartered Patent Agents,
5, Quality Court,
Chancery Lane,
London, W.C.2.

The bottom of the minute tube 32 has external gear teeth which form a cannon pinion 42. The cannon pinion 42 meshes with a minute wheel 43 which is fixed to a minute pinion stud 44. A minute pinion 45, also fixed on the minute pinion stud 44, meshes with an hour tube 46. The hour tube 46 carries, at its end, an hour hand 47.

The various functions of the spacer block 6 are also illustrated by a description of the assembly process of the watch. The assembly commences by placing the frame 1, with its dial side down, in a fixture. The staffs for the centre wheel, pallet lever, escape wheel and barrel are inserted through their respective holes and jewels in the frame. The spacer block 6 is then positioned on the frame. The third wheel assembly, i.e., pinion 28, wheel 27, and their staff 29, is placed within the hole 41 in spacer block 6 and in jewel 5. The endshake jewel 11 is then positioned and the fourth wheel 23 and its staff 24a are placed in hole 50 of the centre arbor 31. The spacer block 6 acts as a jig to temporarily hold the escape wheel staff 21 and the third wheel staff 29 upright. The train bridge 9 is then assembled to the spacer block 6 by screws such as screw 51, which passes through the block. The watch is then assembled with the remainder of its components. One of the last of the assembly steps is the location and fixing of the balance bridge 15. A spacer block hole 52 has a tubular insert 53 which protrudes upwards and locates the balance bridge 15 by being positioned in a hole 55 of the bridge, see Figures 1 and 5. A screw 56 passes through holes 55 and 52 and is threaded in a hole 57 in frame plate 1. A spring 58 completes the balance bridge adjustment arrangement. Preferably the spacer block is made slightly smaller, in its outer dimensions, than the frame plate. An edge of the frame plate 1 protrudes to form ledge 58 of the plate 1 (see Figure 1) which provides a seat for the case. This eliminates a milling operation, conventionally performed, of the frame block to provide a ledge for the seating of the case.

Modifications may be made in the present invention within the scope of the subjoined claims. For example, the spacer block may be used only for the functions of spacing the frame plate from bridge members or to act as a jig to hold parts temporarily, or both. The spacer plate may be injection moulded from plastic.

WHAT WE CLAIM IS:—

1. A watch movement construction including a frame plate having a plurality of bearing means, a bridge having at least one

bearing means, a spacer block positioned between and separating said plate and said bridge, means to secure said frame plate, spacer block and bridge together, a plurality of gears mounted on staffs with at least some of the ends of said staffs rotating in said bearing means, and an oscillator and means to power said oscillator, said spacer block having at least one bearing means in which a staff rotates.

2. A watch movement as claimed in Claim 1 wherein said spacer block has at least one hole in which a staff freely rotates without touching the wall of said hole, said wall acting as a jig during assembly of said movement.

3. A watch movement as claimed in Claim 1 or Claim 2 wherein the spacer block is smaller than the frame plate thereby to provide a ledge on the plate for the seating of a watch case.

4. A watch movement as claimed in any one of Claims 1 to 3 wherein the oscillator is a balance wheel mounted on a staff and the watch includes a balance wheel bridge, wherein one end of the balance wheel staff rotates in a bearing means in said frame plate and the other end rotates a bearing means in said balance wheel bridge, and wherein said spacer block is positioned between said balance wheel bridge and said frame plate.

5. A watch movement as claimed in Claim 4 wherein said balance wheel bridge is held to said spacer block by an adjustable screw acting against a spring to provide the endshake adjustment of said bridge.

6. A watch movement as claimed in Claim 4 or Claim 5 wherein the power means is a spring positioned in a barrel.

7. A watch movement as claimed in any one of Claims 1 to 5 wherein the power train includes a mainspring, a mainspring barrel, a pallet lever, an escape wheel and an escape wheel pinion, and wherein the pallet lever is mounted on a staff one end of which rotates in a bearing means fixed in said spacer block.

8. A watch movement constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.

9. A watch incorporating the watch movement as claimed in any one of the preceding claims.

STEVENS, HEWLETT & PERKINS,
Chartered Patent Agents,
5, Quality Court,
Chancery Lane,
London, W.C.2.

