The present invention relates generally to motor-driven toys, and more particularly to a mechanism for transmitting power to a driven member thereof.

Miniature motors of high-speed are employed for motivating toys of various types. Such high-speed motors, as for example, a miniature one-cylinder internal combustion engine having a speed of from approximately 15,000 to 25,000 R. P. M., are of very low power and, consequently, in direct drive arrangements may be killed or stalled readily upon the sudden application of opposing force against the action of the motor. A force sufficient to kill a miniature high-speed motor is met with in starting and accelerating a toy wheeled vehicle, the power of such motor being too weak to overcome the inertia of the vehicle. Though special gear mechanisms may be employed for drivingly connecting the motor to the wheels, such devices are usually too complicated for application in toys, are expensive to manufacture, and often substantially reduce the speed of the vehicle.

It is an object of this invention to provide a simple, yet efficient mechanism for imparting driving power to a driven member from a motor of low power, and which is especially suited for use in a toy.

It is another object of this invention to provide a motor-driven toy wherein a propulsion wheel thereof is drivingly connected to a miniature motor in such a way that the full force of inertia opposing motion of the vehicle is not applied against the motor during starting operations.

Further objects and advantages of the invention will become apparent from the following part of the specification, in which the details of construction and the mode of operation of a preferred embodiment of the invention are described with reference to the attached drawing which is for illustrative purposes only, and wherein:

Fig. 1 is a perspective view of a toy racing car embodying the invention; and

Fig. 2 is a vertical section of a propulsion wheel which constitutes the left front wheel of the racing car shown in Fig. 1, and shows such wheel associated with the motor of the car.

Referring to the drawing, reference numeral 10 designates the body or frame of a toy vehicle, two free wheels of which are shown at 11 and 12, and a propulsion wheel at 13. The propulsion wheel 13 is drivingly connected to the miniature one-cylinder internal combustion engine 14 mounted in the front end of the vehicle.

Referring to Fig. 2 of the drawing, reference numeral 15 designates the drive shaft of the engine 14. It has a shaft extension 16 of reduced diameter, and an annular ridge or ruff 17 at the base of the extension 16 for holding the shaft against axial movement thereof in the engine. The shaft extension 16 is threaded as indicated at 18, to receive an internally threaded shaft adapter 19. A flywheel 20 having an inwardly extending hub portion 21 is centered on and rotatable with the shaft extension, rotation of the flywheel with respect to the shaft being prevented by the pressure of the adapter 19 forcing the hub portion 21 of the flywheel in tight frictional engagement with the outer face of the ruff 17. One face of the flywheel 20 is concave at its central portion and has a convex annulus 22 concentric with the axis of the flywheel. The shaft extension 16 and the adapter 19 constitute the axle for the propulsion wheel.

The propulsion wheel 13 is arranged on the adapter 19 adjacent to the flywheel 20. The hub portion of the propulsion wheel constitutes a bearing or bushing 23 centering the wheel 13 on the axle but being rotatable independently of the axle. Except for the bushing 23 the propulsion wheel is formed of a flexible material such as, for example, rubber, or an elastic plastic material. A suitable plastic material for this purpose is vinyl chloride having a softening agent mixed with it, for giving the material a consistency and flexibility similar to that of the rubber in automobile tires. The propulsion wheel is concavo-convex and has an enlarged peripheral portion or tire 24. The wheel 13 is arranged on the axle with its convex side adjacent to the concave face of the flywheel 20, and it is held on the axle against axial movement thereof with respect to the axle by means of the washer 26 which is held on the end of adapter 19 by means of the nut 27. The washer 26 is formed of a resilient material which is designed to provide a periphery thereof conforming to the shape of that part of the propulsion wheel with which it contacts. The washer 26 holds the propulsion wheel against the flywheel 20 with slight pressure but permits easy slipping between the contacting surfaces of the flywheel and the propulsion wheel.

It is clear from the above that upon rotation of the propulsion wheel, and because of its concavo-convex configuration, along with the
greater mass of the tire portion thereof, the centrifugal force of the rotating propulsion wheel will cause it to flex toward the adjacent face of the flywheel, thereby deriving more and more power from the propulsion wheel and causing the flywheel to rotate at an increased speed.

4. Said flywheel being concave and providing a convex annulus concentric with said axle, said propulsion wheel being concentric with its convex side adjacent said one face of the flywheel, the tire portion of said propulsion wheel being enlarged, the diameter of said flywheel being less than that of said propulsion wheel, and a washer on the concave side of said propulsion wheel urging it toward said flywheel.

A self-powered toy comprising a body, a motor carried by said body, an axle driven by said motor, a circular driving member mounted on and rotatable with said axle, one face of said driving member being concave and providing a convex annulus concentric with said axle, a concavo-convex driven member centered on but rotatable independently of said axle, at least all but the hub portion of said driven member being formed of elastic material, said driven member being arranged on said axle with its convex side adjacent said one face of said driven member, and means arranged on the concave side of said driven member for holding said driven member slidingly against said driving member, whereby when said driven member is rotated the centrifugal force thereof will urge it into frictional engagement with said driving member.

3. A self-powered toy comprising a body, a motor carried by said body, a shaft driven by said motor, a driving member mounted on and rotatable with said shaft, one face of said driving member being concave, a concavo-convex driven member centered on but rotatable independently of said shaft, at least all but the hub portion of said driven member being formed of elastic material, said driven member being arranged on said shaft with its convex side adjacent said one face of said driven member.