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A. FISCHER

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ROTARY MOTION TRANSMITTING DEVICE

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Fig. 1

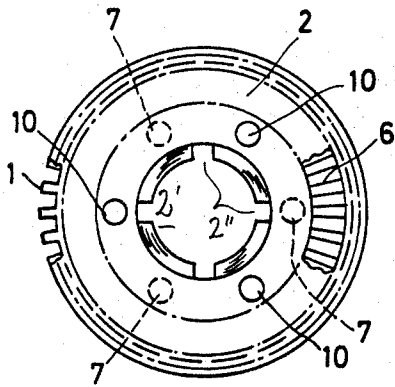


Fig. 2

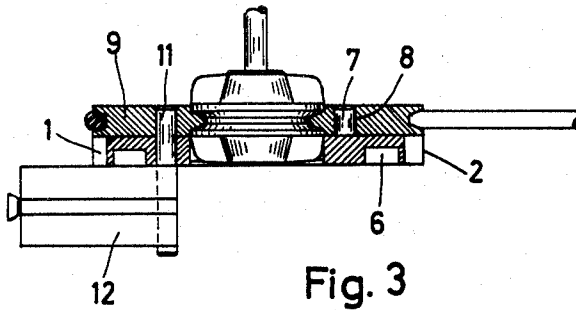
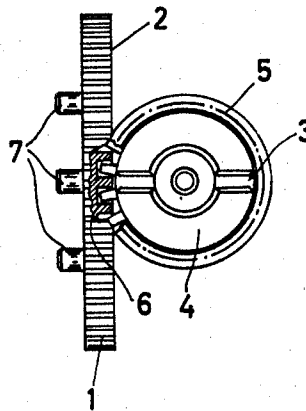


Fig. 3

INVENTOR.

ARTUR FISCHER

BY

*Michael S. Stricker*  
*A. Koenig*

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## ROTARY MOTION TRANSMITTING DEVICE

Artur Fischer, 133 Gruenmettstetterstrasse,

7294 Tumlingen, Germany

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## ABSTRACT OF THE DISCLOSURE

A rotary member has an axis of rotation and is provided on its circumferential face with a first annulus of teeth, and on one of its axial end faces with a second annulus of teeth.

The present invention relates to a rotary motion-transmitting device, and more specifically to a device of this type which has particular utility in conjunction with toy assembly kits.

It need not be pointed out that the use of rotary motion-transmitting devices, which hereafter for the sake of convenience will be called "gear wheels," in toy assembly kits is well known. However, heretofore the use of such gear wheels has always necessitated a certain complexity in the provisions which had to be made for mounting the gear wheel and the auxiliary devices to which the gear wheel was to transmit motion or from which it was to receive motion. Furthermore, such gear wheels have lacked versatility in that the simultaneous transmission of motion to more than one auxiliary element required complicated constructions often beyond the skill of children for whom the toy assembly kit was intended.

It is therefore a general object of the present invention to overcome the above-mentioned disadvantages of the prior art.

A more specific object of the invention is to provide a gear wheel which is highly versatile in the construction of motion-transmitting arrangements.

An additional object of the invention is to provide a gear wheel such as outlined above which is simple and inexpensive to construct and whose use in conjunction with other elements of a toy kit does not require the provision of tools.

An additional object of the invention is to provide such a gear wheel whose assembly to devices to which it is to transmit motion, or from which it is to receive motion, requires little manipulative skill.

In accordance with one feature of my invention I provide a rotary motion-transmitting device, such as a gear wheel, which comprises a rotary member having an axis of rotation and which includes a plurality of motion-transmitting portions spaced from this axis of rotation. Such a gear wheel has, in accordance with the invention, not only an annulus of teeth provided on its peripheral surface and constituting a spur gear, but also another annulus of teeth provided on one of its axial end faces and constituting a face gear. Furthermore, my novel gear wheel is provided with other motion-transmitting means, such as one or more pins provided on that axial end face opposite the one which carries the second annulus of teeth, and openings extending from one to the other of these axial end faces and arranged to accommodate shafts which may serve as pivot axes. Both the openings and the pin or pins extend in axial parallelism with the axis of rotation of the gear wheel but are arranged off-center relative thereto.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as

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to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is an axial end view of a gear wheel in accordance with the present invention;

FIG. 2 is a partially sectioned elevation of a right-angle drive, utilizing a gear wheel of the type shown in FIG. 1; and

FIG. 3 is a top view, partly sectioned, of the gear wheel shown in FIG. 1, showing the same in an arrangement utilizing a sheave and another auxiliary member.

Discussing now the drawing in detail, and firstly FIG. 1 thereof, it will be seen that the gear wheel shown there is generally indicated with reference numeral 2 and that it is provided with a peripheral annulus of teeth 1 constituting a spur gear. It should be noted that, although the teeth 1 are illustrated only on part of the periphery of the gear wheel 2, this showing was selected only to make the drawing simple and readily understandable and that the teeth 1 actually extend over the entire periphery of the gear wheel 2.

A hub 4 (see FIG. 2) is removably connectable to the gear wheel 2 and is provided with one or more projections 3 which, when the hub 4 is inserted into the center opening 2' of the gear wheel 2, will engage with and be received in the complementary recesses 2'' provided in the gear wheel 2, so that the hub 4 is thus non-rotatably locked to the gear wheel 2 to transmit power thereto and to receive power therefrom.

In further accordance with the invention, the gear wheel 2 is provided on at least one of its axial end faces with a second complete annulus of teeth, here indicated with reference numeral 6, only a portion of which is shown. The teeth 6 constitute a face gear and serve to permit use of the gear wheel 2 in conjunction with the peripheral teeth 1 of a second gear wheel 5 (see FIG. 2) so that the two gear wheels 2 and 5 together constitute an angle drive, particularly a right-angle drive. It is to be noted that the teeth 6 are advantageously so recessed in the axial end face of the gear wheel 2 that their outermost tips are located in the plane of this end face and do not project outwardly beyond the end face.

The reason for this latter requirement will become obvious from a consideration of FIG. 3. It is shown therein that a gear wheel 2 similar to the one shown in FIG. 1 can be provided with the hub 4 which is non-rotatably locked to the gear wheel 2. Additionally, however, a sheave 9 is secured to one axial end of the gear wheel 2 for simultaneous rotation with the latter in order to transmit power to, or to receive power from, the gear wheel 2. To permit the connection of this sheave and to further increase the versatility of the gear wheel, the latter is provided on that one of the axial end faces which is opposite the one provided with the annulus of teeth 6, with pins or projections 7 which, as is clearly evident from FIG. 3, can project into corresponding recesses 8 provided in the sheave 9 so that the latter is thereby non-rotatably coupled with the gear wheel 2. Additionally, the gear wheel 2 can also advantageously be provided with one or more bores 10 (see FIG. 1) which extend from one to the other of the axial end faces of the gear wheel and are adapted to receive pins 11, or similar instrumentalities which can serve as axles or for other purposes. In the embodiment shown in FIG. 3 it will be seen that the pin 11 is inserted through an opening 10 in the gear wheel 2 and extends with one end into one of the recesses 8 provided in the sheave 9, thus serving to lock the same still more reliably to the gear wheel 2, whereas the other end of the pin 11 extends into a complementary recess provided in a building block 12 or a similar ele-

ment so that the latter will turn about shaft 11 and will perform a reciprocatory movement during rotation of the gear wheel 2 and the pulley 9 locked thereto. It is this type of arrangement which makes it necessary that the tips of the teeth 6 do not project beyond the plane of the end face in which they are provided, it being obvious that the building block or similar element 12 must closely abut the axial end face of the gear wheel 2 to be properly guided thereby, and that the teeth 6 obviously must not be allowed to interfere with the movement of element 12.

It should be noted that the type of hub illustrated is well known in the art and need not be further described, beyond stating that it usually consists of two parts provided with a screw connection so that they are rotatable relative to one another, these parts being so constructed and arranged that a change in their relative positions will cause them to engage the surrounding surfaces of a member to which they are to be secured, with greater or lesser force.

It will also be obvious that various different materials can be used for constructing the rotary motion-transmitting device in accordance with the present invention, and that metals as well as various different types of plastic materials are well suited for this purpose.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of rotary motion-transmitting devices differing from the types described above.

While the invention has been illustrated and described as embodied in a rotary motion-transmitting device, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A rotary motion-transmitting device comprising a rotary member having an axis of rotation and including a plurality of motion-transmitting portions spaced from said axis, one of said motion-transmitting portions being a first annulus of teeth provided on a peripheral face of said member and another of said motion-transmitting portions being a second annulus of teeth provided on an

axial end face of said member and constituting a face gear.

2. A device as defined in claim 1, wherein one of said motion-transmitting portions includes a surface surrounding a hole provided in said member parallel with said axis of rotation thereof.

3. A device as defined in claim 1, wherein said rotary member is of circular outline and provided with an axially extending central opening; and further comprising a hub detachably received in said opening and co-operating coupling means provided on said member and said hub for coupling the latter non-rotatably to the former.

4. A device as defined in claim 3, wherein said co-operating coupling means comprises at least one radially extending recess provided in the surface surrounding said opening, and a complementary projection provided on said hub and adapted to be received in said recess.

5. A device as defined in claim 3, wherein said co-operating coupling means comprises at least two diametrically opposite radially extending recesses provided in the surface surrounding said opening, and complementary projections provided on said hub and adapted to be received in the respective recesses.

6. A rotary motion-transmitting device comprising a rotary member having an axis of rotation and an axial endface, said rotary member being provided with a plurality of motion-transmitting portions spaced from said axis including a plurality of teeth arranged in said axial endface and constituting a face gear, said teeth comprising tips which are flush with the general plane of said axial endface.

7. A rotary motion-transmitting device including a rotary member having an axis of rotation and an axial endface, said rotary member comprising a plurality of motion-transmitting portions spaced from said axis and including at least one integral projections extending from said axial endface.

8. A device as defined in claim 7; and further comprising a sheave adapted to be arranged coaxially with said member and having an eccentrically located opening adapted in such position to register with and receive said projection, so that said sheave is thereby coupled with said member for rotation therewith.

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FRED C. MATTERN, JR., *Primary Examiner*.

LEONARD H. GERIN, *Examiner*.