Aug. 14, 1951 W. P. GALLAGHER 2,564,103

CLUTCH CONSTRUCTION

Filed March 25, 1946

2 Sheets-Sheet 1

Fig. 1.

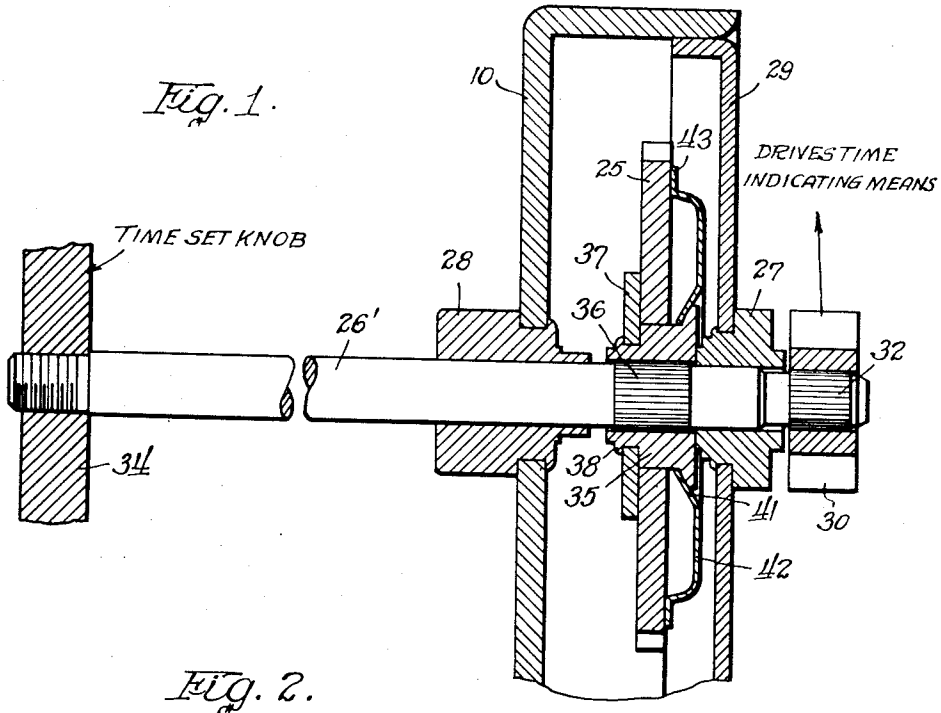
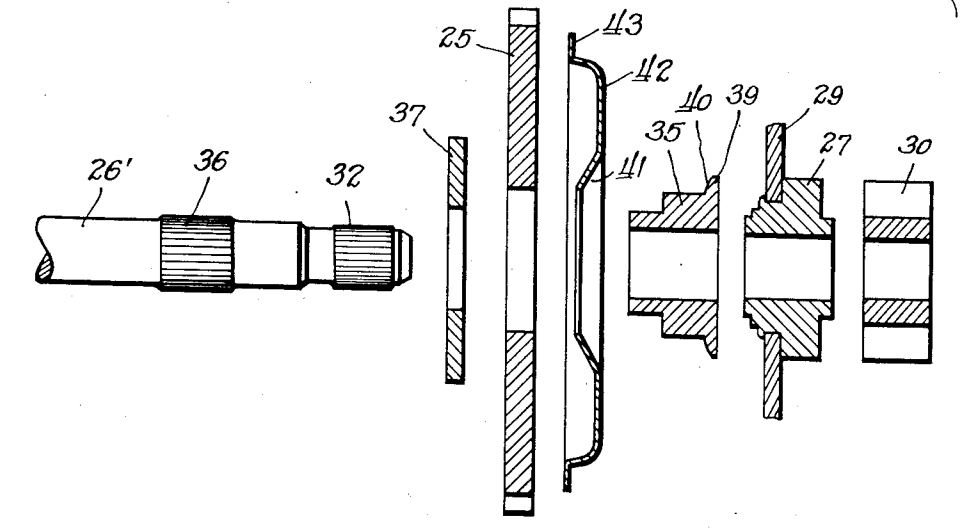


Fig. 2.



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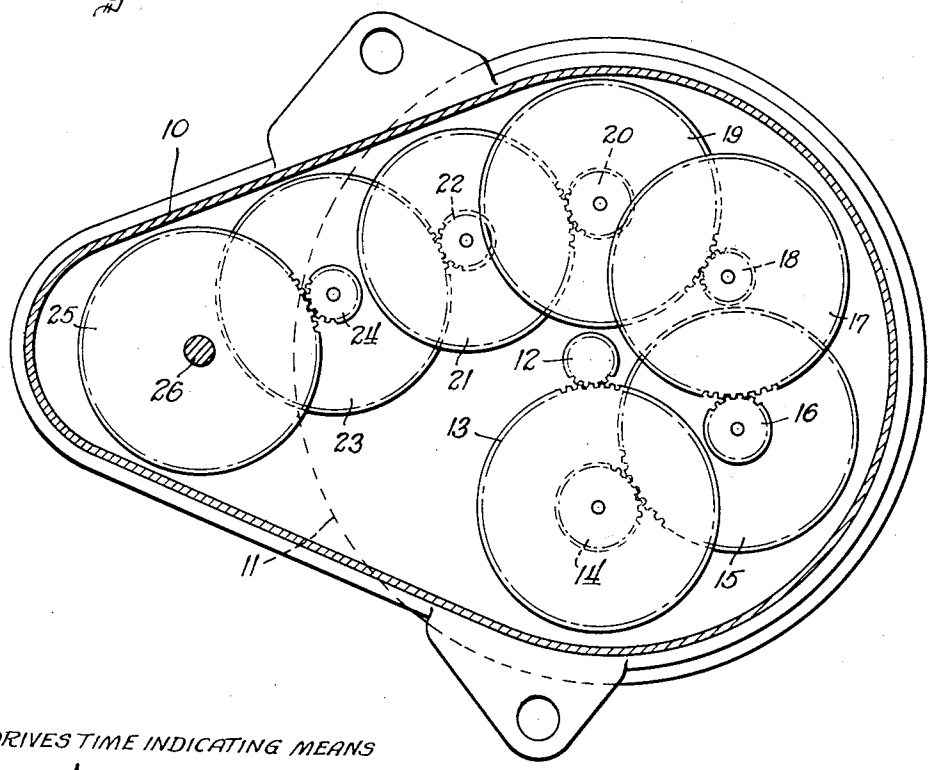
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Fig. 3.



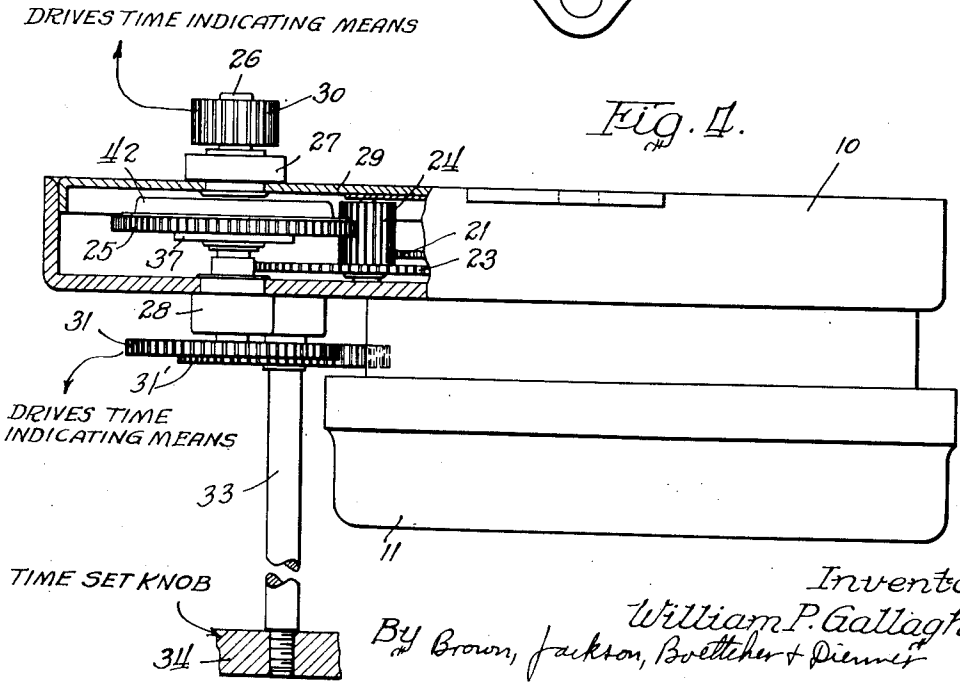


Fig. 4.

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CLUTCH CONSTRUCTION

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1 Claim. (Cl. 64—30)

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My invention relates, generally, to clutch constructions and it has particular relation to the construction of clutches for transmitting relatively small amounts of torque such as used for driving clock mechanisms and the like.

It is customary to provide a synchronous electric motor for driving a time indicating mechanism. Usually the motor operates at relatively high speed, such as 450 R. P. M. This speed must be reduced in order to drive a minute hand at one revolution per hour and the hour hand one revolution during each 12 hours. A reduction gear train is employed for this purpose.

It is conventional to reduce the motor speed by a suitable gear train to one revolution per hour. This speed is suitable for driving the minute hand. Additional gear reduction is provided for driving the hour hand.

It is of course necessary to provide for setting the minute and hour hands to the correct time when the clock is first placed in operation and afterwards when the motor becomes de-energized by power failure or for other reasons. Because of the relatively great gear reduction involved, it is not practical to rotate the reduction gear train while the minute and hour hands are being set. Therefore, some means, such as a clutch, is provided to permit setting of the hands without at the same time operating the gear train.

The object of my invention, generally stated, is to provide a clutch for a reduction gear train for a clock mechanism or the like which shall be simple and efficient in operation, have relatively long life and which may be readily and economically manufactured and installed.

Another object is to locate the clutch within the housing of the reduction gear train.

A further object is to interconnect frictionally the last gear wheel of the gear train and a shaft which drives the time indicating mechanism to provide driving connection therebetween while permitting rotation of the shaft to set the time indicating means without operating the gear train.

A still further object is to employ a face of the last gear wheel as a part of the clutch.

Another object is to provide substantially line contact between a clutch spring washer and a shoulder on the clutch bushing fast on the shaft.

Further objects of my invention will, in part, be obvious and in part appear hereinafter.

My invention is disclosed in the embodiments thereof shown in the accompanying drawings and it comprises the features of construction, combination of elements and arrangements of parts

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which will be exemplified in the constructions hereinafter set forth and the scope of the application of which will be indicated in the appended claim.

For a more complete understanding of the nature and scope of my invention reference may be had to the following detailed description taken in connection with the accompanying drawings in which:

Figure 1 is a sectional view through a portion of the reduction gear casing showing the clutch assembled on a time setting shaft;

Figure 2 shows the parts making up the clutch disposed in spaced relation and shown in section to more clearly illustrate the details of construction involved;

Figure 3 is a top plan view of the gear case with the cover removed; and

Figure 4 is a view, in side elevation, of the gear case and motor mounted thereon, a portion of the gear case and cover being shown in section to illustrate the internal details of construction.

Referring now particularly to Figures 3 and 4 of the drawings, it will be observed that the reference character 10 designates a gear case which is preferably formed of sheet metal and which has mounted thereon a small synchronous electric motor 11. The motor 11 may be of conventional construction and, in so far as the present invention is concerned the details thereof are not important. The motor 11 is arranged to drive a pinion 12, it being understood that the pinion 12 is mounted on a shaft on which the motor rotor is also mounted. The speed at which the pinion 12 rotates depends of course upon the design of the motor 11 and the frequency of the alternating current with which it is energized. For illustrative purposes it may be assumed that the pinion 12 is driven by the motor 11 at a speed of 450 R. P. M.

As indicated hereinbefore it is necessary to reduce the speed of the pinion 12. This may be accomplished by a gear train comprising gear wheels and pinions 13 through 25. It will be noted that the gear wheels and pinions 13—25 are mounted within the gear case 10 and are suitably positioned therearound so as to provide the necessary driving engagement therebetween. The gear train terminates in the gear wheel 25 which will be referred to hereinafter as clutch gear wheel 25.

The clutch gear wheel 25 is mounted for rotation with respect to a shaft 26 and, as will hereinafter appear, is arranged to be frictionally connected thereto through a spring disc clutch. The

shaft 26 is rotatably supported by bearings 27 and 28 which are carried respectively in a gear case cover 29 and the gear case 10 as shown in Figure 4.

In the embodiment of the invention shown in Figure 4 the shaft 26 carries at one end a pinion 30 and at its other end a gear wheel 31. The gear reduction between the pinion 12 and the clutch gear wheel 25 is such that the latter rotates at a speed of one revolution per hour. Accordingly, the pinion 30 and gear wheel 31 are driven at this speed. The pinion 30 may be arranged to drive an hour hand through a further reduction gear train (not shown). This is indicated diagrammatically on the drawing. Likewise the gear wheel 31 is indicated as driving time indicating means. The gear wheel 31 can be arranged to drive a second gear wheel 31' which in turn drives the minute hand at a speed of one revolution per hour.

Referring now to Figures 1 and 2 of the drawings, it will be observed that a time setting shaft 26' is provided which corresponds to the shaft 26 previously referred to and shown in Figures 3 and 4 of the drawings. The time setting shaft 26' may be used where the pinion 30 is arranged to drive both the minute hand and the hour hand. At its outer end the shaft 26' may be knurled, as indicated at 32. The pinion 30 may be pressed on the knurled portion of the shaft 26' and thereby held mechanically in place.

At its rear end the time setting shaft 26' has a time set knob 34 threaded thereon. The knob 34 permits manual rotation of the time setting shaft 26' for the purpose of rotating the pinion 30 to set the hour and minute hands as may be desired.

When the construction shown in Figure 4 is employed, a time setting shaft 33 and knob 34 may be provided for manually rotating the gear wheel 31' which meshes with the gear wheel 31.

In either of the constructions shown in Figure 1 or Figure 4 of the drawings it is desirable to provide frictional connections between the clutch gear wheel 25 and the shaft 26' or 26 so as to permit either of these shafts to be rotated for setting the time indicating means without effecting rotation of the clutch gear wheel 25 and the gear train which drives the same. This is accomplished by a clutch mechanism the construction of which is identical for both embodiments shown in Figures 2 and 4. Accordingly, it will be described in detail with reference to Figure 1, it being understood that the description is applicable to the construction shown in Figure 4.

Mounted on the shaft 26' is a clutch bushing 35. The bushing 35 is held in place by a knurled section 36, the bushing 35 being pressed over the same.

It will be observed that the clutch gear wheel 25 is carried by the bushing 35. The clearance between the clutch gear wheel 25 and the outer periphery of the bushing 35 is such that the former is free to rotate relative to the latter in so far as direct engagement therebetween is concerned. The clutch gear wheel 25 is held in place on the bushing 35 in part by a clutch washer 37 which in turn is secured to the bushing 35 by being ring staked as indicated at 38.

The clutch bushing 35 is provided with an integrally formed shoulder 39 the outer diameter of which is substantially less than the diameter of the clutch gear wheel 25. The shoulder 39 has a convex curved surface 40 which faces the gear wheel 25 and which is arranged to have a substantially line contact engagement with a frusto-conical surface 41 formed in a clutch spring disc 42. At its outer periphery the clutch spring disc 42 has an annular flat portion 43 which is arranged to bear against the adjacent flat surface of the clutch gear wheel 25.

The clutch spring disc 42 has sufficient inherent resiliency to provide a frictional driving connection between the clutch gear wheel 25 and the clutch bushing 35. Because of the line contact provided by the curved surface 40 on the shoulder 39, the clutch spring disc 42 rotates with the clutch gear wheel 25 and relative to the bushing 35 when the shaft 26' is manually rotated. It will be understood however that the clutch spring disc 42 is rotatable relative to the clutch gear wheel 25 but because of the difference in frictional engagement between the clutch spring disc 42 and the clutch gear wheel 25 on the one hand and between the clutch spring disc 42 and the curved surface 40 of the clutch bushing shoulder 39 on the other hand, the relative rotation takes place as described.

The clutch spring disc 42 may be arranged to transmit various amounts of torque between the clutch gear wheel 25 and the clutch bushing 35. In the embodiment of the invention disclosed in Figures 1 and 2 the construction is such as to transmit twenty-one inch pounds of torque. However, the amount of torque transmitted may be more or less. It may be even as low as five inch pounds.

It will be understood that the showing in the drawings of the various parts making up the clutch is at a greatly enlarged scale. This is for the purpose of more clearly illustrating the constructional features of the invention. In a particular embodiment of the invention which has been constructed the clutch gear wheel 25 has an outside diameter of .773''. The clutch spring disc has an outside diameter of $^{45}/_{64}$''. The bushing 35 has an outside diameter of .266''. It will be understood that these dimensions are given solely for the purpose of illustration and are not to be considered as limiting the scope of the invention other than as set forth in the appended claim.

Various materials can be used in making the gear wheels and pinions forming the gear train. For example, the clutch gear wheel 25 may be of yellow brass having a tin plate finish. The clutch spring disc 42 may be formed of stainless steel having a thickness of about .007''. The clutch bushing 35 may be formed of brass rod screw stock. The time setting shaft 26' may be formed of mirror finished steel.

Since certain further changes can be made in the foregoing constructions without departing from the spirit and scope thereof, it is intended that all matters shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

In combination, a rotatable circular drive member having a friction drive surface, a shaft driven by said drive member, a clutch bushing fast on said shaft having a shoulder substantially smaller in diameter than the diameter of said drive member and axially spaced therefrom and presenting a convex curved surface thereto, and a clutch spring disc having a flat outer annular portion for frictionally engaging said surface and a frusto-conical inner portion for frictionally engaging said convex curved surface, said frictional engagement of said disc with said drive surface and said convex surface being such as to allow

initial slippage to occur between said disc and said convex surface.

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