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(54) TIMEPIECE MOVEMENT ASSEMBLY

(71) We, KABUSHIKI KAISHA DAINA SEIKOSHA, a Japanese company of 31-1, 6-Chome, Kameido, Koto-ku, Tokyo, Japan, 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:—

This invention concerns a timepiece movement assembly e.g. for use in a wrist-watch.

According to the present invention, there is provided a timepiece movement assembly comprising first and second bridges, first and second frame plates, at least one spacer which spaces the first and second bridges from each other and which spaces the bridges from the frame plates, and a screw for securing the frame plates to the spacer, the bridges and frame plates being provided with apertured portions for accommodating elements of the movement.

The or each spacer preferably has a flanged portion which is disposed between and in contact with the first and second bridges to space the latter apart.

Moreover, the or each spacer preferably has spaced apart portions which are respectively mounted in apertures in the bridges and frame plates.

The invention also comprises an assembly as set forth above in combination with escapement and gear train elements of the movement which are carried by said bridges and frame plates and which are mounted in the apertured portions.

The said elements may comprise staffs of a gear train, said staffs being rotatably mounted in bearing holes which are provided in the second frame plate.

Moreover the said elements may comprise an oscillatory pallet fork, the second frame plate having a cut-out portion parts of which constitute abutments for limiting oscillation of the pallet fork.

The first bridge and the first frame plate may respectively carry bearings in which is mounted a staff carrying a balance wheel, the balance wheel effecting oscillation of the pallet fork.

[Price 33p]

The pallet fork may be carried by a staff which is rotatably mounted in bearing holes in the first bridge and second frame plate.

The first bridge and the second frame plate are preferably spaced apart by a bearing member having cavities therein of larger and smaller diameters which respectively engage and support larger and smaller diameter stem portions of a winding stem to prevent movement of each said stem portion in three orthogonal directions, the second frame plate engaging the larger diameter stem portion and being provided with a bearing pin which engages the smaller diameter stem portion to prevent movement of each stem portion in a fourth orthogonal direction.

A mainspring barrel drum may be mounted between the first bridge and the second frame plate, the barrel drum being insertable and withdrawable laterally of the first bridge and second frame plate without disassembling the bridges and frame plates.

The said element may also comprise a centre wheel staff which is rotatably mounted in the second bridge and the second frame plate, the first bridge having an aperture through which a seconds hand pinion may be introduced in order to mount the latter on the centre wheel shaft.

Additionally the invention comprises a wrist-watch provided with an assembly as set forth above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is a broken-away, schematic longitudinal sectional view of a timepiece movement assembly according to the present invention.

Figures 2 and 3 are respectively perspective top plan and bottom plan views of the timepiece movement assembly of Figure 1.

Figure 4 is a broken-away view, partly in section, taken on the line 4—4 of Figure 2.

Figure 5 is a broken-away view, partly in section, taken on the line 5—5 of Figure 4.

Figure 6 is a broken-away view, partly in

section, taken on the line 6—6 of Figure 4, and

Figure 7 is a broken-away plan view showing part of the structure of the timepiece movement assembly shown in Figure 1.

Referring to the drawings, a timepiece movement assembly for use in a wrist-watch comprises a first bridge 10, a second bridge 11, a first frame plate 12, and a second frame plate 13, each of which is constituted by a flat plate member and all of which are arranged parallel to and aligned with each other. The first and second bridges 10, 11 and the first and second frame plates 12, 13 are maintained in desired relative positions by virtue of being frictionally engaged with at least one spacer 14 (and preferably by two spacers 14, as shown in Figure 2). Each of the spacers 14 spaces the first and second bridges 10, 11 from each other and also spaces the bridges 10, 11, on the one hand, from the frame plates 12, 13 on the other hand.

The first bridge 10 is provided with apertures 15 in each of which there is mounted an end portion 16 of a respective spacer 14. The second bridge 11 is provided with apertures 20 which are aligned with the apertures 15 and in which are mounted central portions 21 of the respective spacers 14. Each of the spacers 14 is provided, between the end portion 16 and the central portion 21 thereof, with a flanged portion 22 which is disposed between and in contact with the first and second bridges 10, 11 to space the latter apart.

Each of the spacers 14, moreover, is provided with two reduced diameter portions 23, 24 which respectively extend loosely through apertures 25, 26 in the second frame plate 13 and in the first frame plate 12 respectively.

Each spacer 14 has a longitudinally extending threaded hole 27 which receives a bridge screw 28 which serves to secure the frame plates 12, 13 to the spacer 14.

The first bridge 10 and the second frame plate 13 are respectively provided with bearing holes 30, 31 in which are rotatably mounted staffs 32, 33, 34, 35. The staffs 32, 33, 34 and 35 respectively carry a third wheel 36, a fourth wheel 37, the third and fourth wheels forming part of a gear train, an escape wheel 40 and a pallet fork 41. The staffs 33, 34, 35, extend loosely through apertures 38 in the second bridge 11.

The pallet fork 41 is an oscillatory member oscillation of which is effected by a balance wheel 42. The balance wheel 42 is carried by a staff 43 which is rotatably mounted in bearings 44, 45, the latter being mounted in an aperture 46, in the first bridge 10 and in an aperture 47 in the first frame plate 12 respectively.

As best shown in Figure 7, the second

frame plate 13 has a cut-out portion 50 parts 51, 52 of which constitute abutments for limiting oscillation of the pallet fork 41.

The first frame plate 12 is provided with four apertures 53 which are aligned with the apertures 31 in the second frame plate 13 to provide access from the exterior to the staffs 32, 33, 34, 35.

A centre wheel staff 54 is mounted in bearing holes 55, 56 in the second bridge 11 and in the second frame plate 13 respectively. The first bridge 10 is provided with an aperture 60 through which a second hand pinion (not shown) may be introduced in order to support the latter on the centre wheel staff 54. The centre wheel staff 54 also extends through a cut-out portion 62 of the first frame plate 12. The centre wheel staff 54 carries a cannon pinion 70 and an hour wheel 71.

A mainspring barrel drum 63 is carried by a shaft 64 which is itself rotatably mounted in apertures in the first bridge 10 and in the second frame plate 13, the barrel drum 63 being mounted between the first bridge 10 and the second frame plate 13. The barrel drum 63 is insertable and withdrawable laterally of the first bridge 10 and second frame plate 13 without disassembling the bridges 10, 11 and frame plates 12, 13. The shaft 64 is axially located with respect to the first bridge 10 by means of a retaining clip 65. The shaft 64, which is mounted within and carries a barrel staff 66, has secured to its outer end a ratchet wheel 67 which is disposed within the cut-out portion 62.

The second frame plate 13 is spaced from the first bridge 10 by a winding stem bearing member 74 which is an injection moulding of a plastics material. The bearing member 74 is in the form of a block having projections 75, 76 which are respectively received in apertures 77, 78 in the bridge 10.

The bearing member 74 has cavities 80, 81 of larger and smaller diameters respectively, the cavities 80, 81 respectively engaging a larger diameter stem portion 82 and a smaller diameter stem portion 83 of a rotatable and longitudinally movable winding stem 84.

As shown in Figure 5, the larger diameter cavity 80 has surfaces 85, 86, 87 which respectively engage and support the larger diameter stem portion 82 in three orthogonal directions, i.e. from the top and from the left and right hand sides as viewed in Figure 5. Similarly, as seen in Figure 6, the smaller diameter cavity 81 has surfaces 90, 91, 92 which respectively engage and support the smaller diameter stem portion 83 in the same three orthogonal directions.

As shown in Figures 4 and 5, the second frame plate 13 engages the larger diameter stem portion 82 to prevent movement of the

latter in a fourth orthogonal direction, while as shown in Figures 4 and 6, the frame plate 13 carries a bearing pin 93 whose supper surface engages and supports the smaller diameter stem portion 83 to prevent movement of the latter in the fourth orthogonal direction.

The bearing member 74 is provided with a tapered hole 94 in which is disposed a setting lever pin 95, the setting lever pin 95 being mounted in the second frame plate 13. Mounted on the setting lever pin 95 is a setting lever 96 having a bent upturned end 97. The main portion of the setting lever 96 is disposed externally of the frame plate 13, but the end 97 extends through an aperture 100 in the second frame plate 13. The winding stem 84 has a flange 101 which is engaged by the upturned end 97. The setting lever 96 is prevented from becoming disengaged from the setting lever pin 95 by means of a setting lever holder spring 102.

The bearing member 74 is also provided with a cavity 103 in which is disposed a winding pinion 104 carried by the winding stem 84.

The bearing member 74 has an opening 105 therein in which there is fixedly secured a hollow metal pin 106. The pin 106 has threaded portions 107, 108 at opposite ends thereof, into which are screwed internally threaded bushes 110, 111 respectively. Threaded into the bush 110 is a screw 112 which passes loosely through an aperture 113 in the bridge 10. Threaded into the bush 111 is a screw 114 which passes through aligned apertures 115, 116 in the plates 12, 13 respectively. The screw 114 serves to secure the plates 12, 13 to the bearing member 74 while at the same time securing the setting lever holder spring 102 in position.

The parts of the timepiece movement assembly may be assembled as follows. Firstly the end portions 16 of the spacers 14 are inserted into the apertures 15 provided in the first bridge 10 and are caulked thereto. The staff 32 of the third wheel 36 is then mounted in the first bridge 10, and the second bridge 11 is then positioned on the spacers 14 by presenting the apertures 20 thereto. The second bridge 11 is thus spaced from the first bridge 10 by the flanged portions 22.

The bearing member 74 is then secured to the first bridge 10 after passing its projections 75, 76 into the apertures 77, 78 in the first bridge 10. The fourth wheel 37, the escape wheel 40, and the pallet fork 41 are then mounted in position while the centre wheel staff 54 is mounted in the second bridge 11. The winding pinion 104 and the setting lever pin 95 are then positioned as shown in Figures 4 and 5. The second frame plate 13 is then positioned by offering up its apertures to the spacers 14 and passing it

over the latter. Each staff of the gear train is then set in the corresponding bearing holes. After setting the second frame plate 13 in position, the balance wheel 42 is set in position.

After this, (a clutch lever 122 is secured to the second frame plate 13, while a crown wheel 123 is secured to the clutch lever 122 as shown in Figures 4 and 6. A minute wheel 124 is then disposed as shown in Figure 6. The first frame plate 12 then has its apertures offered up to the spacers 14 and is disposed so that the staffs fit into the corresponding bearing holes. When this is done, a bridge screw 28 is threaded into each of the spacers 14 and is secured so as to fix the first and second frames 12, 13 to the spacers 14.

After fixing the cannon pinion 70 to the centre wheel staff 54, the hour wheel 71 is also secured thereto. The setting lever 96 is then mounted on the setting lever pin 95 and is retained in position by the setting lever spring 102 which is in turn fixed to the first frame 12 by the screw 114. The barrel drum 63 is then inserted laterally of the bridges 10, 11 and the frame plates 12, 13 and is disposed in the appropriate position between the bridge 10 and frame plate 13 as shown in Figures 1 and 2. Finally, the ratchet wheel 67 is inserted onto the staff 64.

In the construction described above, the second bridge 11 is maintained in a fixed position with respect to the first bridge 10 while the second frame plate 13 is secured in a fixed position with respect to the first frame plate 12 simply by the means of the spacers 14 and bridge screws 28.

The cut-out portions 50, 62, bearing holes 30, 31, 55, 56, and the apertures 15, 20, 25, 26, 46, 47, 53, 60, 77, 78, 100, 113, 115, 116 in the bridges and frame plates can be made by simple pressing or drilling steps so that the construction shown in the drawings enables watch parts such as bridges and frame plates to be easily and accurately assembled. This is in contrast to a conventional watch in which the balance wheel, pallet fork and gear trains have usually been accommodated in spacers formed by recesses of a frame plate and a bridge, these recesses being machined by milling machines. This procedure involves a great deal of precise and complex machining and is therefore expensive. In contrast to this, the bridges and frame plates of the present invention may be produced in a press and machined in an automatic lathe, so that the parts of the watch movement may be positioned without the use of specially designed jigs and without necessitating the turning over of the watch movement.

The construction enables appropriate cut-out portions to be formed by changing the configurations of the first and second frame

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plates as shown by dotted lines P in Figure 3. The construction also enables the first frame plate 12 to serve to retain the clutch lever 122 as shown in Figure 4.

5 The complete barrel drum 63 together with the ratchet wheel 67 may be disassembled without the need to disturb any of the remaining parts.

10 No bending, off-setting or milling is required, whereby much time is saved in construction.

The provision of the apertures 38 in the second bridge 11 prevents the fourth wheel, the escape wheel, and the pallet fork from becoming inclined during assembly and therefore makes assembly easier.

20 The cut-out portion 50 provided in the second frame plate 13 serves to provide abutment members limiting the oscillation of the pallet fork, thereby dispensing with the need to provide the conventional banking pins.

25 In our co-pending Application No. 23736/72 (Serial No. 1,367,416) we have described and claimed a winding stem bearing assembly for use in a timepiece comprising a winding stem having larger and smaller diameter portions, a bearing block having cavities therein of larger and smaller diameters which respectively engage and support the larger and smaller diameter stem portions to prevent movement of each said portion in three orthogonal directions, and support means secured to the bearing block for engaging and supporting the larger and smaller diameter stem portions to prevent movement of each stem portion in a fourth orthogonal direction.

WHAT WE CLAIM IS:—

40 1. A timepiece movement assembly comprising first and second bridges, first and second frame plates, at least one spacer which spaces the first and second bridges from each other and which spaces the bridges from the frame plates, and a screw for securing the frame plates to the spacer, the bridges and frame plates being provided with apertured portions for accommodating elements of the movement.

50 2. An assembly as claimed in claim 1 in which the or each spacer has a flanged portion which is disposed between and in contact with the first and second bridges to space the latter apart.

55 3. An assembly as claimed in claim 1 or 2 in which the or each spacer has spaced apart portions which are respectively mounted in apertures in the bridges and frame plates.

60 4. An assembly as claimed in any preceding claim in combination with escapement and gear train elements of the movement which are carried by said bridges and frame plates and which are mounted in the apertured portions.

5. An assembly as claimed in claim 4 in which the said elements comprise staffs of a gear train, said staffs being rotatably mounted in bearing holes which are provided in the second frame plate.

6. An assembly as claimed in claim 4 or 5 in which the said elements comprise an oscillatory pallet fork, the second frame plate having a cut-out portion parts of which constitute abutments for limiting oscillation of the pallet fork.

7. An assembly as claimed in claim 6 in which the first bridge and the first frame plate respectively carry bearings in which is mounted a staff carrying a balance wheel, the balance wheel effecting oscillation of the pallet fork.

8. An assembly as claimed in claim 6 or 7 in which the pallet fork is carried by a staff which is rotatably mounted in bearing holes in the first bridge and second frame plate.

9. An assembly as claimed in any of claims 4 to 8 in which the first bridge and the second frame plate are spaced apart by a bearing member having cavities therein of larger and smaller diameters which respectively engage and support larger and smaller diameter stem portions of a winding stem to prevent movement of each said stem portion in three orthogonal directions, the second frame plate engaging the larger diameter stem portion and being provided with a bearing pin which engages the smaller diameter stem portion to prevent movement of each stem portion in a fourth orthogonal direction.

10. An assembly as claimed in any of claims 4 to 9 in which a mainspring barrel drum is mounted between the first bridge and the second frame plate, the barrel drum being insertable and withdrawable laterally of the first bridge and second frame plate without disassembling the bridge and frame plates.

11. An assembly as claimed in any of claims 4 to 10 in which the said elements comprise a centre wheel staff which is rotatably mounted in the second bridge and the second frame plate, the first bridge having an aperture through which a seconds hand pinion may be introduced in order to support the latter on the centre wheel shaft.

12. A timepiece movement assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

13. A wrist watch provided with an assembly as claimed in any preceding claim.

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plates as shown by dotted lines P in Figure 3.
The construction also enables the first frame plate 12 to serve to retain the clutch lever 122 as shown in Figure 4.

- 5 The complete barrel drum 63 together with the ratchet wheel 67 may be disassembled without the need to disturb any of the remaining parts.

10 No bending, off-setting or milling is required, whereby much time is saved in construction.

The provision of the apertures 38 in the second bridge 11 prevents the fourth wheel, the escape wheel, and the pallet fork from becoming inclined during assembly and therefore makes assembly easier.

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45 2. An assembly as claimed in claim 1 in which the or each spacer has a flanged portion which is disposed between and in contact with the first and second bridges to space the latter apart.

50 3. An assembly as claimed in claim 1 or 2 in which the or each spacer has spaced apart portions which are respectively mounted in apertures in the bridges and frame plates.

55 4. An assembly as claimed in any preceding claim in combination with escapement and gear train elements of the movement which are carried by said bridges and frame plates and which are mounted in the apertured portions.

5. An assembly as claimed in claim 4 in which the said elements comprise staffs of a gear train, said staffs being rotatably mounted in bearing holes which are provided in the second frame plate.

6. An assembly as claimed in claim 4 or 5 in which the said elements comprise an oscillatory pallet fork, the second frame plate having a cut-out portion parts of which constitute abutments for limiting oscillation of the pallet fork.

7. An assembly as claimed in claim 6 in which the first bridge and the first frame plate respectively carry bearings in which is mounted a staff carrying a balance wheel, the balance wheel effecting oscillation of the pallet fork.

8. An assembly as claimed in claim 6 or 7 in which the pallet fork is carried by a staff which is rotatably mounted in bearing holes in the first bridge and second frame plate.

9. An assembly as claimed in any of claims 4 to 8 in which the first bridge and the second frame plate are spaced apart by a bearing member having cavities therein of larger and smaller diameters which respectively engage and support larger and smaller diameter stem portions of a winding stem to prevent movement of each said stem portion in three orthogonal directions, the second frame plate engaging the larger diameter stem portion and being provided with a bearing pin which engages the smaller diameter stem portion to prevent movement of each stem portion in a fourth orthogonal direction.

10. An assembly as claimed in any of claims 4 to 9 in which a mainspring barrel drum is mounted between the first bridge and the second frame plate, the barrel drum being insertable and withdrawable laterally of the first bridge and second frame plate without disassembling the bridge and frame plates.

11. An assembly as claimed in any of claims 4 to 10 in which the said elements comprise a centre wheel staff which is rotatably mounted in the second bridge and the second frame plate, the first bridge having an aperture through which a seconds hand pinion may be introduced in order to support the latter on the centre wheel shaft.

12. A timepiece movement assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

13. A wrist watch provided with an assembly as claimed in any preceding claim.

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