Aug. 1, 1961 E. S. McCAA 2,994,154

MECHANICAL TOYS

Filed July 18, 1957 2 Sheets-Sheet 1

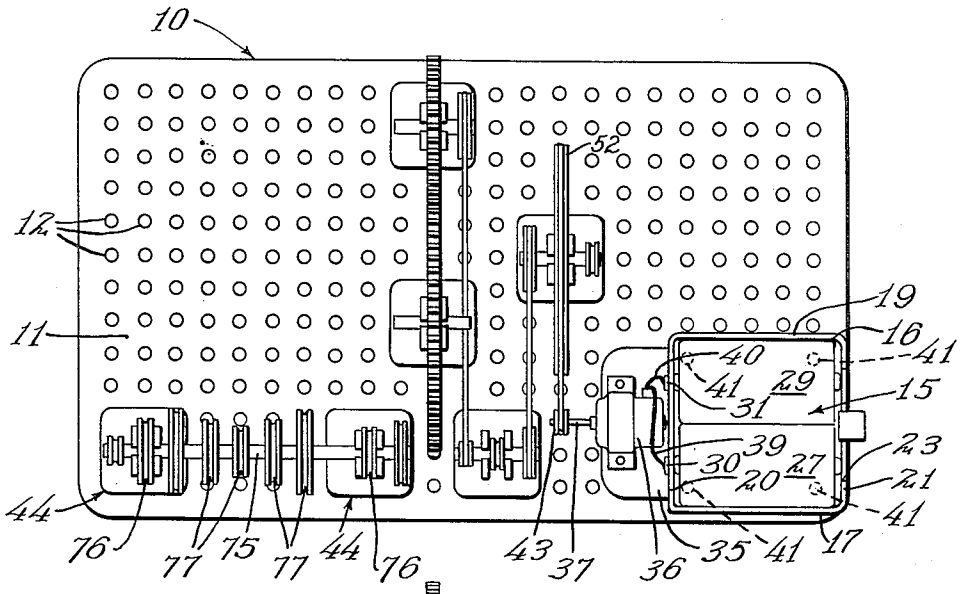


FIG. 1

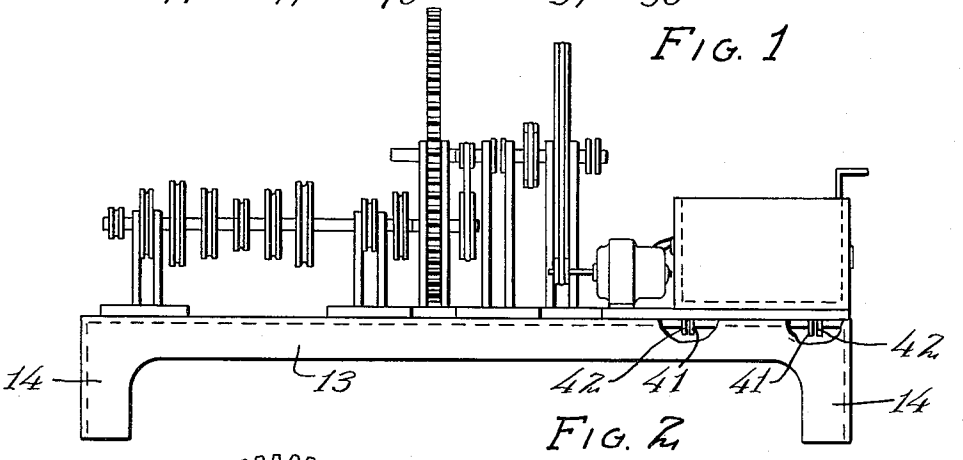


FIG. 2

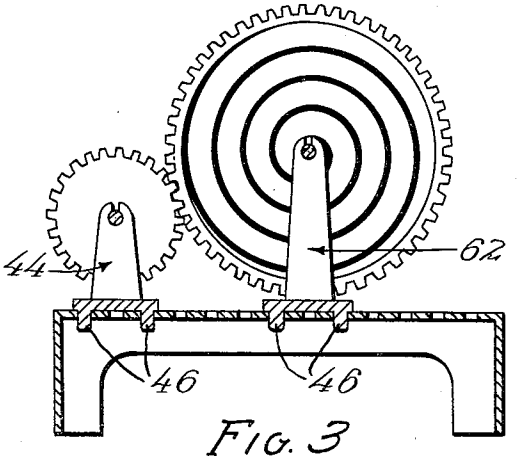


FIG. 3

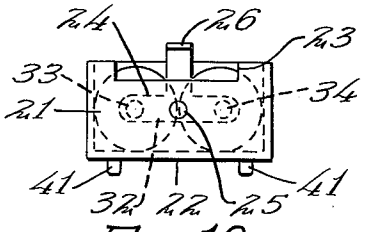


FIG. 10

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MECHANICAL TOYS

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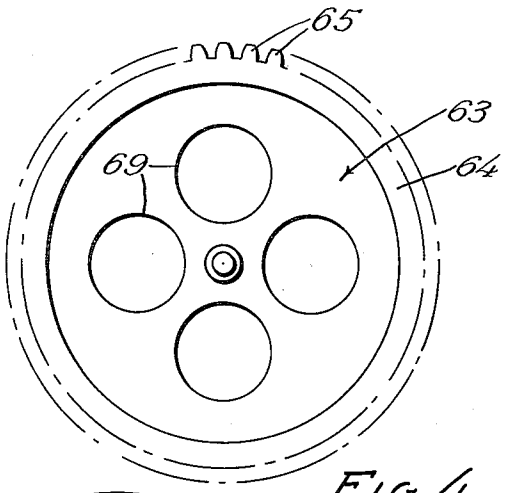


FIG. 4

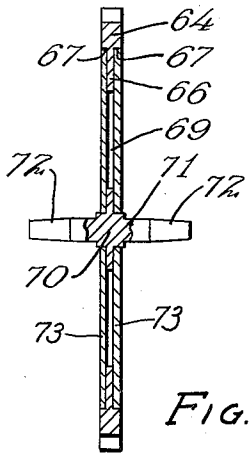


FIG. 5

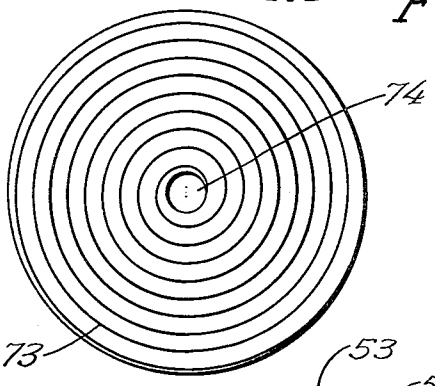


FIG. 6

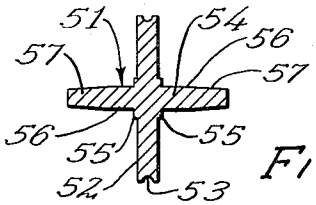


FIG. 7

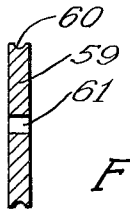


FIG. 8

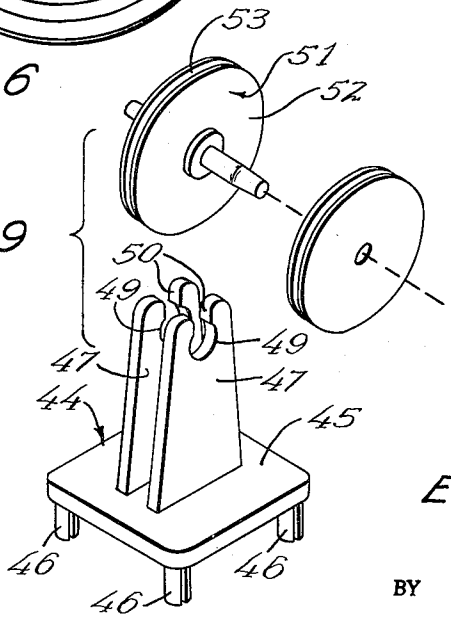


FIG. 9

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2,994,154

MECHANICAL TOYS

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Filed July 18, 1957, Ser. No. 672,827
10 Claims. (Cl. 46—16)

This invention relates to an improvement in mechanical toys and deals particularly with an inexpensive apparatus which is useful in teaching a child various types of mechanical drives and the like.

Various types of mechanical toys have been produced for many years which may be built or assembled into various forms and shapes to produce structures similar to objects seen in everyday life. Some of these devices include an electric motor which may be connected through suitable gears and pulleys to the structures produced for operating the same. The object of the present invention lies in the provision of a simple apparatus including a self contained motor, a series of self contained shaft and pulley supports, and an assortment of pulleys of various sizes and an assortment of gears all of which may be detachably mounted in any desired position upon a table. By connection the motor through an elastic band or string to the various pulleys and gear shafts, a great assortment of different mechanical drives may be produced.

An object of the present invention resides in the provision of a toy having a table or baseboard provided with a series of equally spaced apertures extending vertically therethrough. All of the components which are mounted upon the board include base plates or panels having short downwardly projecting pegs thereupon capable of fitting into the apertures in the base or table. For example, the shaft supports are so constructed that a pulley supported thereby may be mounted in alignment with a pulley upon the motor regardless of the particular position in which the motor is mounted so that this pulley shaft may be driven by an elastic band or string encircling the pulley thereupon and encircling the pulley upon the motor shaft. A second pulley may be mounted upon the pulley shaft, and this second pulley may be used to drive a pulley mounted upon another pulley shaft support. The various parts may be moved about and interchanged to provide a variation in combinations of mechanical motions.

A feature of the present invention resides in the provision of a base or table having apertures therethrough which are equally spaced in two directions so that the elements mounted thereupon may be changed in position throughout the area of the base. For example, the self contained motor unit may be removed from the table and rotated 180 degrees which may have the effect of rotating a driven pulley in a reverse direction. In a similar manner, the motor may be connected by pulleys to one of a pair of independently mounted intermeshing gears to rotate the two gears in one direction, or may be similarly connected by pulleys to the other gear to rotate the two gears in the opposite direction. As a result, the apparatus is educational as well as entertaining.

A further feature of the present invention resides in the provision of a device of the class described including a series of shaft supports each including a base plate which overlies a portion of the base table and is provided with a plurality of downwardly projecting pegs which are spaced to fit into the spaced openings on the base or table. A pair of parallel uprights are supported by the base plate, and the upper ends of these uprights are provided with notches designed to support a pivot shaft in parallel relation to the base plate. A series of pulleys are provided having an integral shaft extending thereto and projecting to opposite sides thereof. These

pulleys may be inserted between the spaced uprights so that the shaft extends through the notches therein, the pulley acting as a spacer to prevent axial movement of the shaft in either direction. Other elements such as pulleys and gears may be frictionally supported on the ends of the pulley shaft to provide numerous combinations of mechanical drives.

An added feature of the present invention resides in the provision of gears which may be supported by the shaft supports and which are cooperable to mesh together when in place. The gears are of proper proportions so that they will mesh together when the shaft supports are properly located relative to one another.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specifications and claims.

In the drawings forming a part of the specifications:

FIGURE 1 is a top plan view of the apparatus showing one arrangement of parts thereupon.

FIGURE 2 is a side elevational view of the apparatus shown in FIGURE 1.

FIGURE 3 is a cross sectional view through the apparatus showing a pair of gears in proper position to mesh together.

FIGURE 4 is a side elevational view of one of the gears showing the construction thereof.

FIGURE 5 is a cross sectional view through the gear shown in FIGURE 4.

FIGURE 6 is an elevational view of a die cut disc which may be frictionally engaged with the gear shown in FIGURES 4 and 5 to change the appearance thereof.

FIGURE 7 is a sectional view through a pulley and integral shaft.

FIGURE 8 is a sectional view through a pulley which may be frictionally engaged with either end of the pulley shaft shown in FIGURE 7.

FIGURE 9 is an exploded view showing the manner in which a pulley may be mounted upon a shaft support and the manner in which an additional pulley may be frictionally engaged with an end of the pulley shaft.

FIGURE 10 is an end elevational view of the motor unit.

In the preferred form of the invention, the toy includes a bench or table 10 having an upper flat panel 11 provided with a series of equally spaced apertures 12 extending therethrough. The table 10 is shown as being rectangular in shape and the apertures 12 are longitudinally aligned and transversely aligned as is indicated.

In actual practice, the table or bench 10 is formed of plastic and is provided with a marginal downwardly extending flange 13 about the periphery of the panel 11. At the corners of the table, the flanges 13 are increased in depth to form legs 14 which support the panel 11 at a suitable elevation. In practice, the legs 14 are of sufficient height so that all of the various elements forming the toy may be confined within the confines of the table when in inverted position. In other words, during storage and shipment, the toy is placed within a rectangular box and all of the various detachable elements may be contained within this box which is of a size just large enough to hold the table.

A motor unit 15 is detachably supported upon the panel 11 to form a source of supply of power for the apparatus. The motor unit comprises a generally rectangular box 16 having parallel side walls 17 and 19, and parallel end walls 20 and 21. The side and end walls are connected in tubular form and extend upwardly from a bottom panel 22. A notch 23 is provided in the end wall 21 and a T-shaped lever 24 is pivotally connected to the wall 21 near its center at 25. The T-shaped lever 24 is provided with a rearwardly turned upper extremity 26 by means of which the lever may be pivoted.

The side walls 17 and 19 are spaced just sufficiently to accommodate a pair of flashlight batteries 27 and 29 in side by side relation. A pair of contacts 30 and 31 extend through the end wall 20 in axially aligned relation to the batteries 27 and 29, the contacts being engageable with the ends of the batteries. The cross arm 32 of the T-shaped lever 24 is designed to engage against the opposite ends of the batteries 27 and 29, and this cross arm is preferably provided with forwardly extending projections 33 and 34 at its opposite ends which are engageable with the battery ends. When the lever 24 is in the central position illustrated, the positive end or terminal of the battery 27 is connected to the ngeative end of the battery 29 to form a closed circuit to the terminals 30 and 31. When the lever 24 is swung in either direction from the center position, the indentation 33 of the cross arm 32 is moved out of contact with the central positive terminal of the batery 27, and the circuit to the terminals 30 and 31 is broken. The motor unit also includes a motor mounting panel 35 which projects forwardly from the end wall 20 forming, in effect, an extension of the bottom panel 22. A motor 36 is mounted upon the panel 35 to extend with its drive shaft 37 extending parallel to the side walls 19 and 17 of the box 16. Conductors 39 and 40 connect the terminals 30 and 31 to the motor 36 to provide a source of current when the switch lever 24 is in a proper position. It should be noted that a series of four downwardly projecting pegs project downwardly from the bottom panel 22, these pegs being properly spaced to fit in the apertures 12 of the table 10. The spacing between the pegs in a lateral as well as in a longitudinal direction is a multiple of the distance between adjoining apertures so that the motor unit 15 may extend in any desired position upon the table. As is indicated in FIGURE 2, the pegs 41 are preferably vertically split as indicated at 42 so that the pins may compress together slightly as they are inserted into the openings to more effectively hold the motor unit in place. The base portion and body structure of the motor unit is preferably made of a plastic material which is sufficiently resilient so that the parts of the pegs may spring together slightly as they are inserted. It will be noted from FIGURE 1 of the drawings that the shaft 37 of the motor 36 is of proper length to support a pulley 43 directly above a row of the apertures 12 in the table in any position of the motor unit. A series of shaft supports 44 which are constructed in the manner best illustrated in FIGURE 9 of the drawings are supplied with the unit, the shaft supports being similar in form but preferably being of different height so that shafts may be supported at desired elevations.

In general, each shaft support includes a generally rectangular base panel 45 having a series of downwardly projecting split pegs 46 monuted thereupon. The pegs 46 are spaced apart a distance which is a multiple of the distance between the apertures in the table 10 or may, of course, be spaced apart a distance equal to the spacing between adjoining apertures but a somewhat wider base is usually preferred. The base 45 supports a pair of parallel uprights 47 having notches 49 in their upper extremities. The notches 49 are preferably keyhole shaped in outline having a slightly narrower entry portion 50 between which the shaft may be urged by springing the parts of the standards on either side of the notch apart. When a shaft is supported in the main or larger diameter portions of the slots 49, the shaft is properly proportioned to rotate without excessive friction.

A pulley and shaft unit 51 is also illustrated in FIGURE 9 of the drawings and is shown in section in FIGURE 7. The unit 51 includes a pulley disc 52 having a peripheral groove 53 therein, and also includes an axial shaft 54 which is preferably integral with or firmly connected to the disc 51. Spacing bosses encircle the shaft 54 integral with the disc 52 to make the pulley of increased width in an axial direction at points adjoining the shaft. The portions 56 of the shaft 54 which are adjacent to the

pulley disc 52 are cylindrical in form and each end of the shaft 54 is slightly tapered as indicated at 57 adapted to fit an additional pulley in a manner which will be later described.

In FIGURE 8 of the drawings I disclose one of the pulleys 59 which is detachably engageable with the tapered end of the pulley and shaft assembly 51. The pulley 59 comprises a disc having a peripheral groove 60 in its outer surface and having an axial aperture 61 extending therethrough. This axial aperture 61 is so proportioned relative to the slightly tapered shaft end 57 so that the distance between the groove 53 of the pulley disc 52 and the groove 60 of the pulley disc 59 is equal to the spacing between adjoining apertures or between adjoining rows of apertures.

It will be noted from FIGURE 1 of the drawings that when the shaft support is in place upon the table, the pulley 52 is arranged on a vertical plane through the axes of the apertures of one row. It should also be noted from an examination of FIGURE 1 of the drawings that the pulley 43 on the motor drive shaft 37 is arranged in a vertical plane through the axes of the apertures of a row when the motor unit is in place upon the table. When pulleys such as 59 are applied to the ends of the shaft 54 of the shaft and pulley assembly 51, they will be on a plane extending vertically through the axes of the apertures of another row. As a result, when the various units are mounted upon the table, the various pulleys can be automatically aligned by placing the units in proper apertures.

The pulleys of the pulley units 51 as well as the pulleys 59 may vary materially in diameter so as to permit the speed of rotation of the various shafts to be changed through very substantial units. Accordingly, certain of the shaft supports may differ from the others in the height of the uprights 47. For example, in FIGURE 3 of the drawings a shaft support 62 is illustrated which is identical with the shaft support 44 illustrated in FIGURE 9 with the exception of the fact that the uprights are somewhat longer so that the shaft will be supported at a greater elevation.

The toy also includes a plurality of gears 63 of the type illustrated in FIGURES 4 and 5 of the drawings. These gears are so proportioned that when they are supported by the various shaft supports 44 and 62, depending upon the size and diameter of the gears, that the gears may be in mesh. As illustrated in these figures, the gears 63 include a cylindrical rim 64 having teeth 65 in its periphery. The rim 64 is supported by a central reinforcing disc 66 which joins the rim 64 with shoulders to provide cylindrical sockets 67. Apertures 69 may be provided in spaced relation through the web or disc 66 to lighten the construction and to improve the appearance.

The web or disc 66 is supported by a central hub 70 from which projects an axial shaft 71. This shaft 71 is provided with slightly tapered end portions 72 which are designed to accommodate pulleys such as 59. The shaft 71 is designed for support in the apertures 49 of a shaft support 44 or 62 which supports the gear on a vertical plane through the axes of the apertures of one row.

As is indicated in FIGURE 6 of the drawings, a disc 73 of paperboard or the like having a central aperture 74 extending therethrough may be applied to either or both sides of the gear 63 to frictionally engage in the cylindrical recess 67. This disc is decorated in any suitable manner so as to add to the interest and attractiveness of the apparatus during operation.

If desired, the unit may also include one or more elongated shafts 75 having a series of axially spaced pulleys 76 thereupon. These pulleys 76 are preferably spaced apart a distance which is a multiple of the spacing between the axes of the apertures of a row so that each shaft 75 may be supported by a pair of spaced shaft supports such as 44. Additional pulleys such as 77 may also be provided on the shaft 75 intermediate the pulleys 76

so that a single shaft may be employed to drive a plurality of other pulleys or other shafts.

Obviously, the detail construction may be varied within certain limits. However, it is important that the various shaft supports as well as the motor unit be able to support the shafts with pulleys thereupon which will automatically align when the supports are placed in proper location. It should also be noted that due to the varying size of the pulleys, it is possible for a great number of different speed combinations to be attained from the motor which operates at a constant speed. Not only is the apparatus entertaining, but it also provides a means of educating a child regarding various types of mechanical drives and the manner in which speed may be increased or reduced depending upon the size of the pulleys and gears in the drive.

In accordance with the patent statutes, I have described the principles of construction and operation of my improvement in mechanical toys, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. A toy including a table having a series of equally spaced apertures therein arranged in rows intersecting at right angles, a motor unit including a motor base, a motor having a drive shaft mounted on said motor base, and a plurality of pegs projecting downwardly from said motor base which are spaced apart a distance equal to a multiple of the spacing of said apertures in said table, a pulley on said drive shaft on a vertical plane through the axes of the apertures of one of said rows when said pegs are engaged in any selected apertures of said table, a shaft support including a shaft support base, a plurality of pegs projecting downwardly from said shaft support base and spaced apart a distance equal to a multiple of the spacing of said apertures in said table, shaft supporting means on said shaft support base having a pair of upwardly directed key-hole-shaped notches, a shaft rotatably supported in the notches of said shaft supporting means having its axis in a vertical plane through the axes of the apertures in one of said rows when said shaft supporting base is mounted on said table, and a pulley on said last named shaft on a vertical plane through the axes of the apertures of one of said rows when said shaft supporting base is mounted on said table, whereby said pulleys may be aligned when mounted in proper relation on said table.

2. A toy including a table having a series of equally spaced apertures therein arranged in rows intersecting at right angles, a motor unit including a motor base, a motor having a drive shaft mounted on said motor base, and pegs adapted to fit snugly in said apertures projecting downwardly from said motor base which are spaced apart a distance equal to a multiple of the spacing of said apertures in said table, a pulley on said drive shaft on a vertical plane through the axes of the apertures of one of said rows when said pegs are engaged in any selected apertures of said table, a shaft support including a shaft support base, pegs projecting downwardly from said shaft support base and spaced apart a distance equal to a multiple of the spacing of said apertures in said table, shaft supporting means on said shaft support base, a shaft rotatably supported by said shaft supporting means having its axis in a vertical plane through the axes of the apertures in one of said rows when said shaft supporting base is mounted on said table, and a pulley on said last named shaft on a vertical plane through the axes of the apertures of one of said rows when said shaft supporting base is mounted on said table, whereby said pulleys may be aligned when mounted in proper relation on said table, and a second pulley detachably engaged on said last named shaft and supported in a vertical plane through the axes of the apertures of one of said rows when said shaft support is mounted on said table.

3. The structure of claim 2 and in which said shaft supporting means comprises spaced parallel uprights.

4. The structure of claim 2 and in which said shaft supporting means includes a pair of spaced uprights having shaft receiving notches in the upper ends thereof.

5. The structure of claim 2 and in which said motor unit includes a battery receptacle for supporting electric motor operating batteries.

6. The structure of claim 2 and in which said motor unit includes a battery receptacle for supporting electric motor operating batteries, conductors connected to said motor and supported for connection with batteries in said receptacle, and a switch in one of said conductors.

7. A toy including a table having a series of equally spaced apertures therein arranged in rows intersecting at right angles, a motor unit including a base, a motor having a motor drive shaft on said base, a pulley on said drive shaft, a plurality of pegs projecting in spaced parallel relation from the bottom of said base, said pegs being spaced apart a distance equal to a multiple of the spacing of the apertures in said table and frictionally engageable in said apertures, said pulley being on a vertical plane through the axes of the apertures of a row when the pegs on said base are engaged in the apertures of said table, a second base having a plurality of pegs extending downwardly therefrom, said pegs being spaced apart a distance equal to a multiple of the spacing of the apertures in said base and frictionally engageable in said apertures, shaft supporting means extending upwardly from said base, a shaft supported by said shaft supporting means in parallel relation to said drive shaft when said pegs are engaged in said apertures, a second pulley supported by said last named shaft on a vertical plane through the axes of the apertures of a row when the pegs on said second base are engaged in said apertures.

8. The structure described in claim 7 and including a gear frictionally engageable on either end of said last named shaft.

9. The structure of claim 8 and including a hollow cylindrical recess in said gear coaxially therewith, and a decorative disc frictionally and detachably engageable in said recess.

10. The structure of claim 7 and including a plurality of additional shaft supporting means similar to said first mentioned shaft supporting means, each having key-hole-shaped notches, shafts detachably supported thereby, and gears on said last mentioned shafts, said gears being so proportioned as to mesh together when the shaft supporting means supporting them are engaged in suitable of said apertures in said table.

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