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COG WHEEL FOR A MODEL BUILDING SET HAVING BLOCKS WITH EVENLY SPACED PROJECTIONS

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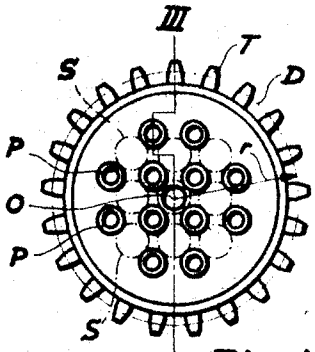

Fig.1

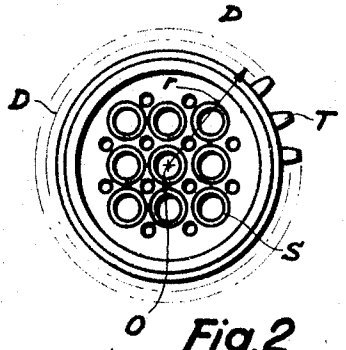

Fig.2

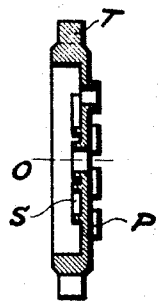

Fig.3

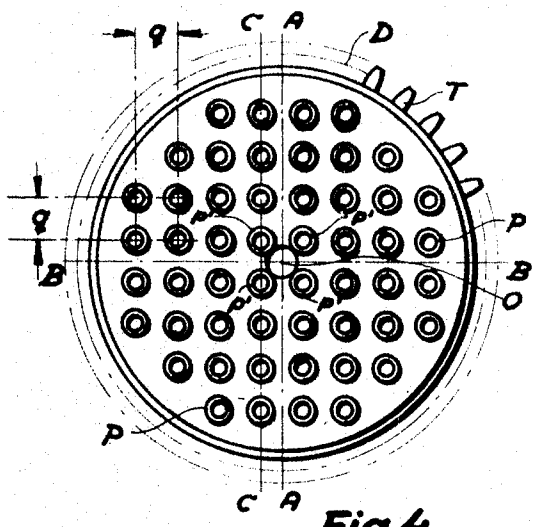

Fig.4

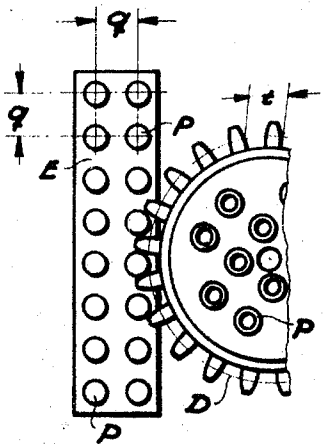

Fig.5

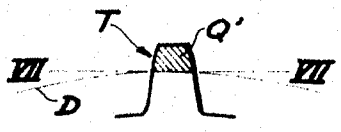

Fig.6

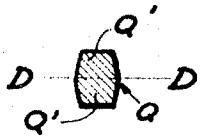

Fig.7

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COG WHEEL FOR A MODEL BUILDING SET HAVING BLOCKS WITH EVENLY SPACED PROJECTIONS

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U.S. Cl. 46—16 6 Claims

ABSTRACT OF THE DISCLOSURE

A cog wheel for a toy building set which has a plurality of building blocks having evenly spaced projections from one side of the building blocks. The cogs on the wheel are arranged in such a manner that the teeth will engage the projections of a building block to make a rack and pinion gear arrangement. The radius r of the pitch circle of the cog wheel is equal to an integral multiple of the space between adjacent projections of the building block.

This invention relates to cog wheels for model and toy building sets and more particularly for building sets comprising building blocks having at least one rectangular face provided with at least two rows of projections uniformly spaced apart in both longitudinal and transverse directions and wherein the distance between the axes of any pair of adjacent projections constitutes the module of the building set.

The object of the invention is to provide additional elements for such building sets so as to extend the uses thereof to include the construction of mechanical toys or models having rotating parts with gear wheel transmissions.

According to the invention this object has been achieved by providing a special type of cog wheel, the features of which are defined in the claims and consist of a specific interrelation between on the one hand the pitch circle and the pitch of the teeth of the cog wheel and on the other hand the module of the building set.

In fact, in order to ensure correct and accurate engagement between any pair of adjacent cog wheels mounted on shafts which are journalled in bearing elements of the building set wherein the location of the bearing is determined by the module of the building set, it has been found that the arrangement of the teeth of the cog wheel must be such that the radius r of the pitch circle is an integral multiple of the module of the building set q, hence the formula $r=cq$, wherein q is the above defined module of the building set, and c is an integer.

Other features and particulars of the invention as defined in the claims will be described with reference to the embodiments shown in the drawings wherein:

FIG. 1 shows a gear wheel according to the invention viewed from one side,

FIG. 2 the same gear wheel viewed from the other side,

FIG. 3 presents a section along the line III—III in FIG. 1,

FIG. 4 shows a larger gear wheel viewed from the same side as the wheel shown in FIG. 1,

FIG. 5 shows part of a gear wheel in engagement with a building element acting as rack or lantern

FIG. 6 shows on a larger scale a section through a tooth at right angles to the plane of the gear wheel and tangentially relatively to the pitch circle, and

FIG. 7 shows a tooth section along the line VII—VII in FIG. 6.

Referring to the drawings and more particularly to FIGS. 1–4 thereof the centre of the cog wheel shown in these figures is designated as O, the pitch circle as D, and the radius thereof as r.

The gear wheel shown in FIGS. 1–3 has 21 teeth T. The gear wheel illustrated in FIG. 4 has 35 teeth, five of which are shown. On the face shown in FIGS. 1 and 4 the gear wheel has a number of coupling studs P disposed symmetrically with respect to two diameters A and B which are disposed at right angles to each other and having the same module q as the coupling studs P on the outer face of the standard elements of a building set in which the gear wheel according to the invention is to be used. Such an element E is illustrated in FIG. 5.

The radius r of the pitch circle D is nq, where n is an integer which in the gear wheel in FIGS. 1–3 is equal to 3 and in the gear wheel in FIG. 4 is equal to 5.

In FIG. 4 the four coupling studs disposed next to the centre O of the gear wheel are designated P′ and their centers together form a square with the side q. A chord through one side of the square parallel to the diameter A—A is designated C—C. The number p of coupling studs in a row determined by one half of the chord C—C and is, in FIG. 1 equal to 2 and in FIG. 4 equal to 4. It will be seen that the coefficient n under the given conditions will be equal to $p+1$, the radius in FIG. 1 being equal to $3q$, where p is equal to 2, and the radius in FIG. 4 being equal to $5q$ and where p is equal to 4.

In the embodiment illustrated in FIG. 5 the tooth module t is determined to be approximately equal to the module q of the building set, which will enable the gear wheel to be brought into engagement with a row of coupling studs P on an element E of the building set to form a rack and lantern pinion.

The tooth module t cannot be exactly equal to the module q of the building set because it is determined by the formula

$$t=2\pi nq/T$$

where T is the number of teeth and therefore must necessarily be an integer. However, if the number of teeth T of the smallest wheel is equal to 7, and t therefore will be equal to $0.9q$, this approximation to the theoretical ideal will be adequate for all practical purposes.

The tooth section Q in the plane VII—VII shown in FIGS. 6 and 7 which touches the pitch circle D and is disposed at right angles to the plane of the tooth wheel, forms, as indicated in FIG. 7, a figure Q comprising two halves Q′ which are symmetrical with respect to the projected pitch circle D and identical with the portion of a section through the tooth T, FIG. 6, in the center plane of the gear wheel disposed outside the pitch circle D, as indicated by the hatching in FIG. 6.

This configuration of the tooth section, which is a characteristic feature of the invention, makes it possible to bring a pair of gear wheels in closely accurate engagement, also when their axes are disposed at right angles to each other.

Like the other elements of the building set the cog wheels may conveniently be made by injection moulding of a thermoplastic material, and like the other elements they may be provided with both primary studs P at one face and secondary studs S, FIGS. 2 and 3, at the other face, the secondary studs S being so formed and disposed that each secondary stud touches the circumference of four primary studs P which together form a square.

Under the conditions defined above, where the tooth module t is approximately equal to the module q of the building set, the number of teeth T in the smallest gear wheel will, as stated, be equal to 7, which is the next integer above 2π, and the other gear wheels will then have a number of teeth T, which is an integral multiple of 7. But it will also be possible to achieve an approximation to the said ideal $t=q$, which is adequate for all practical

purposes by selecting a number of teeth for the smallest gear wheel equal to the next integer below 2π, i.e., $T=6$.

I claim:

1. A toy building set comprising a plurality of hollow parallel-sided blocks open at one face and closed at another face and adapted to be connected together by means of projections uniformly spaced apart and extending from the closed faces of said blocks, the distance between the axes of any pair of said projections constituting the module of said building set, a cog wheel element having a plurality of teeth, said cog wheel element having a pitch circle, the radius of said circle being an integral multiple of the module of the building set, and means comprising the pitch of said teeth whereby said cog wheel element can cooperate with the projections of said blocks in a rack and pinion relationship.

2. A building set as claimed in claim 1, said cog wheel comprising a substantially flat disc-shaped element having a plurality of projections uniformly spaced apart and extending from one face of said disc element at a distance between their axes equal to the module q of the building set, and wherein the radius r of the pitch circle is determined by the formula $r=(p+1)q$, where p is the number of projections located at one face of the disc in a row determined by four projections symmetrically disposed with respect to the center of the cog wheel and adjacent to said center.

3. A building set as defined in claim 1 in which the pitch of the teeth is substantially equal to the module q of the building set.

4. A building set as defined in claim 1 in which the number of said teeth is a multiple of 7.

5. A building set as defined in claim 1 wherein the teeth are shaped in such a manner that, in a section perpendicular to the plane of the disc and tangentially disposed with respect to its pitch circle, the contour of each said tooth is defined by two identical figures disposed symmetrically with respect to a median axis, each of said figures being identical with the part of a section through one tooth in the plane of the disc which is located outside the pitch circle.

6. A toy building set comprising building blocks having at least one rectangular face provided withat least two rows of projections uniformly spaced apart in both longitudinal and transverse directions, the distance q between the axes of any pair of adjacent projections constituting the module of the building set, said building set also having at least one cog wheel characterized by the combination of the following features:

(a) a circular disc having at least one plane face and a central bore,

(b) a plurality of projections extending perpendicularly from said plane face and arranged in parallel rows uniformly spaced apart in both longitudinal and transverse directions, said disc projections being identical with the projections of said building blocks, the distance between the axes of any pair of adjacent disc projections being equal to q,

(c) a plurality of teeth uniformly spaced around the periphery of said disc, the radius of the pitch circle of said cog wheel being equal to the module q of the building set multiplied by an integer.

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U.S. Cl. X.R.

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