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(54) FREEWHEEL

(71) I, TAKAZI NAKANO of Japanese Nationality, of 1122 Banchi, Hiokiso Nishimachi, Sakai City, Osaka Prefecture, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, 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 a freewheel to be used for the motive power transmission mechanism of vehicles, such as bicycles and motorcycles, and other machines.

In one conventional freewheel mechanism, a sprocket wheel having teeth at its periphery for engagement with a chain is provided at its inside circumferential surface with saw-toothed ratchet teeth, and, on a part of the periphery of the body which is fitted in the sprocket wheel there are provided pins which are always urged to protrude by a spring so that their tips are brought into contact with the ratchet teeth. With this arrangement, when the sprocket wheel is rotated in one direction, the body is rotated together with the sprocket wheel by engagement of the pins with the ratchet teeth, and when the wheel is rotated in the other direction or when the sprocket wheel rotates at a speed lower than that of the body, in the one direction, the pins ride over the ratchet teeth so that the sprocket wheel rotates independently of the body.

In the above conventional mechanism, in order to provide pins at the outer circumferential surface of the body, the body must have a comparatively large size. A wheel having a smaller size raises problems in its manufacture and strength.

In view of the above, the present invention has been devised to eliminate the defect of the conventional freewheel by placing the ratchet part at the lateral side of the wheel and to provide an excellent freewheel which enables the ratchet mechanism always to be disposed at a standard position, irrespective of the size of the sprocket wheel, to standardize the parts for simplification of manufacture, and to increase the number of pins so as to make the freewheel withstand a larger torque.

According to the invention there is provided a freewheel mechanism comprising:

a body having a boss with a screw thread formed on its outer peripheral surface and a flange at one end thereof; catch-accommodating holes bored parallel with the central axis of the body into the flange from the inner face thereof; catches fitted in the catch-accommodating holes in such a manner that they are urged by springs to protrude partly from the catch-accommodating holes; a sprocket wheel having at one side thereof a number of tapered catch-receiving grooves arranged at a constant radius; and a retaining ring to be screwed to the body; the flange of the body and the retaining ring retaining therebetween the sprocket wheel in such a fashion that the sprocket wheel can be rotated freely only in one direction on the body.

The invention will further be described with reference to the accompanying drawings, of which:-

Figure 1(A) is a vertical section of one embodiment of the invention;

Figure 1(B) is a vertical section of another embodiment of the invention;

Figure 1(C) is a section of another embodiment of the invention;

Figure 2(A) is a view of a sprocket wheel of a freewheel in accordance with the invention;

Figure 2(B) is a view of a freewheel body used in conjunction with the sprocket wheel of Figure 2(A);

Figure 2(C) is a view of a freewheel bearing of the arrangement of Figures 2(A) and 2(B); and

Figure 2(D) is a part-section through the

sprocket wheel of Figure 2(A).

In the drawings, numeral 1 denotes the body with a boss of a freewheel. Formed in a bore through the body 1 are female screw threads 1a for screw engagement with the outer circumferential surface of a hub. The body 1 has at one end a flange 2, the inner face of which is disposed opposite one side of a sprocket wheel 5. The body 1 has a male screw thread 1b formed on its outer periphery.

On the inner face of the flange of the body 1, there are provided at least two pin-accommodating holes 1c bored in parallel with the central axis of the body 1. These pin-accommodating holes 1c are arranged at appropriate intervals. In each pin-accommodating hole 1c, a spring 3 and a pin 4 are fitted so that the pin 4 is urged to protrude partly from the inner face 2a of the flange 2 by the force of the spring 3.

The number of the above pin-accommodating holes 1c is determined according to the torque applied to the sprocket wheel. Depending on the force of the spring 3, a steel ball may be used as a catch in place of the pin 4.

Loosely fitted to the outer circumferential surface of the body 1 is a sprocket wheel 5 having the required number of teeth. A number of pin-receiving grooves 5a are provided at equal intervals on one side of the sprocket wheel 5, i.e. on the side opposite to the inner face 2a of the flange 2. The distance between the pin-receiving grooves 5a is made related to the distance between the above pin-accommodating holes so that all of the pins fitted in the pin-accommodating holes 1c are simultaneously locked by or separated from the pin-receiving grooves 5a. The pin-receiving grooves 5a are in an elliptical form and are made on one lateral surface of the sprocket wheel, as shown in Figure 2(A). Each of the pin-receiving grooves 5a is tapered in depth so that the groove 5a is deep at one end and gradually becomes shallow as it comes to the other end, finally rising to the same level as the sprocket wheel surface, as shown in Figure 2(D). Because of this configuration of the grooves 5a, both the sprocket wheel 5 and the body 1 are rotated together in only one direction by the engagement between the pins 4 and the pin-receiving grooves 5a, and in case of rotation in the other direction, the pins 4 slide up the tapered surface of the grooves to release the engagement between the pins and the grooves, thus constituting a ratchet mechanism.

To the male screw thread 1b on the outer circumference of the body 1 a retaining ring 7 is screwed. This retaining ring 7 is provided on one side with an annular ball-receiving groove 7a. In this ball-receiving groove 7a a number of balls 6 are placed and the retaining ring 7 is screwed to the male screw thread 1b in such a manner that it presses the balls 6 onto the lateral side of the sprocket wheel 5. Thus, the sprocket wheel 5 is rotatably supported between the retaining ring 7 and the flange 2 of the body 1. In the present embodiments, the above-mentioned balls 6 are brought into tight contact with one surface of the sprocket wheel as shown in Figure 1(C), but balls may sometimes be brought into tight contact with the other surface of the sprocket wheel as shown in Figure 1(A) and Figure 1(B). In this case, a ball-receiving groove 1d similar to the above-mentioned ball-receiving groove 7a is provided in the inner face of the flange radially beyond the pin-accommodating portion of the flange, as shown in Figure 1(A), or radially within the pin-accommodating portion as shown in Figure 1(B). A number of balls 6 are placed in this groove 1d to bring them into contact with the surface of the sprocket wheel 5. In this manner, the balls 6 are brought into contact with both lateral surfaces of the sprocket wheel to give smooth rotation of the sprocket wheel in relation to the body and to prevent difficulties of rotation which may be caused by a large torque. Also, by means of this ball bearing arrangement the sprocket wheel is supported under pressure on the flange side, while it is allowed to rotate smoothly.

Moreover, it can be so devised that an annular groove 5b is provided on the inner face of the sprocket wheel 5 so that the balls 6 are at all times kept in contact with the same circumferential surface of the sprocket wheel. Furthermore, a cover C can be provided on both sides of the sprocket wheel 5 so as to cover the gap between the sprocket wheel 5 and the flange and the gap between the sprocket wheel and the retaining ring 7, thereby preventing entry of rain water, etc. into such gaps.

The present invention has such advantages that because the ratchet mechanism is provided at one lateral side of the sprocket wheel, it becomes possible to dispose the ratchet mechanism at all time at a standard position, without regard to the size of the wheel, whereby manufacturing is made easy and the number of pins can be increased easily to withstand a larger torque.

WHAT I CLAIM IS:-

1. A freewheel mechanism comprising: a body having a boss with a screw thread formed on its outer peripheral surface and a flange at one end thereof; catch-accommodating holes bored parallel with the central axis of the body into the flange from the inner face thereof; catches fitted in the catch-accommodating holes in such a manner that they are urged by springs to protrude partly from the catch-

accommodating holes; a sprocket wheel having at one side thereof a number of tapered catch-receiving grooves arranged at a constant radius; and a retaining ring to be screwed to the body; the flange of the body and the retaining ring retaining therebetween the sprocket wheel in such a fashion that the sprocket wheel can be rotated freely only in one direction on the body.

2. A freewheel mechanism as Claimed in Claim 1, wherein the retaining ring locates a number of balls in an annular groove in one side thereof and the balls are in contact with the sprocket wheel so as to enable the sprocket wheel to rotate smoothly.

3. A freewheel mechanism as claimed in claim 1, wherein the flange of the body locates a number of balls in an annular groove in the inner surface of the flange opposite to the sprocket wheel and the balls are in contact with the sprocket wheel so as to enable the sprocket wheel to rotate smoothly.

4. A freewheel mechanism as claimed in Claim 1, wherein a number of balls are located in an annular groove in one side of the retaining ring and in an annular groove in the inner surface of the flange of the body so as to enable the sprocket wheel to rotate smoothly.

5. A freewheel mechanism as claimed in any of the preceding claims, wherein a cover is provided to cover a gap between the sprocket wheel and the flange of the body and a gap between the sprocket wheel and the retaining ring for preventing entry of water into the gaps.

6. A freewheel mechanism substantially as hereinbefore described with reference to the accompanying drawings.

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

FIG. 1(A)

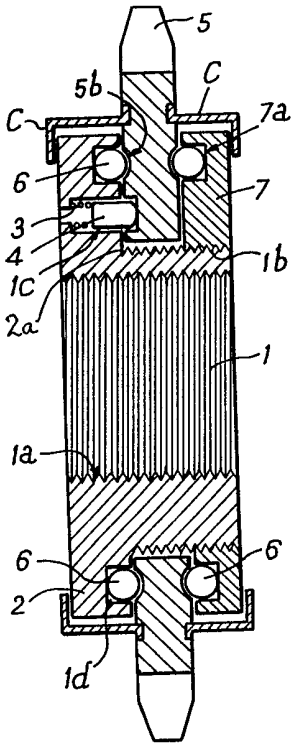

FIG. 1(B)

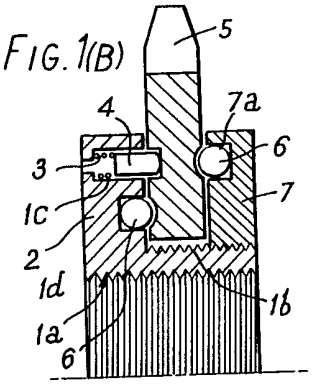

FIG. 1(C)

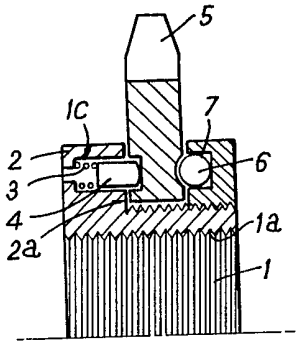

FIG. 2(A)

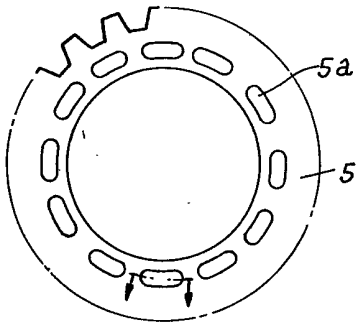

FIG. 2(B)

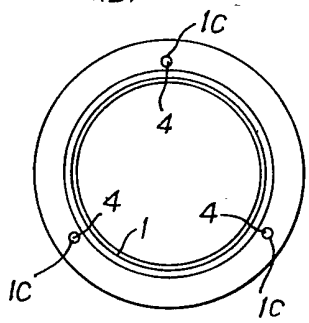

FIG. 2(C)

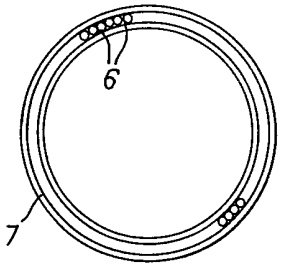

FIG. 2(D)