This invention relates to an arrangement in connection with mechanically operated dancing doll toys and especially but not exclusively to an arrangement in or relating to musical boxes, by means of which arrangement one or more figures are moved on a non-ferromagnetic supporting surface along predetermined paths.

One of the principal features and objects of the present invention is to provide a musical box with dancing figures in which the transmission of movement from a driving part to the figures is effected in such a manner that it is not visible to the spectator. With this object in view the invention provides the figures on a supporting surface constituting the plane of movement and the driving part controlled by the mechanism of the musical box or a motor below said plane of movement, the transmission of movement from the driving part to the figures being effected by permanent magnets.

A further object of the present invention is to provide a musical box in which permanent guiding magnets are arranged on the driving part and guided magnets on the figures respectively so that the figures adjust themselves when moving on the supporting surface as to face always a predetermined direction, without any corresponding change in direction or turning of the guiding magnets below the supporting surface being necessary. With this object the invention provides for poising the permanent guiding magnets arranged on the driving part in substantially vertical direction and for the arrangement of a permanent guided magnet in the base of the respective figure so that the places where the greatest magnetic flux passes out are located laterally side by side. This can be attained either in that the guided magnet arranged in the base of the figure has a horizontal magnetic polarity or it may have a vertical magnet polarity in which case a pole shoe is arranged on the magnet and extends from the top towards the side and then preferably downwards. By this means the guided magnet of the figure is so attracted that it is drawn along by the guided magnet and always adjusts itself in the direction of movement, whereas by turning the guiding magnet about its vertical magnetic axis it exerts no moving influence on the magnet of the figure.

Another object of the invention is to provide a musical box on which two or more figures carry out coordinated movements, such as dancing movements.

Yet another object of the invention is the provision of means which bring the movements of the figures into conformity with the rhythm of the music of the musical box.

Still another object of the invention is to provide a musical box in which the figures are guided over the supporting surface optionally straight ahead along predetermined paths, turning to the right and the left and with turnaround movements.

The arrangement according to the invention for moving the figures on the supporting surface can be used not only in conjunction with a musical box but also in conjunction with other mechanical, electrical or manually driven apparatus, such as in conjunction with a phonograph.

Other objects and details of the invention will become apparent from the following description of several preferred forms of construction illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a vertical sectional view through a musical box:

FIGS. 2 and 3 show on a larger scale cooperating guiding and guided magnets in various positions:

FIG. 4 shows an arrangement with several similarly moving top figures each provided with a guided magnet cooperating with a guiding magnet:

FIG. 5 is a perspective view showing two figures with different magnets and different guiding magnets cooperating therewith to obtain by moving said guiding magnets in the same manner different movements of the figure magnets and their figures:

FIGS. 6 and 7 are perspective views of musical boxes with figures movable in time with the music, parts of the housing being broken away.

In the drawings similar parts are designated by the same reference numerals.

According to FIG. 1, a mechanical music producing mechanism 2 is accommodated in the housing 1 of a musical box and has a vertical shaft 3 carrying a driving part 4. This driving part 4 is rotated by the shaft and carries permanent driving or guiding magnets 5 and 6 which move just below the underside of a non-ferromagnetic supporting surface 7 formed by the top of the musical box. Figures 8 and 9 stand on the supporting surface 7 and each has a convex base 10 in which permanent magnets or soft iron parts are arranged. By the mechanism of the mechanical music producing mechanism 2 the figures 8 and 9 are moved by the magnetic forces on the supporting surface 7 along the paths which are determined by the movements of the driving or guiding magnets 5 and 6. In the form of construction illustrated in FIG. 1 a circular movement is produced. By suitable arrangements of gears or guides any other paths of movement can be obtained.

FIGS. 2 and 3 show possible arrangements of magnets by which a continuous frontal movement of the figures is ensured. A guiding magnet 12 is rigidly connected with a driving part 11 and movable just below a supporting surface 13. The guiding magnet 12 has a magnetic axis extending vertically, that is at right angles to the supporting surface 13. In the embodiment shown in FIG. 2, a figure 14 stands on the supporting surface 13 and has a base in which a permanent magnet 15 is arranged. This magnet 15 has a magnetic axis extending horizontally, that is parallel to the supporting surface 13. By the attraction of unlike poles the magnet 15 will always be drawn along by the movement of the guiding magnet 12, with the result that the point designated by 16 will always face in the direction in which the figure 14 moves.

According to FIG. 3 the base carrying a figure 141 is equipped with a permanent magnet 151 which has a vertical polarity similar to its guiding magnet 12. The component defining the front direction is, in this form of construction, formed by a laterally extended pole shoe 17 of ferromagnetic material in the shape of a hook pointing towards the supporting surface 13. This pole shoe 17 with the upper pole of the guiding magnet 12 of like polarity produces repulsion so that the pole shoe 17 is always located behind in the direction of movement.

In FIGS. 2 and 3 the direction of movement is indicated by arrows L.

According to FIG. 4 three guiding magnets 12 are fixed in line on a common guide or driving part 18. To each of said magnets 12 a magnet 15 is coordinated which is located in the base of a figure 142 which is movable over the supporting surface 13. The magnets 15 are of the same construction as the magnet 15 shown in FIGS. 2 and 3. However, instead of the magnets 15 magnets 15 shown in FIG. 2 may also be used. Any movement of the driv-
The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

1. Claim: In an amusement device, a non-ferromagnetic horizontal support surface, power mechanism including a vertical drive shaft below said surface, magnetically attracted figures supported for free movement on said support surface, a driving part fixed to said vertical drive shaft and rotatable about an axis of rotation defined by said drive shaft, at least one gear wheel rotatably mounted on said driving part with its axis parallel to the axis of rotation defined by said drive shaft, spaced permanent magnets on said gear wheel, spaced permanent magnets cooperating with said magnetically attracted figures for driving the same, and abutment means intermittently engageable with said gear wheel whereby the figures on said shaft are moved in a first path of movement due to rotation of said driving part and a second intermittent path of movement due to engagement of said abutment means engaging said gear wheel.

2. The structure of claim 1 in which one of said spaced permanent magnet means has a magnetic axis normal to the plane of movement of said figures on said supporting surface.

3. The structure of claim 1 in which said power mechanism comprises a music producing mechanism.

4. The structure of claim 1 in which said abutment means comprises stationary teeth concentric to the axis of rotation of said drive shaft.

5. The structure of claim 1 including force-transmitting means on said driving part engageable with said gear wheel and abutment means for providing an intermittent reverse rotation to said gear wheel opposite that caused by the engagement of said gear wheel and abutment means.

6. The structure of claim 5 in which said force-transmitting means comprises a second gear wheel meshed with said first mentioned gear wheel, the axes of said gear wheels each being on a circle concentric to the axis of rotation of said vertical shaft, said abutment means comprising stationary teeth concentric to said axis of rotation of said figures and intermittently engageable with said gear wheels for causing rotation of said spaced permanent magnets in clockwise direction and in counterclockwise direction, respectively, about the axis of said wheel gear.

7. The structure of claim 3 in which said power mechanism comprises a music producing mechanism synchronized with the movement of said spaced permanent magnets by arranging said abutments on said circle so that said magnetically attracted figures are moved in said first and second path of movement chronologically in time with the music produced by said music producing mechanism.

8. An arrangement as set forth in claim 2, wherein said figures include bases having permanent magnets of horizontal polarity.

9. An arrangement as set forth in claim 2, wherein said figures include bases having permanent magnets of vertical polarity and carry a pole shoe extending laterally from the upper pole.

10. An arrangement as set forth in claim 2, wherein said figures include bases having permanent magnets of vertical polarity and carry a laterally extended pole shoe of ferromagnetic material in the shape of a hook pointing towards said supporting face.

11. An arrangement set forth in claim 3, wherein
means are provided for rotating the figure driving means in time with the music produced by the musical box.

References Cited in the file of this patent

UNITED STATES PATENTS

2,220,049 Dunmore Oct. 29, 1940

2,282,430 Smith May 12, 1942

2,814,909 Knowles Dec. 3, 1957

2,840,949 Faulkner July 1, 1958

FOREIGN PATENTS

108,293 Switzerland Jan. 2, 1925

1,129,930 France Sept. 17, 1956