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TRANSMISSION MECHANISM FOR DOLL WITH
INDEPENDENTLY MOVABLE LIMBS

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Fig. 2

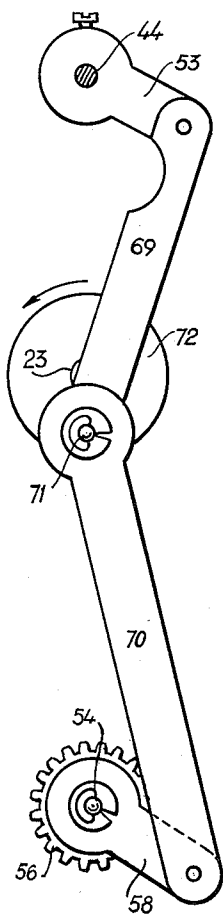
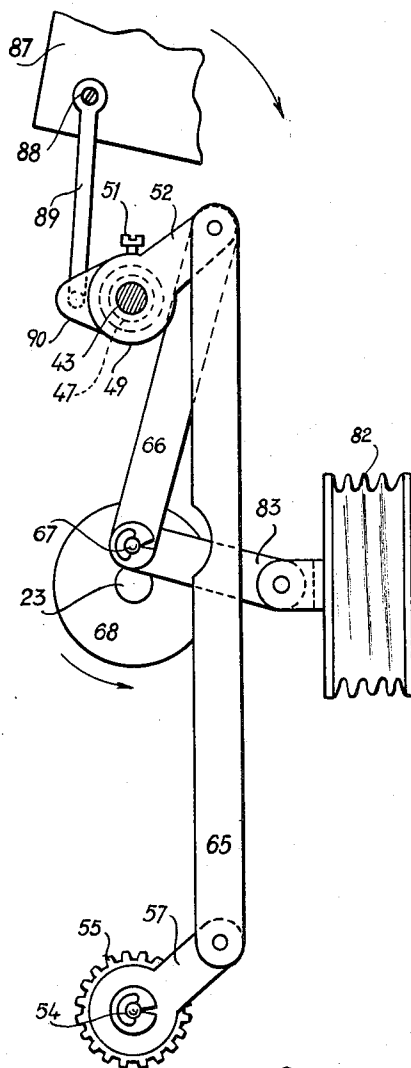


Fig. 3



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TRANSMISSION MECHANISM FOR DOLL WITH INDEPENDENTLY MOVABLE LIMBS

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5 Claims. (Cl. 74—42)

The present invention relates to an animated figure with independently movable limbs, which figure may be an animated figure of any kind, for example an adult or a baby.

This application is a continuation-in-part of my co-pending application Serial No. 521,870, filed July 13, 1955, entitled: Motor Mechanism for Simultaneous Operations.

In the prior art dolls provided with movable limbs an effective naturalness of movement has not heretofore been attained. In part, this is due to the fact that the limbs of these toys are operated with a regularity and synchronism such that the arbitrary natural movements of human beings or animals are poorly imitated. On the other hand, the embodiments approaching reality have the drawback that they are very complicated and of a correspondingly high cost, and are prone to damage.

Thus, the object of the present invention is to provide a new doll with movable limbs wherein, in a simple and correspondingly inexpensive manner, very natural movements are attained from a suitable prime mover, for example a clockwork, which remains completely concealed within the doll's body.

A further object of the invention is to provide a transmission mechanism or gearing for use in dolls of this kind which mechanism is connected between a conventional prime mover and the limbs of the doll to impart to the latter non-symmetrical movements which render more natural the performance of the doll.

The above and other objects, which will appear from the detailed discussion of a preferred embodiment of the invention, are obtained because according to the invention the limbs of the doll, independently mounted on the body of the toy in order to be reciprocated independently of one another, are connected with one another in groups and these groups are connected with the driving member associated with the prime mover so that the phase and form of the cycles effected by the said limbs are different from each other during the operation of the toy.

To this effect, the term "phase" as understood herein is the relative angular position of each limb as regards the prime mover driving member, and the term "form of cycle" denotes the amount of movement by a limb as a function of time.

Preferably, in a doll provided with four movable limbs, for example a baby doll, the limbs are formed with radially extending arms connected to rotatable shafts, and the limbs on one side of the body are connected with one another by means of a connecting rod and one of the limbs is connected with an eccentric member rotated by the prime mover, for example a clockwork, by a connecting rod, while the limbs on the other side of the body are connected by means of connecting rods with an eccentric member also rotated by the prime mover.

In accordance with a further feature of the invention the limbs of the doll are connected to the respective shafts by friction clutches, thus permitting the adjustment of the relative angular position of the limbs relative to said

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shafts independently of the restricted revolving movements supplied to the said limbs by the prime mover. With this type of construction a baby may be reproduced which, for example, when lying on a cradle, moves its legs and arms in the arbitrary manner usual in the babies. Further, the limbs may be adjusted or moved independently of each other with the prime mover at rest.

The invention is set forth in detail in the following specification and claims, taken in connection with the accompanying drawing in which:

Fig. 1 is a front view of the complete mechanism;

Fig. 2 is a side view of part of the mechanism for driving the limbs on one side of the doll, and

Fig. 3 is a side view of the mechanism for driving the limbs on the other side.

With reference to Fig. 1, it will be seen that a portion of the doll's body has been shown at 10 and it has openings 11 therein for moving members in the form of legs 12, and has housings 13 therein in which moving members in the form of arms 130 are rotatably housed. Preferably the doll's body is formed of two parts made of synthetic resin and engageable with one another on a line extending along the sides of the body, and both parts are joined together in a conventional easily separable manner (not shown) so that the assembled body constitutes an enclosure protecting the mechanism within the doll, while at the same time it may be easily opened for the purpose of servicing or repair of the mechanisms. The upper part of the body has therein a wide opening, not shown in the drawing, through which the neck for a head 14 protrudes.

Within the doll body 10 are two lateral plates 15, spaced from each other by means of transverse members 16 at the upper and lower ends of the plates 15. Between these plates are rotatably mounted several shafts of a prime mover in the form of a conventional clockwise mechanism comprising the spring 17, the shaft 18 of which protrudes outside the plates 15 and has the end 19 of a square shape for engagement by a winding key. The clockwork also has a primary gear wheel 20 provided with a winding ratchet mechanism 21. Gear wheel 20 meshes with the pinion 22 secured on a main shaft 23 which in turn is rotatably mounted between plates 15. A driving member in the form of a multiplying transmission starts at the main shaft and comprises the gears 24, 25 and 26, pinions 27, 28 and 29 and shafts 30, 31 and 32. The last pinion, shown at 29 has connected thereto a pair of arms 33 forming part of a governor device 34. Another pair of arms forming part of the governor is connected to a sleeve 35 slidable on the shaft 32. Sleeve 35 has a friction plate 36 thereon adapted to engage a fixed stop 37 on one of the plates 15, for restricting the speed of the transmission during the working of the toy. The pinion 29 has fixed thereto a cross or star shaped member 38 between the arms of which the in-turned end 39 of a stop lever 40 may be inserted. Lever 40 is pivoted on one of the plates 15 at 41 and protrudes outside the body 10 through an opening 42.

The upper part of each of the plates 15 has an opening therein aligned with the opening in the other plate, in which opening two shafts 43, 44 are rotatably mounted. At the end near the center of the doll, the shaft 43 has an axial hole 45 therein in which the reduced end 46 of the shaft 44 is positioned. The shafts are thus engaged with one another so that, as indicated in Fig. 1, each shaft prevents inward displacement of the other and, furthermore, this engagement contributes to maintaining both shafts aligned. The axial locking of both shafts is completed by the holding rings 47 fastened on the shafts by means of the set screws 48 adjacent the inner surfaces of the plates 15.

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The two shafts 43, 44 protrude laterally of the respective plates 15 and each shaft has secured thereto, outside of the said plates, a collar 49, 50 respectively by means of set screws 51, and each collar has a radial arm 52, 53 thereon for the operation thereof in a manner to be described.

The lower part of each plate 15 has fastened thereto a pivot 54 protruding outwardly and aligned with the other pivot. Gears 55, 56 respectively are rotatably mounted on said pivots 54 and have attached thereon radial arms 57, 58 for the operation thereof by means which will be described. Beneath the said gears, the plates 15 are bent so that the ends 59 are at an angle to the remainder of the plates. Bearing bushings 60 are mounted on the ends 59 and have journaled therein the shafts 61, 62 for the legs of the doll. Each of said shafts has mounted thereon a gear 63, 64 respectively meshing with the gears 55, 56 previously described.

On the left side of the mechanism, as better seen in Fig. 3, the two radial arms 52 and 57 are connected by means of a connecting rod 65. Furthermore, the radial arm 52 has articulated thereto one end of a connecting rod 66 the opposite end of which is connected to the eccentric pin 67 on a disc 68 which in turn is secured to the end of the main shaft 23 where it protrudes from the adjacent plate 15. There is thus formed a group of connecting means between the transmission and the limbs on the left side of the doll.

It will be understood that the working of the prime mover described above will cause rotation of shaft 23 and disc 68 which, by means of the connecting rod 66 will impart a synchronous phased motion to both radial arms 52 and 57. Thus, at this side of the doll the corresponding leg and arm, connected to the shafts 43 and 61 in a manner to be described, will perform similar movements between pre-selected angular positions determined by the initial positions of the arm and leg.

On the other side of the body, as seen in Fig. 2, the radial arms 53 and 58 have articulated thereto the outer ends of connecting rods 69 and 70, the inner ends of which are articulated to the eccentric pin 71 fast on a disc 72 which in turn is secured to the main shaft 23. In this case the arm of the doll will perform a movement with the same amplitude and form of cycle as that of the other side, but in a different phase. The leg on this side does not exactly follow the movement of the corresponding arm as is the case with the arm and leg on the other side, since in the present instance the transverse displacement of the pin 71 constantly changes the distance between the ends of the radial arms 53 and 58, that is to say, the relative angular position of these arms. There is thus formed another group of connecting means connecting the transmission to the arm and leg on the other side.

Other equivalent types of mechanical transmissions may be used to give to the several limbs different displacements, and there may be provided conventional means for shifting easily from one to the other variation. For example, the keying of the radial arms to the respective shafts may be changed, or the offsetting of the articulation points of the said radial arms may be varied.

The coupling of the four limbs to the respective shafts is carried out in the same manner, so that a detailed description of one will serve for each of the four.

As indicated in Fig. 1, the limbs, for example limbs of molded synthetic resin, but a coupling member 73 having an outer surface 74 which is perpendicular to the axis of rotation of the limb, and a cylindrical portion 75 which fits in one of the housings 13 or one of the openings 11. The inner part of member 73 has an inner surface 76 also perpendicular to the axis of rotation and at the center of this surface is a cylindrical housing 77 extending inside of the limb. Within the housing 77 there is mounted a cylindrical body 78 having a threaded axial bore into which is threaded the end of the driving shaft

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for the member in question. Within the housing 77 is a compression spring 79 which rests against the bottom of the housing and urges the body 78 outwardly. However, movement is prevented by the washer 80 the central opening of which is of a smaller diameter than the cylindrical body. The washer is secured to the member 73 by means of a screw 81. The friction produced by the compression of the spring between the washer 81 and the cylindrical body 78 provides a suitable connection between the limb and the driving shaft, although permitting the limb to be manually displaced with respect to the shaft in order to set the relative angular positions of the limbs.

The toy may be provided with other known, complementary mechanisms. For example, a device such as a bellows 82 provided with acoustic devices may be used for imitating the voice or the crying of a child, or the sounds produced by animals. In the present instance the bellows is connected by a connecting rod 83 to the pin 71 for driving the limbs of the one side of the body.

In accordance with a further feature of the invention, the head of the doll is mounted so that it may be set in any given position around a vertical axis and it is made to oscillate in a direction transverse to this axis in synchronism with the movements of the limbs. To this end the plates 15 have two upper extensions 84 parallel to one another and spaced from each other, in which two aligned holes 85 are formed for receiving the tenons 86 mounted on the oscillating body 87 between the extensions of the plates. This body has, at a point spaced from the said tenons, a pivot 88 to which one end of a connecting rod 89 is articulated, the opposite end of which rod is articulated to the free end of a radial arm 90 secured to the retaining ring 47 on shaft 43 at the left of Fig. 1, so that the oscillating body 87 follows the movements of the left arm.

The head 14 is secured to the oscillating body 87 by means of a stem 91, the upper end of which is mounted in the head 14. The stem extends through an axial hole 92 in body 87. The head rests on the upper part of the oscillating body which protrudes slightly from between the plates 15. The lower end of the stem extends beneath the body 87 where it has secured thereto a retaining ring 93. Between this ring and the lower surface of the oscillating body 87 is compressed spring 94 which maintains the engagement of head 14 and oscillating body 87 with some friction. A skirt 95 depending from the lower edge of the head conceals the parts of the mechanism which otherwise would remain exposed.

As it will be understood from the above description, the head nods simultaneously with the movement of the limbs of the toy, but at the same time it may be given the desired lateral rotation by merely turning it manually with respect to the body, either during the performance of the device or when the prime mover is stopped.

By means of the above construction a number of additional advantages is obtained. For example, the doll does not appear to have junctions between the limbs and the body thereof. The inclined arrangement of the revolving shafts of the legs make the movements thereof more natural. Furthermore, the special arrangement of the friction couplings permits all of the movements to be effected without damaging the device as is the case with known constructions.

I claim:

1. In a combination, a prime mover, a driving member driven by said prime mover, four moving members movable independently of each other, four rotatable shafts, one for each of said moving members, on which said moving members are frictionally fitted, and a plurality of groups of connecting means, each different from the others and each connected to and driven from said driving member, said driving member comprising a first eccentric and a second eccentric and one of said groups of con-

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necting means comprising lever arms fixedly connected to each of the first and second of said rotatable shafts, a connecting rod pivoted between the lever arms on said first and second rotatable shafts and a link pivotally connected between one of said lever arms and said first eccentric, and the other of said groups of connecting means comprising a lever arm fixedly connected to each of said third and fourth rotatable shafts, and a link pivotally connected between each of said lever arms on said third and fourth shafts and said second eccentric.

2. The combination as claimed in claim 1 in which the first rotatable shaft and the third rotatable shaft are aligned, one shaft of the pair of aligned shafts having a recess therein and the other shaft of the pair of aligned shafts having a reduced end portion rotatably fitted in the recess in said one shaft.

3. The combination as claimed in claim 1 in which one of the shafts of said first and second shafts and one of the shafts of said third and fourth shafts is at an angle to the other shaft of the first and second shafts and the other shaft of the third and fourth shafts, and transmission means on said inclined shafts connecting said inclined shafts to the lever arms for said inclined shafts.

4. The combination as claimed in claim 2 in which the frictional fit between said shafts and said movable

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members comprises a cylindrical housing on the movable member, a cylindrical body on the shaft rotatably fitted into said cylindrical housing, a washer fixed to said housing and surrounding the shaft and with the aperture in the washer of a diameter smaller than the diameter of said cylindrical body, and resilient means in said housing bearing on said cylindrical body urging the end of said cylindrical body into frictional engagement with said washer.

5. The combination as claimed in claim 1 and a further movable member, a cylindrical oscillating body connected to said driving member for oscillating said body transverse to the longitudinal axis thereof, said cylindrical oscillating body having an axial hole therethrough, and a stem connected to said further movable member and extending through said axial hole and frictionally engaged with said oscillating body.

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