Nov. 28, 1933. R. J. PARRISH 1,937,162

TOY

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FIG. 1.

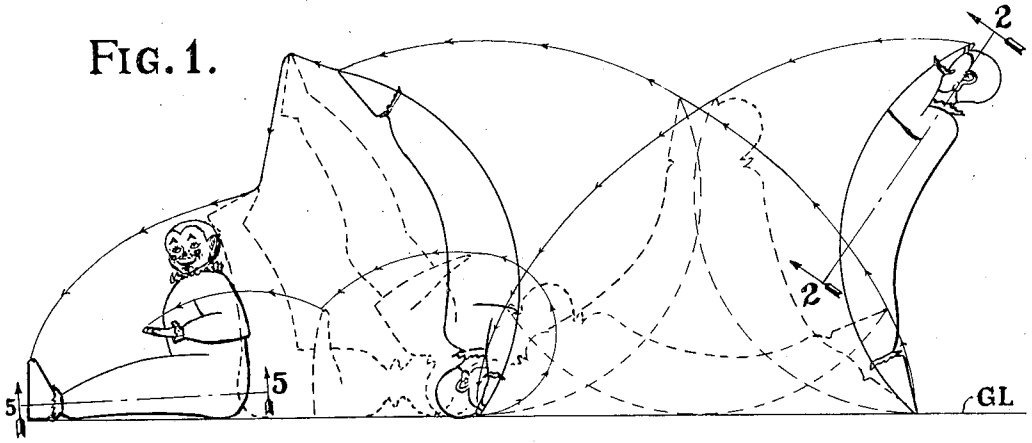
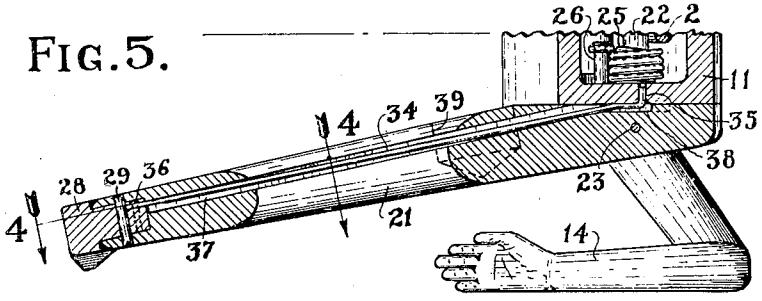



FIG. 5.



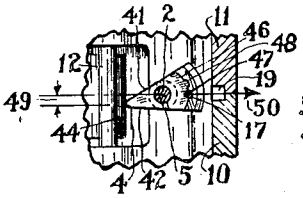




FIG. 6.

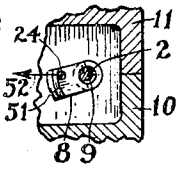



FIG. 7.

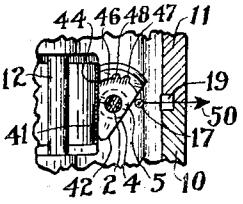



FIG. 8.

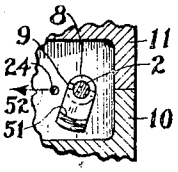



FIG. 9.

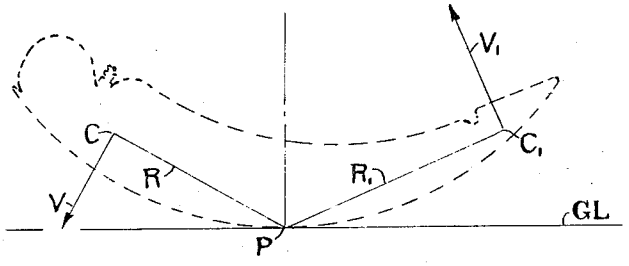



FIG. 10.

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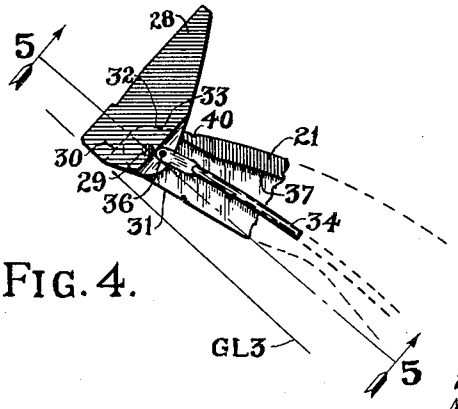



FIG. 4.

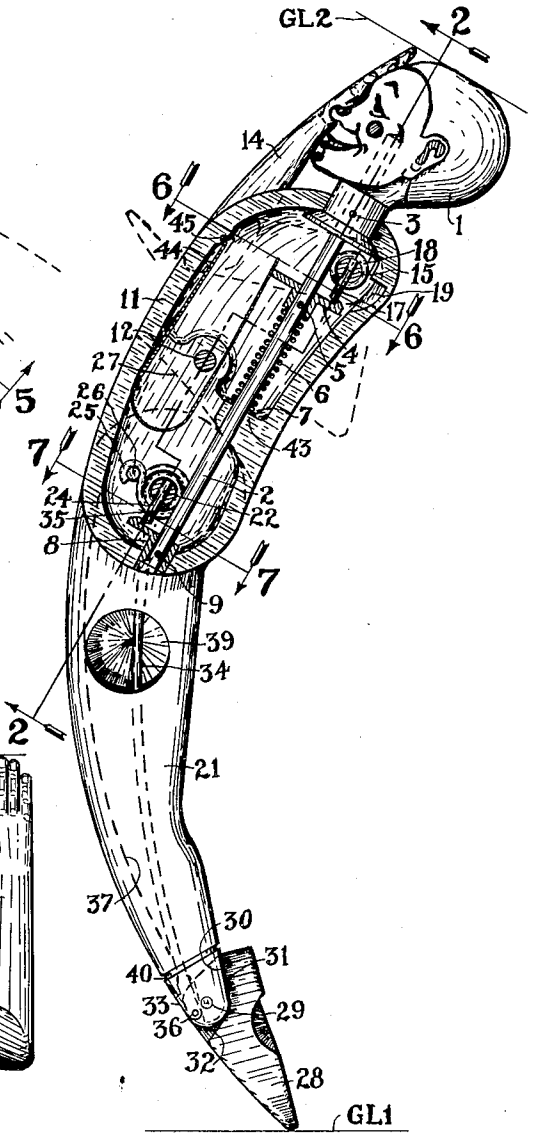



FIG. 3.

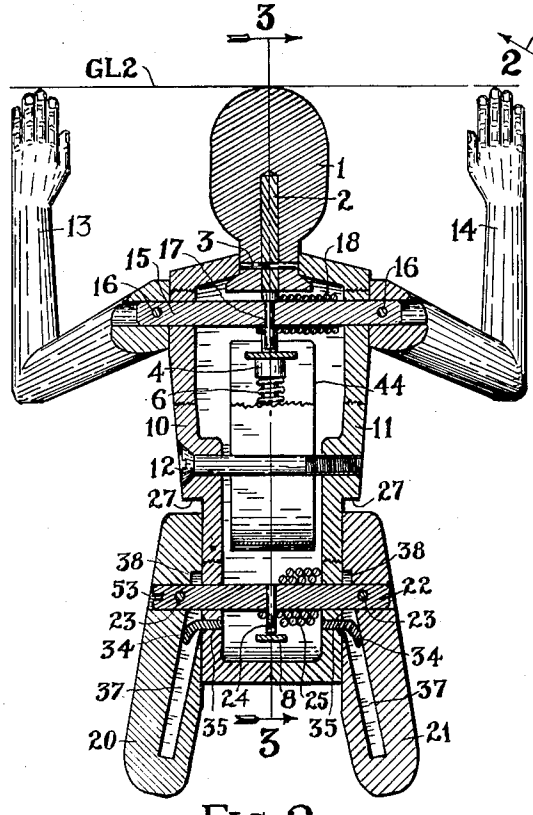



FIG. 2.

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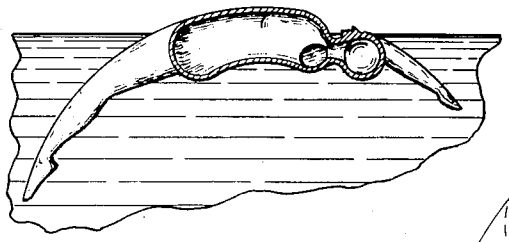


FIG. 13.

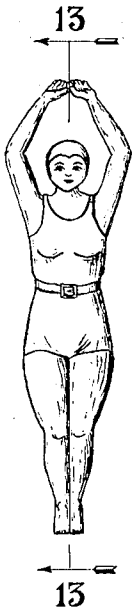



FIG. 12.




FIG. 11.

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Patented Nov. 28, 1933

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# UNITED STATES PATENT OFFICE

1,937,162

## TOY

Russell J. Parrish, Richmond, Ind.; Mary E. Parrish administratrix of said Russell J. Parrish, deceased

Application November 16, 1931
Serial No. 575,311

17 Claims. (Cl. 46—40)

My invention relates to a toy that may be represented in the form of a human being or an animal and is characterized generally by its novel construction such, that when properly disposed in a standing position for use on a substantially flat horizontal surface, gyratory and gravitational forces, independent of other forces, will act thereon to cause the same to somersault or roll from a substantially upright position thru an inverted position and thence to a prone position.

My invention is further characterized by providing in a toy of this type movable limbs and novel means for actuating said limbs at predetermined intervals in the somersaulting or rolling motion as affected by the gyratory and gravitational forces to impart to said toy a further rolling motion.

A further characteristic of my invention resides in the provision in a toy of this type, a head adapted to move relative to the body of the toy and means for actuating said head in a selected direction.

A still further characteristic of my invention resides in having the means for actuating the head and limbs of my novel toy entirely disposed within the body portion thereof and in providing means for retaining said head and limbs in a preset position, said retaining means being adapted to be released by a primary movement of said head during the rolling movement of said toy.

My invention contemplates as a further characteristic thereof the combination of a figure embodying my novel construction and a diving platform of appropriate length with means, if desired, for suitably adjusting the height of said platform so that said figure when properly placed on the platform and acted upon by gyratory and gravitational forces will effect a somersault in part or in whole on the platform, and will continue somersaulting thru the air striking the water head first, feet first or any other desired position, and ending in a floating position with the forward part of the figure presenting upwardly.

In the drawings, which form a part of this specification and in which similar parts are designated by similar reference characters:

Fig. 1 is a diagrammatic view illustrating the different positions assumed by the toy as it is moved from a vertical position thru the inverted position and into a sitting position.

Fig. 2 is a vertical transverse sectional view thru the head and body taken on the line 2—2 on the vertically disposed figure in Fig. 1.

Fig. 3 is a vertical mid-section view taken on line 3—3 of Fig. 2 showing the positions of the arms and legs in dotted outline for the seated position of the figure.

Fig. 4 is a sectional view thru the line 4—4 in Fig. 5, showing the foot in the position that it assumes when the figure is in the seated position.

Fig. 5 is a transverse sectional view thru the leg and foot on line 5—5 in Figs. 1 or 4.

Fig. 6 is a fractional sectional view on the line 6—6 of Fig. 3, showing the arm trigger when the head is set to turn to the left as seen in Fig. 1.

Fig. 7 is a fractional sectional view taken on the line 7—7, of Fig. 3, showing the lower or leg trigger when the head is set to turn to the left.

Figs. 8 and 9 are views corresponding to views 6 and 7 respectively, but showing the position of the trigger members when head is completely turned to the left.

Fig. 10 is a diagram illustrating the mechanics of the movement.

Fig. 11 is a diagrammatic view of the movements of a diving figure, embodying my invention as it is moved from a vertical position on a diving platform, thru the air into the water and in its final floating position, initial and final positions being shown in full line, intermediate positions being shown in dotted lines.

Fig. 12 is an enlarged view of the floating figure, and

Fig. 13 is an enlarged sectional view on the line 13—13 of Fig. 12, the figure being disposed in a floating position.

The head assembly consists of a head and neck 1, rigidly attached to the vertical shaft 2 by a pin 3. An upper or arm trigger 4 is rigidly attached to the vertical shaft 2 by a pin 5, Figs. 3 and 6, a compression spring 6 and a washer 7 being freely mounted on shaft 2, and disposed between the trigger 4 and a support formed integral with each half of the body as hereinafter described. The shaft is passed thru an opening in the support and has attached at its lower end a trigger 8, by means of a pin 9. The trigger 8 has a stem that constitutes a bearing for the shaft 2 and is received within an opening formed between the two halves. It will thus be seen that the shaft is rotatably mounted between the halves of the body and journalled at three spaced positions.

The body assembly is formed of two parts a left half 10 and a right half 11. These parts are held together by a screw 12 and are aligned by shoulder and hip shafts 15 and 22 respectively. The left and right arms 13 and 14 are fixedly attached to a shoulder shaft 15 by pins 16, 16,

the shoulder shaft and arms being movable together and rotatably mounted in openings formed directly opposite each other in the body halves 10 and 11. At the middle of the shoulder shaft 15 is rigidly inserted an arm lever 17, the lower end of which engages with the trigger 4. A helical torsional spring 18 is freely mounted about shaft 15. The right end of said spring is formed with a straight portion and is prevented from turning by bearing against the inside of the body half 11, and the left end of the spring 18 is formed with a bent portion that is hooked about the arm lever 17, tending to rotate the arms in counter-clockwise direction, Fig. 3, until the lever 17, when released by trigger 4, is stopped by a notch 19, formed in the body at junction of halves 10 and 11, the finger tips and elbows being shown in dotted outline in Fig. 3, as the position to which the arms are lowered by the action of the spring 18.

The left leg 20 and the right leg 21 are rigidly attached to hip shaft 22 by pins 23, 23 and said shaft and legs are rotatably mounted in body halves 10 and 11. At the middle of the hip shaft 22 is rigidly inserted a leg lever 24, the lower end of which engages with the trigger 8. A two-layer helical torsional spring 25 is freely mounted about the shaft 22. The right end of said spring is prevented from turning by being hooked about a pin 26, which is rigidly fixed in body half 11 and the left end of said spring is hooked about leg lever 24, tending to rotate the legs in a clockwise direction, Fig. 3, until the front of the legs are stopped by overhanging ledges 27, 27 formed on the body halves 10, 11.

Each leg 20 and 21 has a foot 28, Figs. 3 and 4, that is rotatably mounted about an ankle pin 29. The lower end of each leg is forked to receive the foot. The backward motion of the foot in relation to the leg, is limited by the contact of surface 30 on the foot with surface 31 on the back of the leg. The forward motion of the foot with relation to the leg is limited by the contact of surface 32 on the foot with surface 33 on front of the leg. The backward and forward movement of each foot is actuated by a means of a rod 34 which is hooked at its upper end thru a hole 35 in the body and is rotatably attached at its lower flattened end by pin 36 to the foot at a point above the ankle pin (relative to the sole of the foot). Each leg is formed with a deep slot 37 extending throughout substantially the entire length of the leg, i. e., from the center of rotation at the upper end to the point of rotation at the lower end. Each leg is also formed with a cylindrical hole 38 at the inner surface of the upper end concentric with shaft 22. These slots 37—37 and holes 38—38 permit the free movement and flexing of rods 34—34. Holes 39 are provided on the inside of each leg to permit the rods 34 to be held as the upper end of said rod is guided into hole 35 in assembling. A groove 40 is formed above the ankle of each leg to receive a draw string of the cuff of a clown suit (not shown), to prevent the latter from sliding down and interfering with the motion of the foot relative to the leg.

The rotation of the foot 28 about the ankle pin 29 as the leg 21 swings forward is apparent from inspection of Figs. 3 and 4, or perhaps it would be clearer to assume that the leg is fixed as in Fig. 3 and that the hole or pivot point 35 rotates counter-clockwise about the center of shaft 22. Since the distance from 22 to 35 plus the distance from pivot point 35 to pivot point 36 is greater than the distance from point 22 to point 36, and since the foot, as above described, has a limited counter-clockwise rotation, the straight line distance between points 35 and 36, will become shorter until the points 22, 35 and 36 are all in line. This will cause the rod 34 to flex or bow forward due to the end thrust, but the tangential component of this force causing back thrust will not be sufficient to overcome the torque due to spring 25. By a continued relative clockwise movement of the point 35 about point 22 this end thrust is first relieved, and then, rod 34 will pull point 36 up and forward about point 29 bringing the foot to a position relative to the leg, as shown in Fig. 4.

The head assembly described above is rotatably mounted in the body, but its angle of rotation is limited to 180° minus the angle formed by sides 41 and 42 of trigger 4, Figs. 6 and 8. This corresponds to the normal unstrained angle of rotation of the human head from side to side. The distance of the vertical movement of the head assembly with relation to the body is the difference between the straight section of the neck and the thickness of the body wall at the neck. This distance is greater than the over lap of lever 17 with trigger 4 and greater than the over lap of lever 24 with trigger 8. The head and trigger assembly is held to its uppermost position by the thrust of compression spring 6 between trigger 4 and washer 7, the thrust being applied to ledge 43 of the body halves 10 and 11. A U-shaped spring 44, made of flat spring material, has its front end hooked into a groove 45 formed in the inner wall of body halves 10 and 11 and its rear end bears against the point of the trigger 4, Figs. 3 and 6, in the normal position of the head, or against the side 41, Fig. 8 or side 42 of trigger 4, corresponding to a "left face" or a "right face" of the head respectively.

The raised ridge 46 of the arm trigger 4, Fig. 6 is in the shape of an arc concentric with the shaft 2. In this ridge and at equal distance from its centerline are two semi-cylindrical holes or notches 47 and 48 to receive the lower end of arm lever 17. The moment 49—50, tending to cause trigger 4 to turn from the position shown in Fig. 6 to the position shown in Fig. 8, is equal to the force of spring 44 against trigger 4 multiplied by the distance from the point of application or contact of spring 44 to the plane of action of lever 17. The raised ridge 51 of leg trigger 8, Figs. 7 and 8, is an arc concentric with shaft 2. The action of leg lever 24 coincides with the action of lever 17.

From the above description it will be obvious that when the top of the head is pressed down relative to the body Fig. 3, the triggers 4 and 8 clear the ends of levers 17 and 24 respectively, allowing the arms and legs to change from the position shown in Fig. 3 and the right hand outline of Fig. 1 to the dotted line position shown in Figs. 3 and 4 and by the left hand outline in Fig. 1. As soon as the end of lever 17 is clear of the notch 47 in the ridge 46 of trigger 4, spring 44, Fig. 6, becomes effective to snap the head to the left or right respectively and with it the triggers 4 and 8 to a position shown in Figs. 8 and 9, respectively. If the end of lever 17 were placed in notch 48 instead of notch 47, the same relative change of triggers 4 and 8 would take place, as shown in Figs. 3 and 9, but reversed about arrow lines 50 and 52.

Figs. 3 and 9 also show that the planes of action as represented by arrow lines 50 and 52,

are no longer intercepted by trigger ridge 46 and 51, respectively. It is therefore impossible for the leg lever 24 not to be properly released due to the motion of the legs being slower than that of the arms, said slower motion being due to the longer radius of gyration of the legs than that of the arms and due to the greater velocity of the feet to be decelerated than the velocity of the hands to be accelerated. See middle solid outline of Fig. 1.

Hip shaft 22 has a screw driver slot 53 at its left end to permit initial stress to be given spring 25 before the right leg 21 is pinned to the shaft. The right leg holds the shaft against this turning force while left leg 20 is attached.

The detail operation of the severally assembled parts of this embodiment of my invention having been explained, the operation of the toy as a whole will now be described:

In the standing position, Figs. 1 and 3, the palms of the hands, the undersides of the forearms, the front of the body, the front of the legs and the top of the feet when from the side, form the arc of a circle. The body, arms and head are naturally heavier than the legs and feet, but the centers of gravity and the radii of gyration are further controlled by making the hands and arms and the feet of heavier materials than that of the body, head and legs. Assuming now, that the toy has moved from the vertical or normal standing position to a position as shown in Fig. 10, which is the same relative position as the third outline from the right in Fig. 1, P, the point of contact of the toy or figure with the ground line GL, moves from the toes to the tips of the fingers. P is also the instantaneous center of rotation of the outline. C and $C_1$ are the instantaneous centers of gravity of the upper part and the lower part respectively and although they move slightly with the change of P, they may be assumed as practically constant because of the concentration of mass at or near those points. R and $R_1$ are the instantaneous radii of gyration of points C and $C_1$ about point P. R decreases and $R_1$ increases as P moves from right to left. V and $V_1$ are the instantaneous velocities of points C and $C_1$ respectively about point P and $V:V_1=R:R_1$.

It is difficult to show a mathematical demonstration when all quantities are variables, but some general statements may serve to prove the principle. By the physical laws of motion, force varies as the acceleration, and acceleration varies as the square of the velocity, and in rotary motion acceleration also varies inversely with the radius. Therefore in Fig. 10 the accelerations of C and $C_1$ are increasing and decreasing respectively due to the respective decrease and increase in radius of gyration, but decreasing and increasing respectively due to the decrease and increase of velocity. If the mass at C and the mass at $C_1$ were equal, the acceleration would alternately become equal and reverse and the figure or toy would rock back and forth with decreasing amplitude as a rocking chair coming to rest, but as the mass at C is much greater than that at $C_1$ the force generated at C is sufficient to cause the figure to rock past dead center as shown by the middle solid outline, Fig. 1, before the counter force generated at $C_1$ has increased sufficiently to bring the motion to rest.

In Figs. 1 and 10, GL represents the ground line, whereas, in Figs. 2, 3 and 4, $GL_1$, $GL_2$ and $GL_3$ represent the same positions of the ground line relative to the outlines of the respective figures as that shown in right, middle and left solid outline respectively of Fig. 1.

The form having rocked and rotated to the fifth position or middle solid outline of Fig. 1, the head strikes the ground line as at $GL_2$, Figs. 2 and 3 and releases the triggers 4, 8, causing the arms, legs, feet and head to act as above described. As explained before, the arms move more quickly than the legs and as the elbows project behind the body, the arms thru the spring 18 help lift the back of the body to a sitting position as shown in the seventh position in Fig. 1. However, the major part of the force causing the sitting position is due to the suddenly increased acceleration of the feet due to their suddenly decreased radius of gyration, see 6th and 7th positions of Fig. 1. The increased force generated by this acceleration of the lighter lower portion is expended in lifting the heavier upper portion to a sitting position and in bringing the figure to rest.

The action of the feet relative to the legs not only adds to the lifelike appearance of the figure but aids the action of the somersault first, by increasing the height of the figure in the tip-toe standing position and thus increasing the radius of gyration of the upper portion of the figure during the first part of the somersault and second, by bringing the toes in and thus decreasing the radius of gyration of the feet in the latter part of the somersault.

The toy is reset by bending the legs down and back as far as possible and bending the arms up and back as far as possible, holding one arm and the body in one hand and with the front of the legs until the face is to the front. By releasing the pressure that holds the arms and legs back, the arm lever 17 will fit into either notch 47 or 48 of the trigger 4. To change the direction to which the head is to face, the arms are pressed back sufficiently to permit the head to turn and then turning head until the lever 17 is felt to engage with the other notch.

The trigger setting may be made automatic by eliminating the feature of automatically turning the head. If, in Fig. 3, the rear edge of the ridge of the upper trigger 4, the front of the lower end of arms lever 17, the front of the ridge of trigger 8, and the rear of the lower end of leg lever 24 were beveled, moving the arms up and back, and the legs down and back simultaneously will force both triggers down against the thrust of spring 6 until both triggers are automatically set.

Figs. 11, 12 and 13 illustrate a further embodiment of my invention. In this embodiment, the doll or diving figure is rigid, the upper portion being heavier than the lower portion and the front of the outline is also an arc of a circle, all as in the first form of the invention; but, in addition, the doll must not only be capable of turning a somersault but to float in water and its center of buoyancy and the center of gravity so arranged that it will float face up and with the face above the surface of the water, as in Fig. 13. The hands and the feet may be spread apart as in the first form, but preferably should be held together corresponding to the attitude for diving, as shown in Fig. 12.

Referring to Fig. 11, it will be seen that the diving doll, in solid outline, is positioned on a platform 54, the doll being shown in dotted outline in a series of attitudes or positions as it makes a forward somersault on the platform, leaving the platform feet first, a forward somer-

sault in the air and entering the water head first and at such an angle as to cause a backward somersault under water, emerging head first and ending by floating on its back face up. The platform 54 is slidably mounted on the upright support 56 which is fitted with a weighted base 57 which may set on the edge of a wading pool as indicated in Fig. 11 or on the bottom of the pool or of a shallow vessel of water. The height of the diving platform above the surface of the water is adjustable to accommodate the variation in the height of the base and to permit any number of somersaults in one dive, a definite additional height being required for each rotation in the air, the vertical adjustment of platform 54 on support 56 being fixed by a clamp screw 58. The initial position for each dive is standing on tip toe with both toes pressed back against shoulder 59 of the platform and with the tips of the fingers touching the upright support 56. In this position the center of gravity of the doll is just forward of the vertical plane thru the toes so that when restraint is removed the doll will tip forward. The platform 54 is provided with a short end so that when the doll is positioned thereon the dive is the same as the first except the initial somersault on the platform is eliminated, the figure tilting forward head first from the short end 55 of the platform.

The invention is not to be limited to contours or mechanical details except as restricted by the appended claims. Compression springs or tension springs or rubber bands may be used instead of torsion springs, as illustrated in my first embodiment and the doll may be made of any solid material; the diving doll may be made of any material, preferably rubber, that will not deteriorate rapidly in water and which will permit the doll to float. Candy, chewing gum, cake or other food product materials may be used. The somersaulting toy may be sold as a food product or confection.

I claim:

1. A somersaulting body representing a figure substantially symmetrical relative to its longitudinal center plane and of substantially convex front outline from end to end, said body having its upper end portion heavier than the lower end portion so that when in an upright position, with respect to a substantially horizontal plane, with its center of gravity slightly in advance of the vertical, said body will automatically move forward and pass thru an inverted position thereof.

2. A somersaulting body representing a figure comprising a body portion and limbs fixed to opposite ends thereof, said body and limbs presenting in longitudinally extended position an arcuate front, the upper end portion of said figure being heavier than the lower end portion, so that when in an upright position with respect to a substantially horizontal plane, with its center of gravity slightly in advance of the vertical, the same will be moved forward and pass thru an inverted position by gravitational and gyratory forces.

3. A somersaulting body representing a figure comprising a body portion and movable limbs fixed thereto, said body and limbs presenting in longitudinal extended position thereof, a substantially arcuate front, said figure having its upper end portion heavier than its lower end portion for causing the same to be moved forward from a substantially upright position with respect to a substantially horizontal plane and pass thru an inverted upright position when acted on by gravitational and gyratory forces and means for actuating said limbs during said movement to effect a further movement of said figure into another advanced position.

4. A somersaulting body representing a figure comprising a body portion and movable limbs fixed thereto, said body and limbs presenting in longitudinally extended position thereof, a substantially arcuate front, said figure being adapted to pass thru an inverted upright position from its normal position and means for actuating said limbs during said movement to effect a further movement of said figure into another advanced position.

5. A body representing a figure comprising a body portion, a head and limbs presenting in longitudinally extended position thereof a substantially arcuate front, said body portion and limbs being pivotably connected together and said figure having its upper end portion heavier than its lower end portion for causing the same to be moved forward from a substantially verticle position thereof, with respect to a substantially horizontal plane and pass thru an inverted upright position when acted on by gravitational and gyratory forces and including means for actuating said limbs during said movement to effect a further movement of said figure into another advanced position on said surface.

6. A somersaulting body representing a figure comprising a body portion, a head and limbs, presenting in longitudinally extended position thereof a substantially arcuate front, said body portion and limbs being pivotably connected together and said head being mounted for rotation relative to said body, said figure having its upper end portion heavier than its lower end portion, for causing the same when moved forward from a substantially vertical position thereof, on a substantially horizontal surface, to pass thru an inverted position, means for actuating said limbs during said movement to effect a further movement of said figure into another advanced position on said surface and means controlled by said actuating means, for rotating said head relative to said body.

7. A body representing a figure comprising a body portion and movable limbs attached thereto, said body and limbs presenting in longitudinally extended position thereof a substantially arcuate front, said figure having its upper end portion heavier than its lower end portion for causing the same to be moved forward from a substantially upright position and pass thru an inverted upright position when acted on by gravitational and gyratory forces and means entirely disposed within the outline of said body for actuating said limbs during said movement to effect a further movement of said figure into another advanced position.

8. A body representing a figure comprising a body portion, and a head connected to said body portion, said head and body portion being mounted for relative rotational movement, said figure presenting in longitudinal dimensions a substantially arcuate front and being so constructed and arranged that when tipped forward from its vertical position of balance on a horizontal surface said figure will be acted on by gravitational and gyratory forces to cause the same to move thru an inverted position and means for effecting said relative movement, said means being adapted to be actuated by a relative linear movement of said head and body.

9. A body representing a figure comprising a

body portion and a head connected to said body portion and mounted for linear and angular movement relative thereto, said figure being adapted to be acted on by gravitational and gyratory forces, to cause the same to move thru an inverted position and means operable by said linear movement for effecting said angular movement relative to said body.

10. A body representing a figure comprising a body portion and a head connected to said body portion and mounted for linear and angular movement relative thereto, said figure being adapted to be acted on by gravitational and gyratory forces, to cause the same to move thru an inverted position and spring means operable for rotating said head relative to said body and means adapted to be released by the relative linear movement of said head and body for setting said springs means into operation.

11. A body representing a figure comprising a body portion, and a head connected to said body portion, said head and body portion being mounted for relative rotational movement, said figure presenting in longitudinal dimensions a substantially arcuate front and being so constructed and arranged that when tipped forward from its vertical position of balance on a horizontal surface said figure will be acted on by gravitational and gyratory forces to cause the same to move thru an inverted position and means for rotating said head about its axis during said last mentioned movement and means for presetting said first mentioned means to obtain a predetermined direction of rotation of said head.

12. In combination with a figure adapted to advance from a vertical position thru an inverted position, said figure having a body portion and a head movable connected thereto, of means movable with said figure and connected to said head for actuating the same independent of said first mentioned movement and means for presetting the direction of movement of said head.

13. A body representing a figure having its center of gravity above its geometrical center comprising a body portion and limbs rotatably connected to the upper and lower ends of said body portion, said limbs being movable in opposite directions and presenting with said body portion in their extreme outer positions a substantially arcuate front means for maintaining said limbs in their extreme position means for releasing said limbs and means for actuating said limbs in opposite directions whereby when said figure is positioned slightly forward of a substantially vertical position gravitational and gyratory forces will cause the same to pass thru an inverted upright position and into a sitting position.

14. A body representing a figure having its center of gravity above its longitudinal center and being adapted to advance from a vertical position thru an inverted position and thence into a seated position comprising a body portion, limbs pivotably connected to opposite ends of said body portion, means disposed within said body portion for actuating said limbs in opposite directions, trigger means for releasably holding said limbs in substantially arcuate alignment; a head slideably connected to said body portion and adapted to be rotated about its longitudinal axis, said head cooperating with said trigger means to release the same when said body is in the inverted position, and means adapted to rotate said head in the inverted position thereof.

15. A somersaulting body representing a figure comprising a body, arms and legs attached to said body at the ends thereof, said legs having feet jointed thereto at the ankle and being so constructed and arranged to form an arcuate front outline, that is a continuation of the front outline of said body and arms, and means for releasably holding said feet fixed with respect to said body.

16. A somersaulting body representing a figure comprising a body, arms and legs attached to said body at the ends thereof, said legs having feet joined thereto at the ankle and being so constructed and arranged to form an arcuate front outline, that is a contination of the front outline of said body and arms, means for holding said feet fixed with respect to said body portion in the normal position thereof, and means for actuating said feet during the somersaulting of said figure.

17. A somersaulting body representing a figure comprising a body, arms and legs attached to said body at the ends thereof, said legs having members joined thereto at the ankle and being so constructed and arranged to form an arcuate front outline, that is a continuation of the front outline of said body and arms, means for releasably holding said arms and leg members fixed with respect to said body portion in the normal position thereof, and means for actuating said arms and leg members during the somersaulting of said figure.

RUSSELL J. PARRISH.