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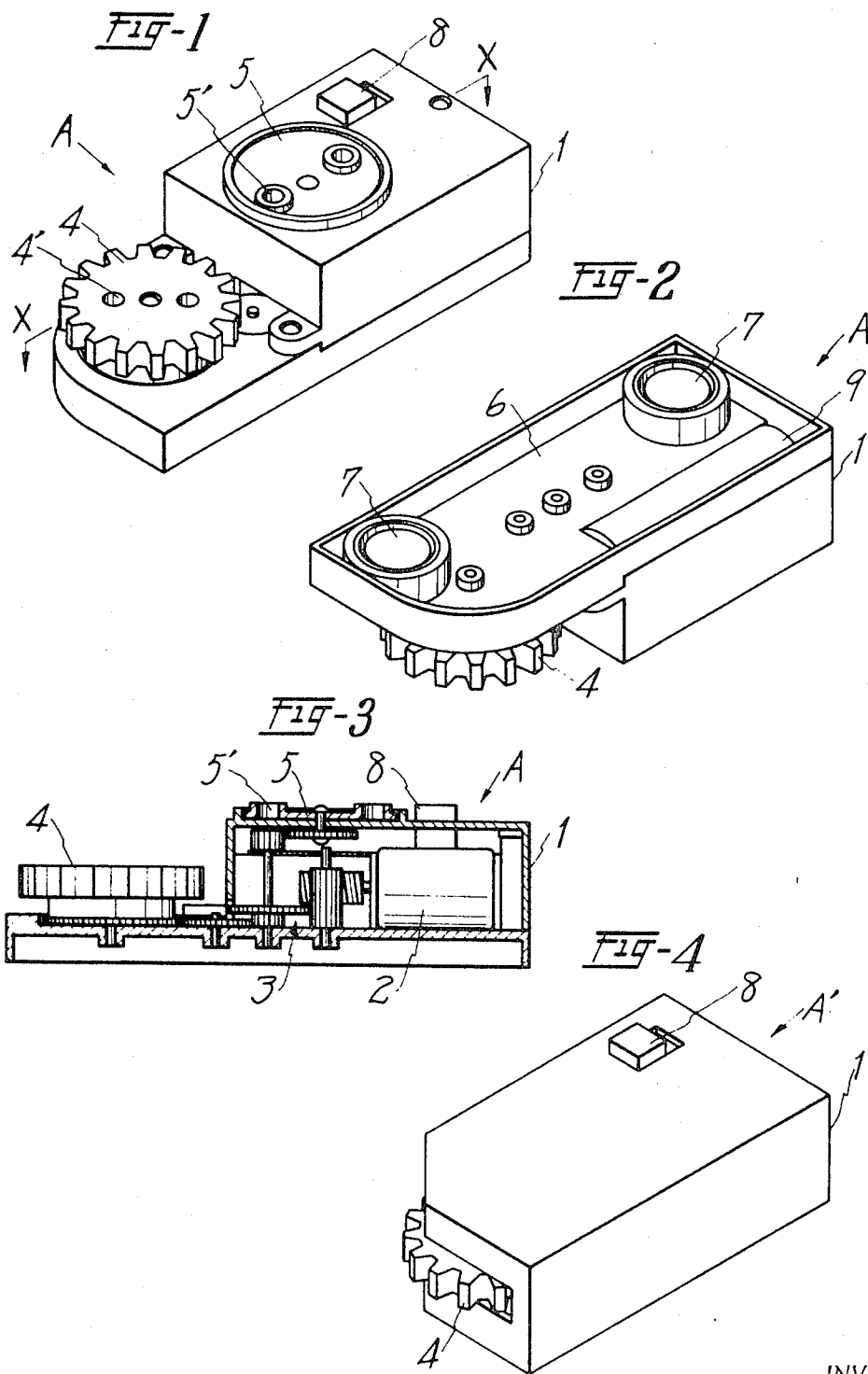
MASARU AOKI

3,608,233

TOY CONSTRUCTION SET

Filed July 22, 1970

7 Sheets-Sheet 1



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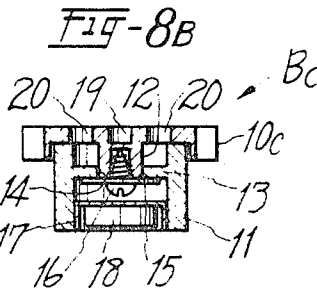
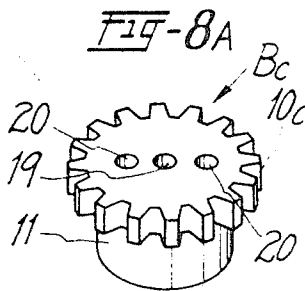
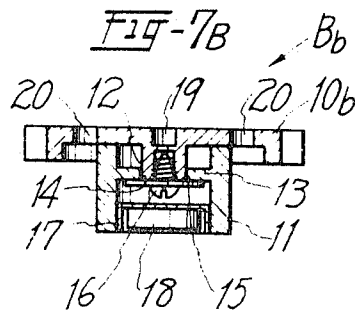
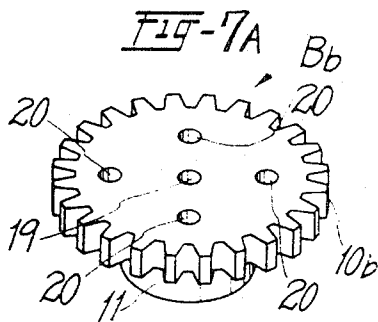
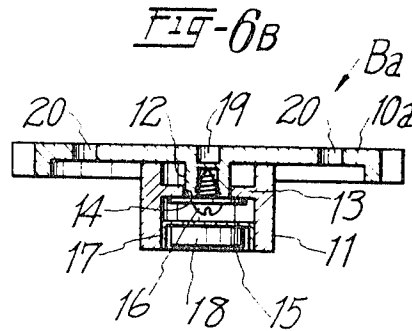
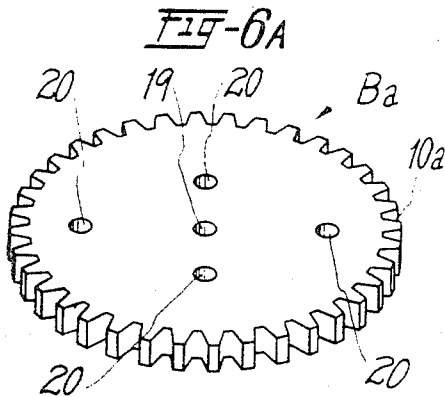
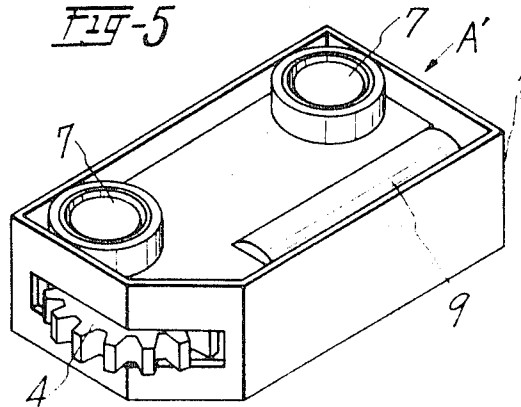
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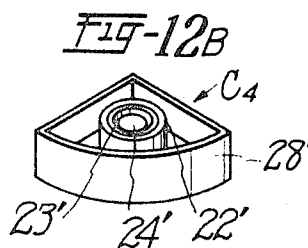
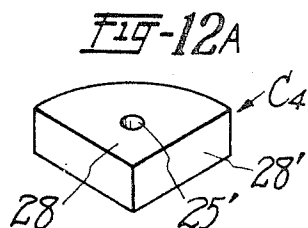
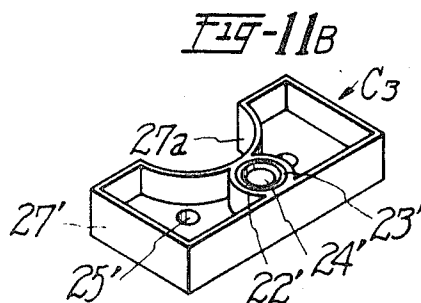
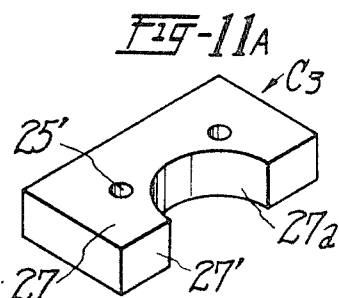
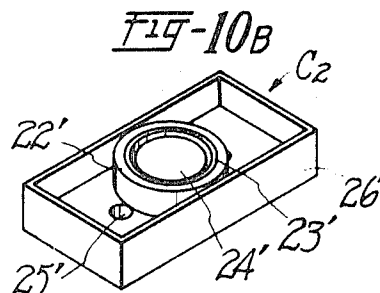
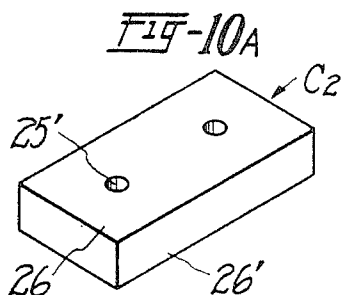
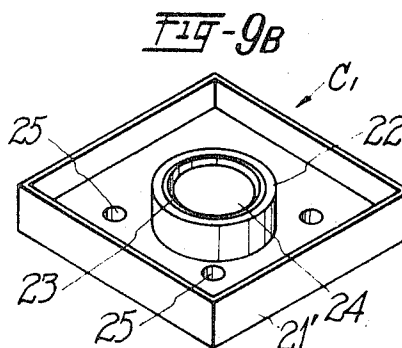
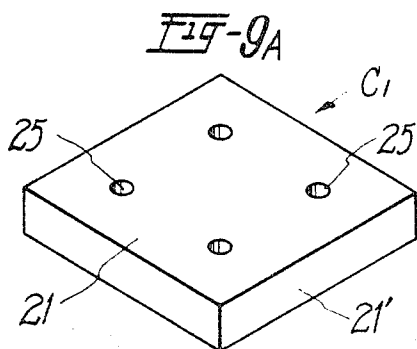
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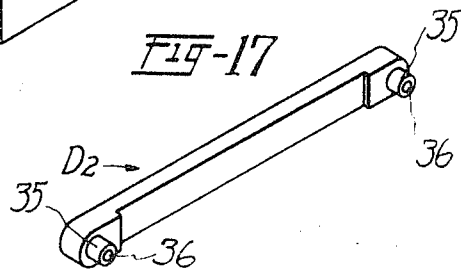
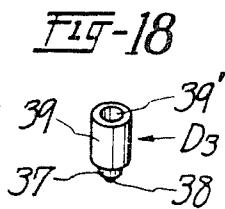
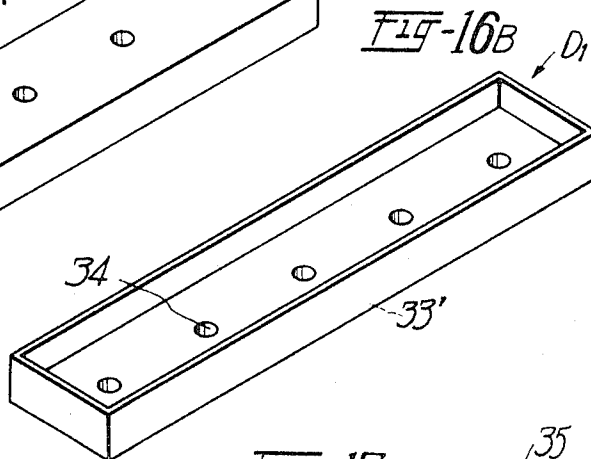
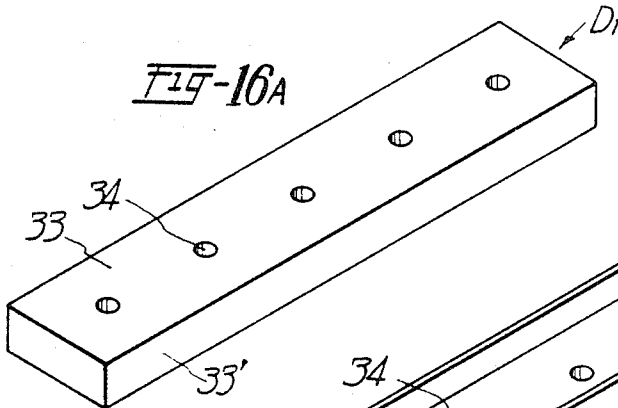
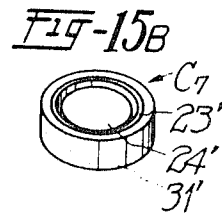
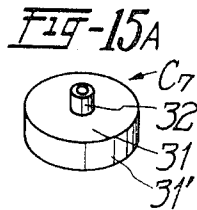
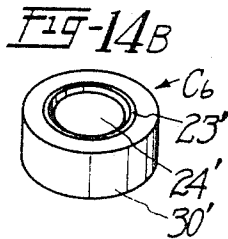
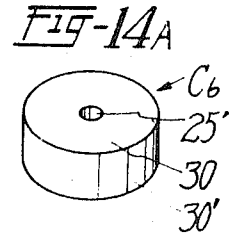
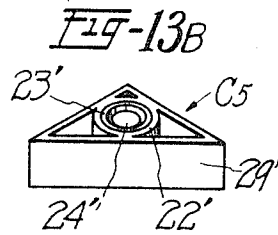
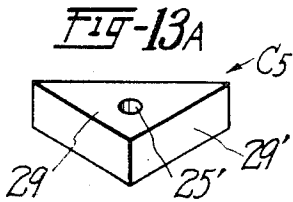
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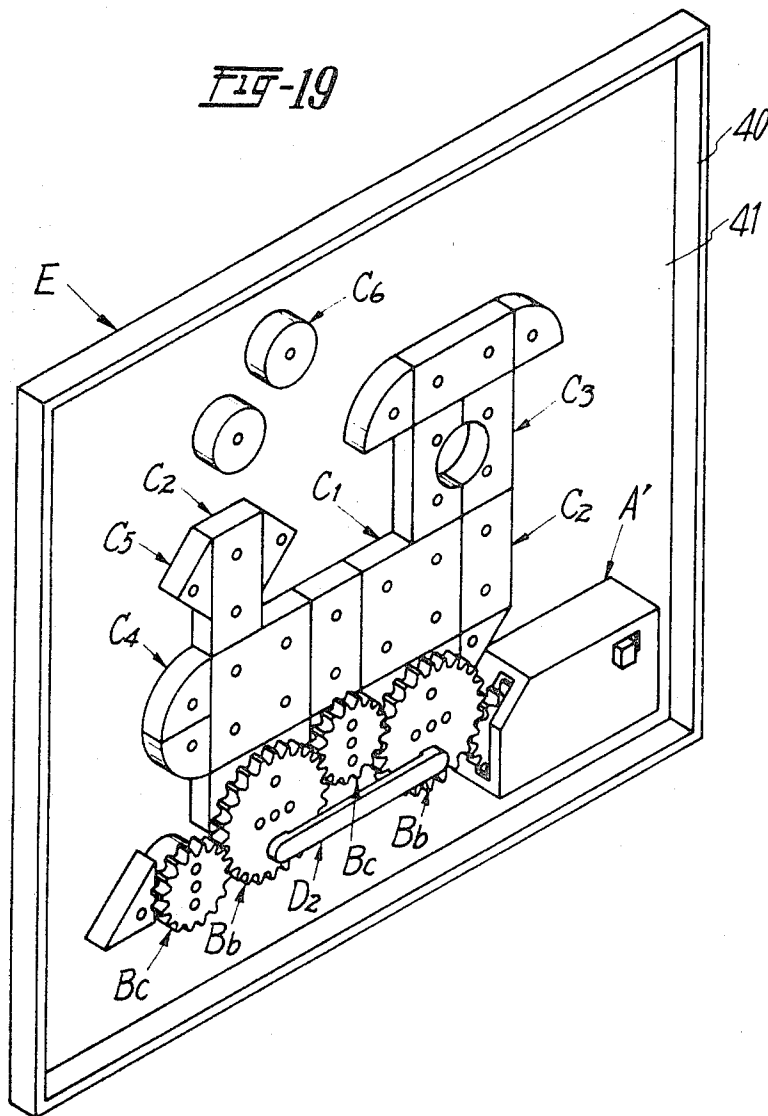
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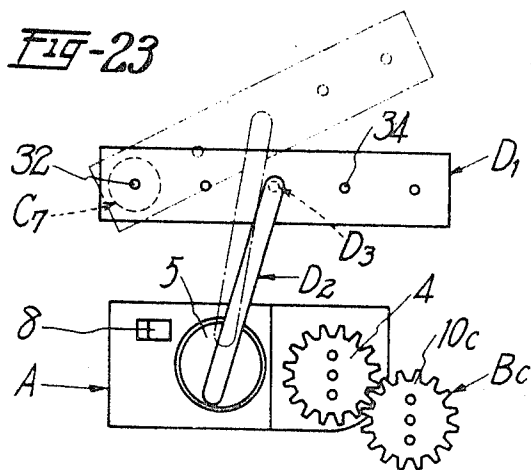
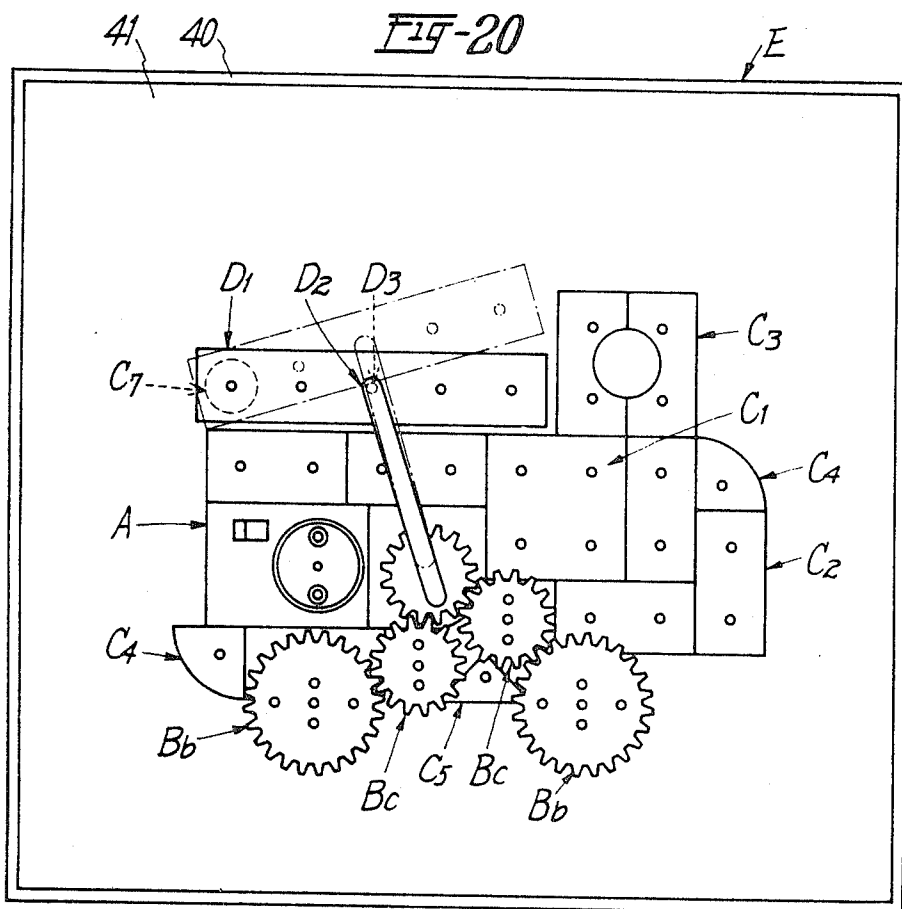
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TOY CONSTRUCTION SET

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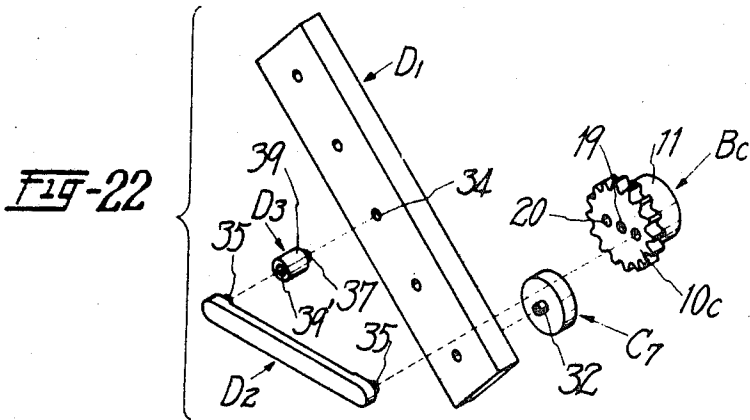
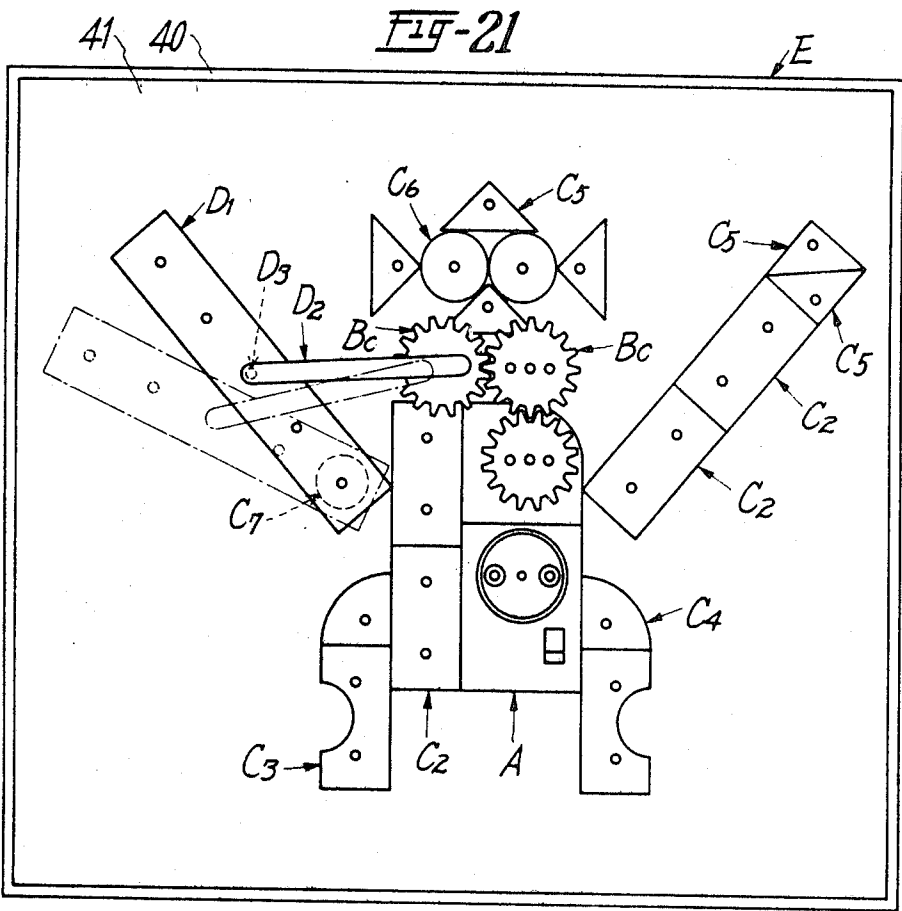
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7 Sheets-Sheet 7



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3,608,233

## TOY CONSTRUCTION SET

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Int. Cl. A63h 33/06

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7 Claims

### ABSTRACT OF THE DISCLOSURE

A toy construction set which comprises a variety of construction elements adapted to be assembled into a toy assembly of the desired type having a stationary portion and an operative portion. The construction elements include magnet-equipped elements adapted to be magnetically held on a magnetizable surface in assembled relationship. The magnet-equipped elements include a power means for operating the operative portion of the toy to be assembled.

### SUMMARY OF THE INVENTION

This invention relates to toy blocks, and more particularly to a toy construction set having various elements adapted to be assembled into a wide variety of toys, especially into a toy of the kind which is called "action toy" or "animated toy."

One object of the present invention is to provide a toy construction set having a variety of elements which may be assembled into an animated toy of the desired type which comprises a stationary or motionless part and an operative or motional part adapted to be operated by one of the elements of the set that is a power means.

Another object of the present invention is to provide elements for such a set the majority of which are each provided, on the reverse side thereof, with a magnet so as to be magnetically attachable to a magnetizable surface, such as the surface of a magnetizable metal board, and to be held in assembled relationship with each other on such surface.

A further object of the present invention is to provide an animated toy assembly which can be readily disassembled and reassembled into other animated toys of the desired configurations and types and which is safe to handle and attractive in appearance.

A still further object of the present invention is to provide a toy construction set of the type stated above which has educational value by stimulating the imagination and creative ability of children.

Yet another object of the invention is to provide a toy of the kind described above which can be manufactured and sold at a relatively small expense.

These and other objects and advantages of this invention will be more evident upon consideration of the following detailed description and drawings, in which:

FIG. 1 is a perspective view of one form of a power unit according to the present invention;

FIG. 2 is a perspective view of the power unit shown in FIG. 1, illustrating the reverse side thereof;

FIG. 3 is a longitudinal cross-sectional view taken along line A-A of FIG. 1, from which two magnets have been removed;

FIG. 4 is a perspective view of another form of a power unit;

FIG. 5 is a perspective view of the power unit shown in FIG. 4, illustrating the reverse side thereof;

FIGS. 6A, 7A, and 8A are perspective views of gear units, respectively;

FIGS. 6B, 7B and 8B are vertical cross-sectional views of the gear units of FIGS. 6A, 7A and 8A, respectively;

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FIGS. 9A, 10A, 11A, 12A, 13A, 14A and 15A are perspective views of different sections which are provided in the reverse sides thereof with magnets and which are used in the assemblage of a stationary part of the toy to be assembled according to the present invention;

FIGS. 9B, 10B, 11B, 12B, 13B, 14B and 15B are perspective views of the sections shown in FIGS. 9A to 15A, illustrating the reverse sides thereof, respectively;

FIG. 16A is a perspective view of an elongated box-like member which is used chiefly as a moving part of the toy;

FIG. 16B is a perspective view illustrating the reverse side of the member shown in FIG. 16A;

FIG. 17 is a perspective view of a link;

FIG. 18 is a perspective view of a tubular connector;

FIG. 19 is a perspective view showing one example of assemblage of the animated toy according to the present invention;

FIGS. 20 and 21 are side elevations showing two other examples of assemblage, respectively, of the animated toy;

FIG. 22 is an exploded view illustrating one example of how to fabricate an assembly to be animated; and

FIG. 23 is a view showing an example of assemblage of an operating mechanism forming a part of the animated toy to be assembled according to the present invention.

The toy construction set according to the present invention comprises a power unit A or A', gear units Bb, Bc and/or Ba, different shapes of members C1 to C7 and D1 to D3 which are selectively used depending on the type or kind of the toy to be assembled, and a supporting base or board E for supporting these parts of assemblage thereon.

The power unit A or A' is designed to be combined with other toy constituting sections and to power the toy assembled. The power unit A' shown in FIGS. 4 and 5 is a variant of the power unit A shown in FIGS. 1 to 3 and does not differ substantially from the latter in construction and manner of operation. To avoid repetition, therefore, the parts or portions corresponding to or are similar to those of the latter will not be described in detail.

As shown in FIGS. 1 to 3, the power unit A comprises a casing 1 in which a battery, not shown, a battery-operated motor 2 and a driving gear, generally designated at 3, are disposed, and an output gear wheel 4 and a rotatable disc 5 rotatably mounted on said casing and operatively connected to the motor 2 through the driving gear 3, respectively. The output gear wheel 4 and the rotatable disc 5 are provided, as shown in FIG. 1, with eccentric holes 4' and 5', respectively for the purposes which will be described later.

The casing 1 is formed, on the reverse side thereof, with a recess 6 in which are provided circular permanent magnets 7 so that when the reverse side is placed on the supporting board E, which comprises a metal plate capable of being magnetized, the power unit A can be magnetically held in its attracted state on said supporting board. The motor circuit, not shown, is provided in the casing 1 and is arranged to be made or broken by the manipulation of the switch means 8 projecting outwardly of said casing.

Indicated by reference numeral 9 is a battery container in which the battery for operating the electric motor 2 is disposed.

As may be seen from FIGS. 1 to 5, the principal difference between the power units A and A' is that the latter has not the rotatable disc 5 that the former has.

Referring now to FIGS. 6A to 8A and 6B to 8B, there are shown three gear units Ba, Bb and Bc which comprise gear wheels 10a, 10b and 10c having a different diameter, respectively.

A hollow cylindrical member 11 having a diameter smaller than that of the gear wheel 10a is loosely mounted

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on a boss 12 projecting downwardly from the central portion of the lower face of the gear wheel 10a so as to rotatably support said gear wheel. More specifically, an inward flange 13 projects inwardly from an upper portion of the inner face of said hollow cylindrical member and the boss 12 is loosely inserted in an opening 14 which is defined by the inner peripheral edge of said flange. After this insertion, a washer 15 is placed on the bottom face of said flange 9 and is fastened tightly against the boss 12 by means of a screw 16. Thus, the hollow cylindrical member 11 is prevented from coming off the boss 12 and at the same time the gear wheel 10a is allowed to rotate freely relative to said cylindrical member. A tubular receiving element 17 of a magnetic material is inserted in the lower portion of the cylindrical member 11 and is secured thereto. A permanent magnet 14 is secured to the inside of the tubular receiving element 17. This tubular element 17 serves to substantially enhance the magnetic attraction of said permanent magnet 18.

The gear wheel 10a is provided, in the central portion of its upper face, with a relatively small circular hole 19, and in its diametrically opposed positions, with circular apertures 20 each having the same diameter as that of the central hole 19 for the purposes which will be explained later.

The other gear units Bb and Bc shown in FIGS. 7A, 7B and 8A, 8B have the same structure and shape as the gear unit Ba with the exception that they are smaller in size. Accordingly, as to these two Bb and Bc, detailed description will be omitted.

It is to be noted that the power unit A or A' and at least one of said gear units Ba, Bb and Bc are indispensable as the basic constituent members for the toy to be assembled according to the present invention.

Description will now be directed to varied sections or members which are selectively used depending on the type of the animated toy to be assembled and which are used for fabricating a motionless or stationary part of the toy.

As shown in FIGS. 9A and 9B, the first motionless part-constituting member C1 is a tray-like member having a square flat cover 21 and a hollow base portion 21' having its lower end opened. A hollow cylindrical member 22 depends from the lower face of the upper wall 21 of said member. A receiving tubular element 23 of a magnetic material is mounted in the hollow cylindrical member 22. A permanent magnet 24 is disposed within the tubular element 23. A plurality of circular apertures 25 are formed in the upper wall 21 in spaced-apart relationship and with predetermined intervals.

Other motionless part-constituting members C2, C3, C4 and C5 are also tray-like members and have the same height as that of the first member C1. The second member C2 shown in FIGS. 10A and 10B has a flat rectangular top wall 26 and a hollow base portion 26'. This rectangular shape is such that it is in exact conformity with the rectangular shape obtained by dividing symmetrically the square shape of the upper wall 21 of the first member C1 into two parts. The right-angled isosceles triangle obtained by transversely dividing the rectangular shape at the center thereof into two square shapes and then by dividing one of said square shape into two parts along the diagonal line, is in exact conformity with the right-angled isosceles triangle of the upper wall 29 of the fifth member C5 shown in FIGS. 13A and 13B.

The third member C3 shown in FIGS. 11A and 11B has a flat rectangular top wall 27 and a hollow base portion 27' and is provided with a semi-circular recess 27a on one side thereof. This semi-circular recess 27a has a diameter allowing each of the hollow cylindrical member 11 of the gear units Ba, Bb and Bc to be snugly received therein.

The fourth member C4 shown in FIGS. 12A and 12B has a flat cover 28 and a hollow base portion 28', said cover having a shape of a quarter of a circle. This quarter

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of a circle has a radius of a length which is in conformity with the length of one of the edge lines, which cross each other at right angle in the right-angled isosceles triangle, of the fifth member C5 having a flat triangular cover 29 and a hollow base portion 29'.

These members C2, C3, C4 and C5 are each provided, in its top wall with one or more circular apertures 25', and at the lower face thereof, with a permanent magnet 24' which is mounted in the hollow cylindrical member 22', which is secured to said lower face, with a magnetic tubular member 23'.

The sixth member C6 shown in FIG. 14A comprises a cylindrical casing 30' having a circular top wall 30. A magnetic tubular member 23' having therein a permanent magnet 24' is mounted in said cylindrical casing. As shown in FIG. 14A, the circular top wall 30 has in its central portion a circular hole 25'.

Referring now to FIGS. 15A, 15B, 16A, 16B, 17 and 18, there are depicted members C7, D1, D2 and D3 which are chiefly used for the assemblage of an operative part of the toy according to the present invention. The first operative part-constituting member C7 comprises a cylindrical casing 31' having a circular top wall 31 which is provided, in its central portion, with a rotatable tubular member 32 arranged to pivot about the axis of said cylindrical casing. The second member D1 is an elongated rectangular tray-like member which has a hollow base portion 33' and a flat upper wall 33 having a plurality of spaced-apart circular apertures 34 therein. The third operative member D2 is a relatively elongated link which has at its ends laterally projecting tubular members 35 rotatably mounted on pins 36, respectively. The fourth member D3 is a tubular coupling member which comprises a tubular body 39, a rotatable tubular member 37 rotatably mounted on a pin 38 axially projecting from one end of the tubular body which has at the other end a circular bore 39'.

Preferably, all of the aforementioned toy-constituting elements are suitably colored or color coded so that they may catch the eyes of children or their assemblage may become much easier.

FIG. 19 shows an example of the toy assembled in the form of a locomotive according to the present invention. This assembly is fabricated by properly placing the power unit A or A', gear units Bb and Bc and an appropriate number of other combining members C1, C2, C3, C4, C5 and C6 on the supporting board E, which comprises a frame 40 and a magnetizable metal plate 41, and then by attaching the operative member D2 to the gear units Bb in such a way that the rotatable tubular members 35 are mounted in the respective eccentric apertures 20. As shown, the output gear wheel 4 of the power unit is meshed with the toothed wheel 10b of gear unit Bb which constitutes the rear wheel of the locomotive. This toothed wheel 10b is in meshed engagement with the smaller gear wheel 10c of gear unit Bc, which is, in turn, meshed with the gear wheel 10b of another gear unit 10b which constitutes the front wheel of the toy. When the switch 8 is turned on and the motor starts rotating, the rotational force of the motor will be transmitted, via the output toothed wheel 4, to a series of toothed wheels 10b, 10c, 10b and 10c, which are in meshed engagement with each other, to rotate the wheels, thereby causing the operative member D2 to make reciprocation. Since the gear units Bb and Bc are secured by the attractive forces of the magnets 18 to the magnetic board E, and since the toothed wheels 10b and 10c are arranged to rotate relative to the hollow cylindrical members 11, these toothed wheels can be driven for rotation continuously by the output toothed wheel 4 without coming off the board E, even when the board E is placed in an upright position.

FIG. 20 shows another example of the toy assembled in the form of a dump truck. In this example, the operative part-constituting parts C7, D1, D2 and D3 are used in addition to other members including the power unit

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A. These parts C7, D1, D2 and D3 are combined with each other so that the operative section D1 can be swung, as shown in FIG. 20, during the operation of the toy.

FIG. 21 shows another example of assemblage of the toy which has the configuration of a robot. The operative part of portion of the toy is fabricated in accordance with such procedures as illustrated in FIG. 22. First, the disc-like member C7 shown in FIGS. 15A and 15B is attached to the supporting board E by the aid of the magnetic attraction of the permanent magnet 24' of the member C7. Then, the rectangular tray-like member D1 is rotatably mounted on the disc-like member C7 by inserting the rotatable tubular member 32 of the latter in one of the several circular apertures 34 formed in the upper wall 33 of the former. And then, the rotatable tubular member 37 of the tubular coupling member D3 is inserted in another aperture 34 of the oblong member D1. Finally, one of the two rotatable tubular members 35 of the elongated link D2 is inserted in the bore 39 of said tubular coupling member D3, while the other of the two rotatable tubular members 35 is inserted in one of the circular apertures 20 eccentrically formed in the gear wheel 10c of gear unit Bc.

In the toy shown in FIG. 21, when the power unit A is actuated, its drive power is transmitted to the driven gear wheel via the intermediate gear wheel which is in meshed engagement with the output gear wheel 4 of the power unit A. Whereupon, the oblong member D1, which is coupled to one end of the link D2 having its other end coupled to an eccentric position of the driven wheel, will repeat swinging movement about the axis of the rotatable tubular member 32 of the shallow cylindrical member C7 which is magnetically held on the supporting board E.

FIG. 23 shows another example of how to operatively connect the swingable assembly, which comprises the elongated rectangular member D1, the shallow cylindrical member C7 pivotally supporting the member D1 and the link D2 one end of which is pivoted to the first member D1, to the power unit A. In this example, the other end of the link D2 is pivoted to the rotatable disc 5, instead of the output gear wheel 4, of the power unit A by bringing the rotatable tubular member 35 at that end into fitted engagement with one of the eccentric circular apertures 5' of the rotatable disc 5 of said power unit.

As may be seen from the foregoing description, the present invention makes it possible for the user to fabricate various configurations or kinds of toys, which are capable of making animated cartoon-like movements, such as the simulated locomotive, truck and robot heretofore described or other animated toys of many types as desired by properly placing the power unit and the desired number of other magnet-equipped sections on the magnetizable surface and by selectively combining them with the motional members. It is to be noted that the assembled toy may be hung on a wall without setting it in motion whereby it may be used as an article for internal decoration.

What I claim is:

1. A toy construction set comprising a variety of construction elements assembled into a toy assembly of the desired type; said set having a stationary portion and an operative portion, said construction elements including magnet-equipped elements held on a magnetizable surface in assembled relationship, said magnet-equipped elements including a power means for actuating the operative portion of the toy to be assembled.

2. A toy construction set as set forth in claim 1, wherein said power means is in the form of a box-like unit comprising a casing having a first side and a second side in which a battery-operated motor and a driving gear are

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disposed, an output gear wheel rotatably mounted on said casing and operatively connected to said battery-operated motor through said driving gear, and a permanent magnet mounted on the second side of said casing so that when the second side thereof is placed on said magnetizable surface, said power means can be magnetically held thereon.

3. A toy construction set as set forth in claim 1, wherein said magnet-equipped elements further include a plurality of gear wheel units for transmitting the drive power of said power means to the operative portion of the toy to be assembled, each of said gear wheel units comprising a gear wheel, a hollow cylindrical member for rotatably supporting said gear wheel, said hollow cylindrical member having a diameter smaller than that of said gear wheel, and a permanent magnet mounted in the lower portion of said cylindrical member so that when the lower end of said cylindrical member is placed on said magnetizable surface, said gear wheel unit can be magnetically held thereon.

4. A toy construction set as set forth in claim 1, wherein said magnet-equipped elements further include a plurality of tray-like members having various configurations in plan view and having hollowing base portions and flat upper walls each having therein one or more apertures, each of said tray-like members being provided, within the hollow base portion thereof, with a permanent magnet so that when the reverse side thereof is placed on said magnetizable surface, the tray-like member can be magnetically held thereon.

5. A toy construction set as set forth in claim 1, wherein said construction elements further include an elongated rectangular tray-like member which has a hollow base portion and a flat upper wall, a relatively elongated link member, and a tubular connector member for pivotally connecting said elongated link member with said elongated rectangular tray-like member, said link member being operatively connected to said power means for reciprocation so that, when connected to said elongated rectangular tray-like member and said power means, it can impart a swinging movement to said elongated rectangular tray-like member.

6. A toy construction set as set forth in claim 5, wherein said elongated rectangular tray-like member has in its flat upper wall a plurality of spaced-apart apertures and is pivotally supported on said magnetizable surface by a disc-like member which is one of said magnet-equipped elements and which is provided with a rotatable tubular member, said apertures of said flat upper wall being arranged to be selectively engaged by said tubular connector member and said rotatable tubular member of said disc-like member.

7. A toy construction set as set forth in claim 1, further comprising a supporting board for supporting thereon said construction elements, said supporting board comprising a metal sheet capable of being magnetized and being surrounded by a frame simulating a picture frame.

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U.S. Cl. X.R.

46—243R