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(54) Slip mechanism for use in a timepiece.

(57) A slip mechanism for use in a timepiece comprising a shaft member (20, 20-a, 20-b) made of metallic material; a pinion (22) which is fixed to a first portion (20-b) of the shaft member (20, 20-a, 20-b); and a toothed wheel (21) made of synthetic resin material, the toothed wheel (21) being drivingly connected to a second portion (20-a) of the shaft member (20, 20-a, 20-b) so as to permit rotation of the toothed wheel (21) to be transmitted therefrom to the shaft member (20, 20-a, 20-b) and also to permit slip to occur therebetween characterised in that the pinion (22) is made of synthetic resin material and that the second portion (20-a) of the shaft member (20, 20-a, 20-b) is an integral portion thereof which frictionally engages the toothed wheel (21).

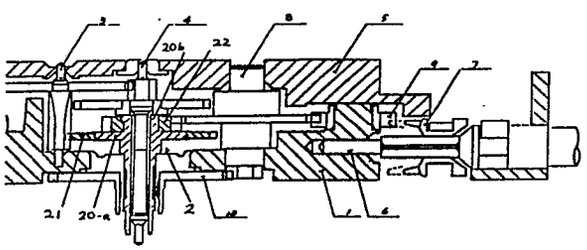

FIG 1

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SLIP MECHANISM FOR USE IN A TIMEPIECE

The present invention relates to a slip mechanism for use in a timepiece and although the invention is not so restricted, it relates more particularly to a slip mechanism incorporated in a minute wheel, of a timepiece.

In Figures 4 and 5 there are shown prior art slip mechanisms each of which is incorporated in a minute wheel, i.e. a centre wheel and pinion, of a timepiece.

The slip mechanism of Figure 4 is constructed to include an axle or centre wheel shaft 40 having an integral pinion 43 and made of a metallic material; a ring 41 made of a metallic material, the ring 41 being mounted on and drivingly engaging a portion 44 of the shaft 40, the portion 44 being spaced from the pinion 43; and a toothed wheel 42 made of a synthetic resin and frictionally engaging the ring 41 so as to be adapted to rotate the latter in a slipping manner. On the other hand, the slip mechanism of Figure 5 is constructed to include: a shaft 52 and integral pinion made of a first synthetic resin; and a toothed wheel 51 made of a second synthetic resin different from that of the pinion 50 and frictionally engaging the pinion 50 so as to be adapted to rotate the latter in a slipping manner.

However, the prior art construction of Figure 5 has the following problems:-

(1) Since the shaft 52 is made of a synthetic resin, it is difficult to fix it securely to the metallic hand of the prior art, so that the fixing of the hand cannot be easily automated;

(2) Since the pinion 50 is injection-moulded integrally with the finished shaft 52, the synthetic resin material to be used is limited because the synthetic resin employed in the shaft 52 must have a higher melting point than that employed in the toothed wheel 51.

(3) Since the accuracy of the inter-engaging surfaces of the toothed wheel 51 and the shaft 52 determines the performance of the slip mechanism of the finished product, the use of the synthetic resin for producing both these parts is unsatisfactory because it is difficult to make them perfectly round and concentric so that it is difficult to ensure a predetermined degree of slipping therebetween.

The prior art construction of Figure 4 has the following problems:

(4) When the ring 41 is fixed on the shaft 40, the shaft 40 is liable to be warped, swelled or twisted so as to fail to ensure a predetermined slip torque; and

(5) Since the machining of the shaft 40 having the pinion 43 is very complicated, this involves a high production cost which leads to an increase in the cost for the finished product.

It is, therefore, an object of the present invention to solve the above-specified problems and to provide an inexpensive and durable slip mechanism for use in a timepiece which has stable slip torque with little variation.

According to the present invention, there is therefore provided a slip mechanism for use in a timepiece comprising a shaft member made of metallic material; a pinion which is fixed to a first portion of the shaft member; and a toothed wheel made of synthetic resin material, the toothed wheel being drivingly connected to a second portion of the shaft member so as to permit rotation of the toothed wheel to be transmitted therefrom to the shaft member and also to permit slip to occur therebetween characterised in that the pinion is made of synthetic resin material and that the second portion of the shaft member is an integral portion thereof which frictionally engages the toothed wheel.

Preferably, the pinion and/or the toothed wheel has been moulded onto the shaft member.

Preferably, the pinion and the toothed wheel are made of the same synthetic resin material.

The shaft member and the pinion preferably have inter-engaging surfaces which prevent relative rotation therebetween.

The shaft member may have an undercut portion within which a part of the pinion is located.

Preferably, the slip mechanism is incorporated in a minute wheel of a timepiece.

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

Figure 1 is a section showing the main portion of a wheel train of a timepiece provided with a slip mechanism according to the present invention;

Figures 2 and 3 are a plan view and a section respectively of a minute wheel or a centre wheel-and-pinion according to one embodiment of the present invention and forming part of the structure shown in Figure 1; and

Figures 4 and 5 are sections showing minute wheels or centre wheels-and-pinions of the prior art.

In Figure 1 there is shown part of a timepiece comprising a timepiece frame 1 and a bridge 5. Rotatably mounted in these parts is a minute wheel or centre wheel-and-pinion 2 which comprises an axle or shaft 20 having a ring or flange 20-a, a toothed wheel 21 and a pinion 22. The minute wheel 2 forms part of a wheel train comprising a third wheel 3 and a seconds or fourth wheel 4. There is also provided a stem 6 which can be actuated from the outside; a clutch wheel 7 se-

cured to the stem 6; a time correction wheel 8; a setting wheel 9; and an hour wheel or calendar hour wheel 10.

When the stem 6 is actuated manually in an axial direction for correcting the time, the clutch wheel 7 is moved forward to the position, as indicated by broken lines, in which it comes into meshing engagement with the setting wheel 9 so that rotation of the stem 6 can be transmitted to the time correction wheel 8. The rotations of the clutch wheel 7 are transmitted through the setting wheel 9 and the time correction wheel 8 to the centre wheel-and-pinion 2 and to the hour wheel 10, thereby to correct the time. Since a slippage is then caused at the centre wheel-and-pinion or minute wheel 2 between the flange 20-a and the wheel 21, the time is corrected with the third wheel 3 and the fourth wheel, i.e. the seconds wheel, 4 being fixed.

The minute wheel 2 will now be described in more detail with reference to Figures 2 and 3.

The centre wheel shaft or axle 20 is made of a metallic material and has a guide or bevelled portion 20-f for mounting a timepiece hand (not shown) into position, the shaft 20 also having integral rings 20-a and 20-b for holding a centre or toothed wheel 21 and a centre wheel pinion 22 respectively, as will be described hereinafter. The ring 20-b for guiding and holding the centre wheel pinion 22 is formed with an undercut portion 20-d for receiving a part 24 of the centre wheel pinion 22. The shaft 20 and pinion 22 have inter-engaging flat surfaces 20-e, 23 to prevent relative rotation therebetween.

The centre wheel 21 and the centre wheel pinion 22 are formed by insert-moulding them onto the centre wheel shaft 20. For example, the centre wheel shaft 20 may be positioned in an insert-mould so that the centre wheel 21 and the centre wheel pinion 22 can be injection-moulded simultaneously thereonto.

Moreover, the centre wheel 21 is shrunk onto the ring 20-a of the centre wheel shaft 20 so as to frictionally engage the latter in such a way that drive can be transmitted from the toothed wheel 21 to the shaft 20 while permitting slip to occur therebetween. Thus the slip torque is determined by the fastening force resulting from the moulding shrinkage of the centre wheel 21 on the centre wheel shaft 20, i.e. the co-efficient of friction between the plastics material of the centre wheel 21 and the engagement portion of the ring 20-a of the metallic shaft 20.

Therefore, the slip torque of the centre wheel 21 can be stabilised at a low value either by improving the surface state of the engagement portion of the ring 20-a of the centre wheel shaft 20 by a polishing-finish or a barrelling-polish, or by providing effective lubrication of the engagement portion of the ring 20-a of the centre wheel shaft 20, e.g. by means of a fluoro-resin thin film such as Teflon (Registered Trade Mark).

Since, moreover, the shaft 20 is formed with the undercut and side surface portions 20-d, 20-e at the pinion mounting portion of the shaft, relative movement therebetween will not occur.

Because of this construction, quality will not be adversely affected even if the centre wheel 21 and pinion 22 are moulded of a common plastics material, and they can be formed simultaneously to simplify the machining.

The slip torque mentioned above can be better stabilised either by using an oil impregnated plastics material or by impregnating oil into the engagement face of the centre wheel 21 by annealing the latter in the oil.

Since the slip torque of the centre wheel-and-pinion 2 is stabilised at the aforementioned low value, the wheels concerned with the time correction, such as the clutch wheel 7, the setting wheel 9, the time correction wheel 8 and the third wheel 3 can be made of a softer material so as to reduce the cost of the timepiece drastically.

In the construction shown in Figures 1 to 3, the following effects can be attained:-

(1) Since the hand mounting portion 20-f is made of metal, the quality and reliability, such as the durability, in the fixing of the metallic hand (not shown) can be substantially improved;

(2) Since the centre wheel shaft 20 which constitutes the insert part during moulding, is made of metal, the degree of freedom in selecting the resin material to be used for the wheel 21 and pinion 22 can be so increased that resin materials having specific desired characteristics can be freely used;

(3) Since the centre wheel shaft or insert part 20 is made of metal, the engagement face thereof with the centre wheel 21 can be polished, barrelled or lubricated to stabilise the slip torque. Moreover, since the insert part 20 is made of metal, the size of the centre wheel ring 20-a can be less variable, thus enabling its roundness or eccentricity to be improved so as to stabilise the slip torque;

(4) Since the ring 20-a which engages the centre wheel 21 is integral with the centre wheel shaft 20, it is less warped, swelled or twisted than the separate ring press fitting type 41 of the prior art so that the slip torque can be highly stabilised; and

(5) Since the pinion 22 is moulded of plastics, the centre wheel shaft 20 is not formed integrally with the pinion 22 so that its machining cost can be reduced.

Since no gear milling is required for the centre wheel shaft 20 moreover, the centre wheel shaft 20

with the pinion 22 can be machined by a general purpose automatic machine whereas these parts have had to be machined in the prior art by a special automatic machine.

Since the centre wheel 21 and the pinion 22 can be simultaneously moulded unlike the separate parts of the prior art, the step of press fitting the ring 41 on the centre wheel shaft 40 of the prior art can be avoided so as to simplify the production process.

Thus, in the production of the centre wheel shaft or the wheel 21 or pinion 22, the simplest procedures can be used to provide the centre wheel-and-pinion 2 as a finished product at the most reasonable cost.

As will be appreciated, the centre wheel-and-pinion 2 according to the present invention compares favourably, in quality and production cost, with many types of the prior art.

Claims

1. A slip mechanism for use in a timepiece comprising a shaft member (20, 20-a, 20-b) made of metallic material; a pinion (22) which is fixed to a first portion (20-b) of the shaft member (20, 20-a, 20-b); and a toothed wheel (21) made of synthetic resin material, the toothed wheel (21) being drivingly connected to a second portion (20-a) of the shaft member (20, 20-a, 20-b) so as to permit rotation of the toothed wheel (21) to be transmitted therefrom to the shaft member (20, 20-a, 20-b) and also to permit slip to occur therebetween characterised in that the pinion (22) is made of synthetic resin material and that the second portion (20-a) of the shaft member (20, 20-a, 20-b) is an integral portion thereof which frictionally engages the toothed wheel (21).

2. A slip mechanism as claimed in claim 1 characterised in that the pinion (22) and/or the toothed wheel (21) has been moulded onto the shaft member (20, 20-a, 20-b).

3. A slip mechanism as claimed in claim 1 or 2 characterised in that the pinion (22) and the toothed wheel (21) are made of the same synthetic resin material.

4. A slip mechanism as claimed in any preceding claim characterised in that the shaft member (20, 20-a, 20-b) and pinion (22) have inter-engaging surfaces (20-e, 23) which prevent relative rotation therebetween.

5. A slip mechanism as claimed in any preceding claim characterised in that the shaft member (20, 20-a, 20-b) has an undercut portion (20-d) within which a part (24) of the pinion (22) is located.

6. A slip mechanism as claimed in any preceding claim characterised in that the slip mechanism is incorporated in a minute wheel (2) of a timepiece.

7. A slip mechanism for a timepiece, comprising: an axle made of a metallic material; a pinion made of a synthetic resin integrally with said axle; and a toothed wheel made of synthetic resin formed so integrally with said axle as to rotate in a slipping manner.

8. A slip mechanism for a timpiece of claim 7 wherein said axle and toothed wheel are formed by simultaneous moulding.

9. A slip mechanism for a time piece of claim 7 wherein said toothed wheel and pinion are made of the same synthetic resin.

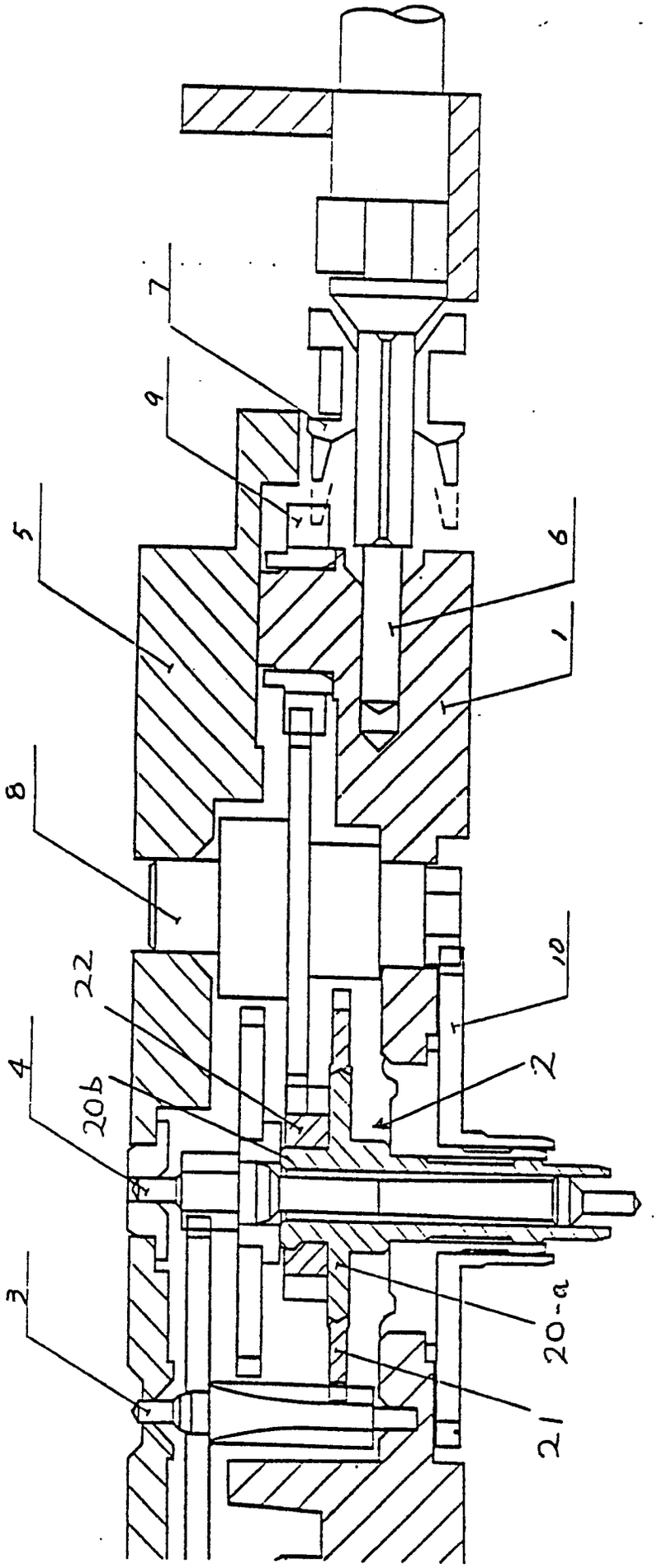

FIG 1

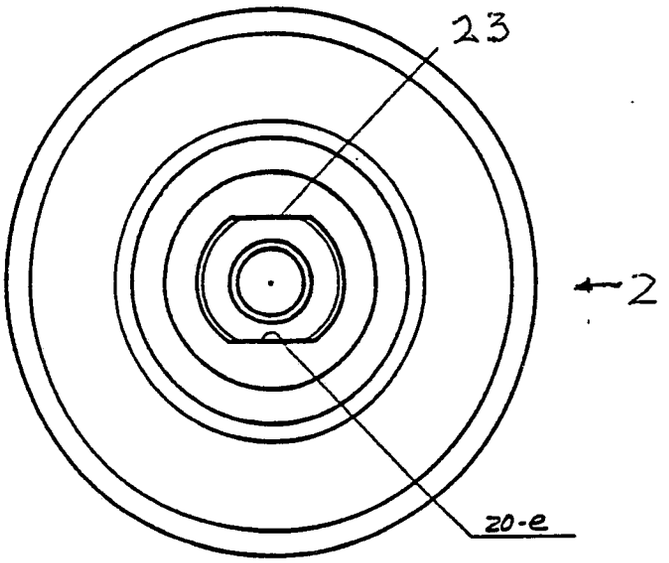

FIG 3

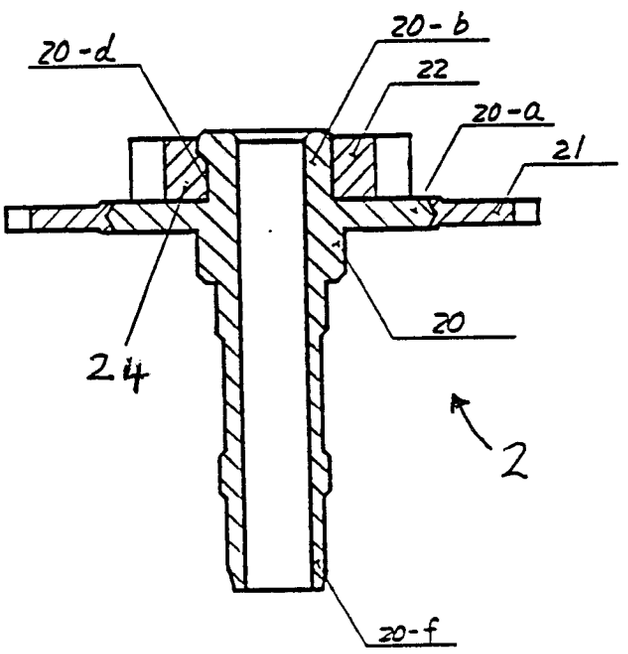

FIG 2

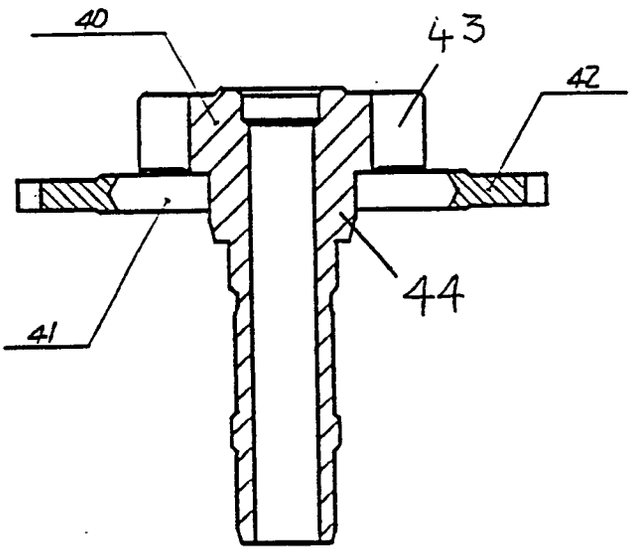

FIG 4

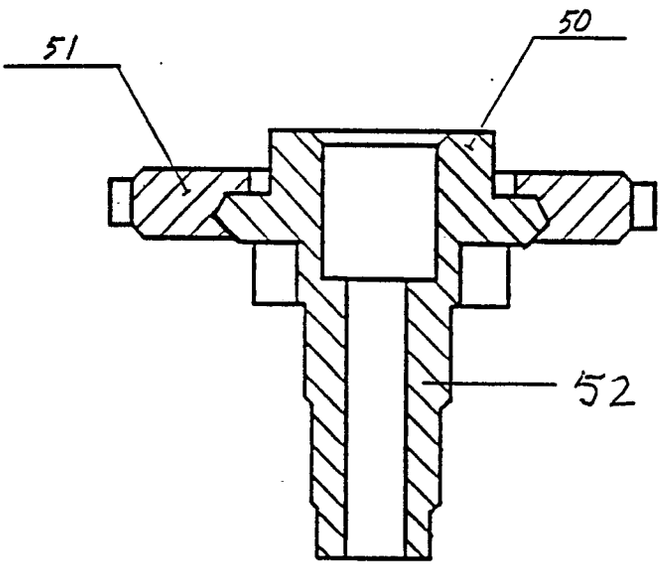

FIG 5