Aug. 9, 1966 J. L. BONANNO 3,264,779

MOTION DELAY MECHANISM AND ANIMATED TOY EMPLOYING IT

Filed July 10, 1964

FIG. 1.

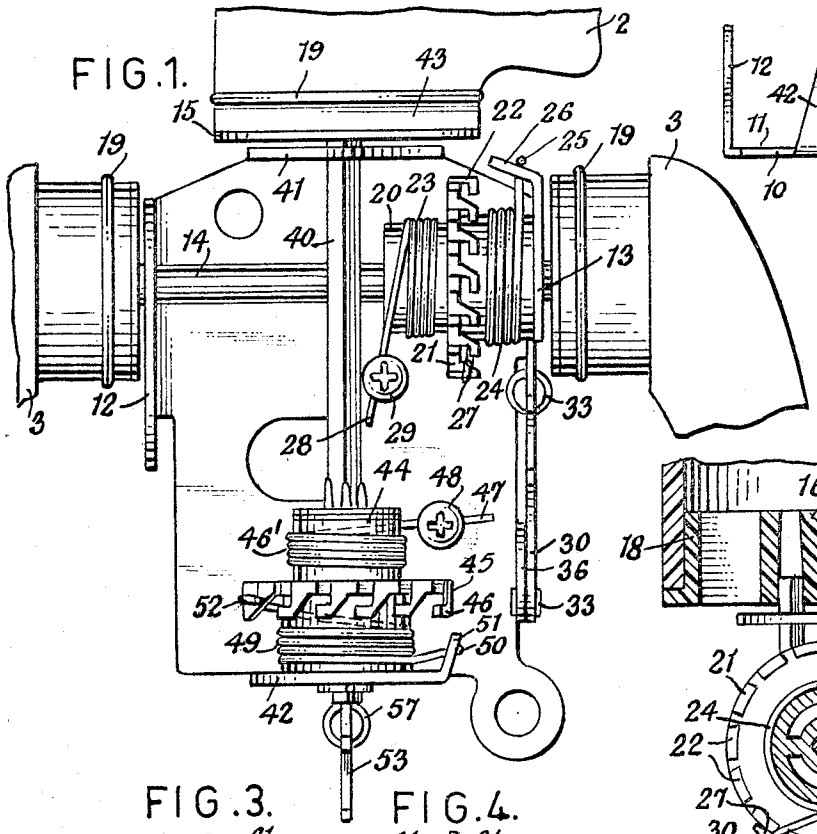


FIG. 5.

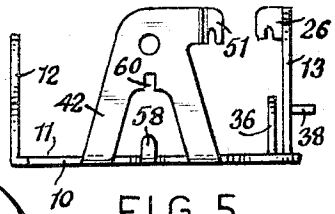


FIG. 2.

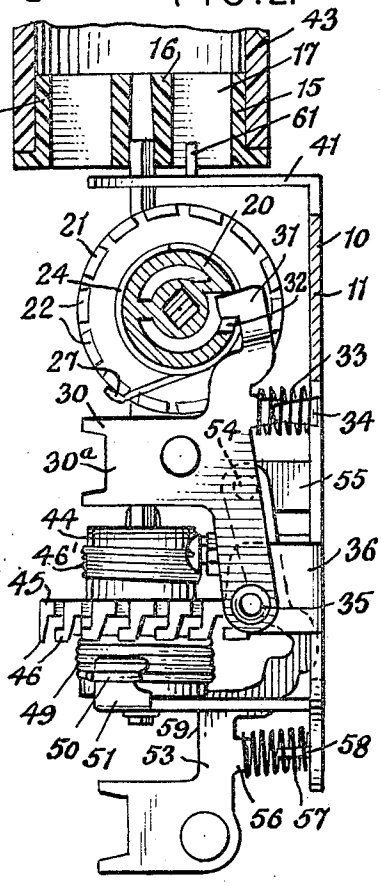


FIG. 3.

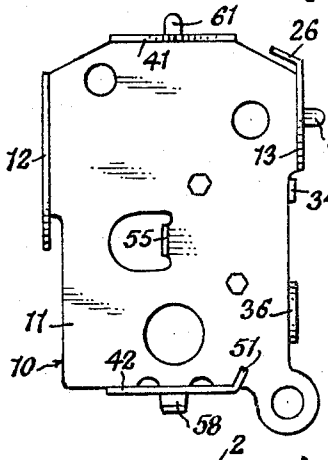


FIG. 4.

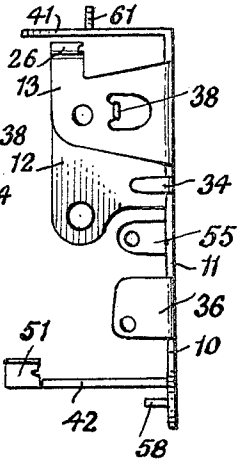
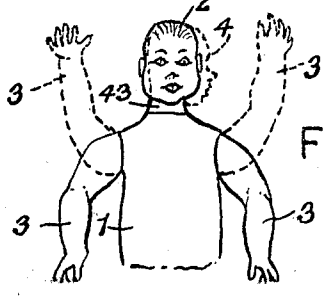


FIG. 6.



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MOTION DELAY MECHANISM AND ANIMATED TOY EMPLOYING IT

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19 Claims. (Cl. 46—120)

This invention relates generally to mechanisms in which a driven component is caused to move relative to another component, and has particular reference to a motion delaying means for retarding the movement in a predetermined controllable manner.

It is an object of the invention to provide a motion-delay device which is simple in structural nature, inexpensive to manufacture, easily regulated, reliably effective over long periods of usage, silent in operation, and exceptionally staunch and rugged, and resistant even to immersion in water.

The improved motion-delay mechanism is characterized by the employment of a means such as a tensioned coil spring for imparting rotation, through a limited arc, to a shaft which controls the movement of the component to be driven; and by recourse to a helical braking spring to impede the shaft frictionally when the shaft is rotated in driven direction. The convolutions of the retarding spring extend in a direction in which they automatically tighten against the shaft, or against a drum carried by the shaft, during its driven movements. Thus the frictional effect can be accurately regulated whereby the driven movement is slowed to the desired extent, while the return or re-setting movement can be brought about with a minimum of externally applied force.

The invention is useful for a wide range of purposes. It is particularly applicable to animated toys, for assuring relatively slow movement of one part with respect to another. For example, in a doll, the movement of the head, or of one or more of the appendages, can be regulated to bring about relatively slow life-like animation. The invention will therefore be described and illustrated as part of a doll mechanism.

In the embodiment chosen for illustration, a doll body contains a mechanism which includes a pair of shafts, each of said shafts having a limited rotative movement, one of the shafts carrying the doll's head and the other shaft carrying the arms. Mounted on each shaft is a drum encircled by two springs, one of which springs is a coiled driving spring and the other a contractible braking spring, the arrangement being such that the rotation of each shaft under the torque imposed on it by its driving spring is resisted by the contractible spring to such an extent that the movement of each of the shafts is slowed causing the arms and head to move in a slow, lifelike manner. Latches are provided by which the drive springs can be held under tension until released by manual pressure exerted on the body of the doll, the latch releases being exteriorly accessible.

One way of achieving these objects and advantages, and such other benefits as may be pointed out hereinafter, is exemplified in the accompanying drawings, in which—

FIG. 1 is a front elevational view of an animating mechanism constructed according to the present invention;

FIG. 2 is a side elevational view of the same, with certain parts shown in section;

FIG. 3 is a face view, on a reduced scale, of the base member of the animating mechanism;

FIG. 4 is a side elevational view of the same;

FIG. 5 is an end view of the base member; and

FIG. 6 is a front elevational view of a portion of the body of a doll showing how the arms and head thereof are moved by means of the animating mechanism.

The animating mechanism is shown, by way of example, housed within the body 1 of a doll and is coupled to the head 2 and also to the arms 3 in a way which causes these parts of the doll to move slowly from one position to another and thus simulate the leisurely movements of an infant. That is to say, the head of the doll can be caused to turn slowly from a forwardly-facing position, as shown in full lines in FIG. 6, to a side-facing position as shown at 4 in dotted lines, or vice versa. This movement, when slowly carried out by the present animating device, tends to simulate the act of a baby in falling asleep during the turning of the head as above described. The animating device also provides means by which the arms 3 of the doll can be slowly raised above the head, i.e., from the lowered retracted position shown in full lines in FIG. 6, to the raised or extended position shown in dotted lines, or vice versa. The head movement and arm movement can be effected simultaneously, or operated separately, as may be desired.

The mechanism shown includes a metallic base member 10 shown in detail in FIGS. 3, 4 and 5. It has a back wall 11, on which are formed integral side flanges 12 and 13 in which a cross shaft 14 is mounted for limited rotative movement. The cross shaft 14 has its opposite ends extending respectively beyond the flanges 12 and 13, the ends of the shaft being attached to the arms 3 of the doll. For this purpose, each arm 3, which may be of hollow construction and composed of a soft plastic material, may be fitted with an appropriate insert or plug 15 (shown in FIG. 2 in association with the neck portion 43 of the head 2 of the doll). The plug consists of a cylindrical piece having a central hub 16 from which spokes 17 radiate and connect to a rim 18. The ends of the cross shaft 14 are force-fitted into the hub 18 and to further securely attach the arms 3 to the shaft 14, a wire ring 19 may be tightly fitted around each arm.

Mounted on the shaft 14 is a drum 20 formed with a disk 21, said disk having on its periphery a plurality of hook members 22. A coil spring 23 encircles one part of the drum and constitutes a snubbing or braking device tending to control the rotative speed of the shaft 14, so that upon the manual disengagement of a latch or control member to be described, the regulated rotative speed of the shaft 14 will be slow and the arms 3 borne by the shaft will be slowly raised to the position shown in dotted lines 3 in FIG. 6.

The rotating means for the shaft 14 consists of a torsion spring 24 encircling a part of the drum 20 between the disk 21 and the side flange 13. This is a drive means and has one end 25 engaged with a lug 26 formed at one end of the flange 13. The second end 27 of the driving spring 24 is engaged with the disk 21 and is connected with a selected one of the hooks on said disk to properly tension the spring 24 and cause it to rotate the shaft 14 at the desired speed.

The braking or snubbing spring 23 which encircles the inner part of the drum 20 has one end 28 adjustably connected to a post 29 secured to the base plate 11. This spring 23 can be adjusted to provide the necessary contracting force around the drum 20 to frictionally slow down the rotation of the shaft 14 so that the arms 3 carried by the shaft 14 will very slowly move from their lowered to their raised position.

Tension is stored in the spring 24 by manually moving the arms 3 downwardly from their raised position to the lowered position, and when this position is reached, a latch member or catch 30, best seen in FIG. 2, will have its nose 31 engage with a recess 32 formed in the

wall of the drum **23** and thus hold the drum and shaft **14** against rotative movement. A coil spring **33** is fitted around a lug **34** on the side of the base plate **11** and serves to bias the latch member **30** in a direction away from the base plate so as to hold the latch member normally in the drum-engaging position shown in FIG. 2. The latch member **30** is pivoted at **35** on a lug **36** formed as an integral extension of the base plate **11**.

The animating mechanism is housed within and concealed by the hollow body of the doll and when a child desires to have the arms of the doll raised or elevated, she will exert pressure on the part of the body of the doll behind the fingerpiece **30***a* on the latch member **30**, thereby releasing the latch member from its engagement with the slot **32**, whereupon the tensioned drive spring **24** will begin to rotate the shaft **14** while the braking spring will resist such rotative movement, thereby slowing down the rotation of the shaft **14** so that the arms **3** of the doll will be slowly and smoothly raised. Stop means can be provided for limiting the raising and lowering movements of the arms **3**. For thus purpose a lug **38** can be formed on flange **13**, projecting into the plug or insert **15** in one of the arms **3**, and located between the spokes **17** of the plug so that it contacts with one or the other of the spokes at the limit of its travel in either direction.

The manner in which the head **2** of the doll can be rotated (e.g., from front-facing position to side-facing position) is substantially similar to the manner in which the arms are moved. At **40** is shown a square shaft which is rotatively mounted in the flanges **41** and **42** of the base member. The head of the doll is formed with a tubular neck **43** in which one of the plugs **15** is fitted, the hub **16** thereof receiving the end of the shaft **40** substantially as shown in FIG. 2. A wire clamping ring **19** may also be used to firmly attach the neck of the doll to the inserted plug. The shaft **40** carries a drum **44**, substantially similar to the drum **20**, the drum **44** carrying a disk **45** having the peripherally hooked edge **46**. Encircling the upper part of the drum **44** is the braking spring **46**[1] having its end **47** adjustably connected to the post **48**. The propelling or torsion spring **49** has its other end **52** connected to an end **50** connected to a lug **51** formed on the flange **42**, and has selected one of the hooks **46** on the disk **43**. The drive spring may, by the selection of the proper hook on the disk **43**, be set for the required torque to rotate the shaft **40** at the desired speed.

The latch for controlling the rotation of the shaft **40** is indicated at **53**. It has one end pivoted at **54** to a lug **55** formed on the body of the base plate **11**. The latch **53** is formed with a lug **56** which engages with a coil spring **57** maintained by a lug **58** formed on the base plate **11** at one end thereof. The coil spring **57** acts to bias the latch **53** to drum-engaging position, and the edge **59** of the latch enters into a notch **60** (FIG. 5) in the flange **42** and engages with a slot in the hub **44**, said slot being similar to that shown at **32** in the drum **20**. The flange **41** has a lug **61** which constitutes a stop member, and by its contact with one or the other of the spokes **17** in the neck plug **15** it limits the rotative movement of the head from a front-facing position to a side-facing position and vice versa.

From the foregoing, the operation of the animating device will be readily understood. The tension in the torsional propelling spring **49** is stored by manually turning the head **2** from its side-facing position to its front-facing position. When this position is reached, the latch **53** engages the notch in the drum **44** and holds the shaft **40** from turning. When the lach **53** is manually depressed by pressure exerted at the proper position on the body of the doll, the drum **44** will be released from the latch and the shaft **40** will begin to rotate toward a side-facing position of the head. While the shaft **40** is turning, the braking spring will frictionally create a drag or retarding effect on the drum **44** and will materially slow down the turning of the doll's head, thus simulating the natural turning of the head of a sleepy infant about to begin its slumber.

The shaft **14** carrying the arms **3** operates in a similar manner. By bringing the arms **3** down from raised position to lowered position, energy will be stored in the torsional or propelling spring **24** and when the lowered position of the arms is reached the latch **30** will engage the slot **32** in the drum and hold it from rotating. Upon exertion of manual pressure on that part of the body of the doll behind which the fingerpiece of the latch is situated, the latch will be depressed and will free the drum **20**. The shaft **14** will then turn and raise the arms to elevated position. The frictional effect of the braking spring **23** on the drum **20** will be to slow down the rotation of the shaft **14** so that the movement of the arms **3** from lowered to raised position will be slow and leisurely.

The arms and head thus have their propelling springs tensioned or cocked by simply moving these parts of the doll from their advanced positions to retracted positions. No winding keys, levers or other parts project from the body of the doll. Moreover, the device is solely spring-operated, and is noiseless in operation.

While the invention has been described in connection with a doll, it will be understood that it is of wider scope and provides a highly useful and versatile mechanism that can control a variety of movable components. For example, it could be embodied in a delayed-action domestic electric light switch of the kind which employs a tiltable mercury switch unit. Another illustrative field of use of the invention would be in a telephone dialing mechanism.

In whatever environment the invention may be used, is operates silently and reliably, and can be readily designed and adjusted to impart precisely the desired retardation. The several parts of the mechanism are made of non-corrodable material so that humidity, and even complete submergence, will not cause damage to the mechanism. The drum is composed of stable wear-resistant plastic such as acetal resin plastic, and the springs of stainless steel or other non-corrodable material. The braking effect is dependent, of course, upon the coefficient of friction, and in each case the braking spring is formed with just right diameter, and the correct selected number of convolutions, to impart the desired retarding force. This can be regulated, also, by varying the tension on the driving spring.

Although only a single embodiment of the invention has been described, it is therefore obvious that the invention is not restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What is claimed is:

1. In an animated toy, a component mounted for relative movement with respect to another relatively fixed component, a rotatable shaft for moving said first-named component, driving means for imparting rotative movement to said shaft through a limited arc, and a helical braking spring having convolutions encircling the shaft and acting to restrain it frictionally and thereby retard said movement, the convolutions extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten.

2. An animated toy as defined in claim **1**, in which said first-named component is mounted on said shaft for slow rotative movement therewith when the shaft is driven.

3. An animated toy as defined in claim **1**, in which said shaft carries a drum upon which said braking spring is wound, and in which said driving means is a coil spring wound around another part of said drum.

4. In an animated toy, a component mounted for relative movement with respect to another relatively fixed component, a rotatable shaft carrying said first-named component, a coil spring interposed between said com-

ponents for imparting rotative movement to said shaft through a limited arc, means for releasably latching said shaft in a position in which said coil spring is tensioned, a drum on said shaft, and a braking spring having convolutions encircling said drum and acting frictionally to restrain the rotative movement of the shaft when said latch is released, the convolutions of said braking spring extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten against said drum.

5. An animated toy as defined in claim 4, in which said drum carries a notched disc, one end of the coil spring being anchored to said relatively fixed component, the other end being selectively engageable with one of the notches in said disc so that the torque exerted by said spring upon the shaft can be regulated.

6. In a doll, a hollow body, an appendage mounted for relative movement with respect thereto, a rotatable shaft journaled in said body and carrying said appendage, a coil spring encircling said shaft for imparting a limited rotative movement to it, said spring having one end anchored to said body and the other to said shaft, a drum on said shaft, and a helical braking spring having convolutions encircling said drum and acting to restrain it frictionally and thereby retard the shaft movement, the convolutions extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten against said drum.

7. A doll as defined in claim 6, including a means for releasably latching said shaft in a position in which said coil spring is tensioned, and a latch release in a location accessible from the exterior of said body.

8. A doll as defined in claim 7, in which said shaft extends transversely across said body and said appendage is an arm of the doll.

9. A doll as defined in claim 7, in which said shaft extends in a longitudinal direction and said appendage is the head of the doll.

10. A doll as defined in claim 6 in which there are a plurality of shafts of the character described, including a coil spring, drum, and helical braking spring for each, the doll appendage carried by one of said shafts being the head of the doll.

11. In a doll, a hollow body, a pair of arms mounted for relative movement with respect thereto, a rotatable shaft journaled transversely in said body and carrying said arms at its opposite ends, a coil spring encircling said shaft for imparting to it a rotative movement which swings said arms from a retracted position alongside the body to an extended position projecting from the body, said spring having one end anchored to said body and the other to said shaft, a means for releasably latching said shaft in a position in which said coil spring is tensioned, a latch release in a location accessible from the exterior of said body, a drum on said shaft, and a helical braking spring having convolutions encircling said drum, said convolutions extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten against said drum while rotative movement of the shaft in the opposite direction is not impeded, whereby the shaft may be readily rotated by hand to the latched position, whereupon release of the latch causes the arms to move slowly from their retracted to said extended position.

12. In a doll, a hollow body, a rotatable shaft journaled longitudinally in said body and carrying the doll head at one end, a coil spring encircling said shaft for imparting to it a rotative movement which swings the doll head through an arc of movement between two positions, said spring having one end anchored to said body and the other to said shaft, a means for releasably latching said shaft in one of said doll head positions with said coil spring tensioned, a latch release in a location accessible from the exterior of said body, a drum on said shaft, and a helical braking spring having convolutions encircling said drum, said convolutions extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten against said drum while rotative movement of the shaft in the opposite direction is not impeded, whereby the shaft may be readily rotated by hand to the latched position whereupon release of the latch causes the head to move slowly from one of its positions to the other.

13. A toy doll provided with a head having a limited rotative movement from a front-facing position to a side-facing position, a frame, a shaft mounted for restricted rotative movement therein, the head being mounted on said shaft, a drum on said shaft, a pair of helical springs encircling said drum, one of the springs being effective to rotate the shaft, the other spring acting to retard the driven rotation of the shaft and thereby effect a slow turning movement of the head, the convolutions of said retarding spring extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten.

14. A doll as defined in claim 13, including a releasable spring-biased latch, the drum having a notch for engagement by said latch to hold the drum against rotation, and a disk carried by the drum and having hooks arranged around its periphery for selective engagement by one end of the shaft-rotating springs to regulate the torque exerted by said spring on the shaft.

15. A doll having a movable head and movable arms, a rotatable shaft carrying the head, a rotatable shaft carrying the arms, a drum carried by each shaft, a pair of spring encircling each drum, one of the springs on each shaft being a shaft-propelling spring, the second spring on each drum being a braking spring having convolutions extending in a direction in which the rotative movement of the shaft in the propelled direction induces them to tighten whereby said second spring is effective to resist rotative movement of its drum and serving to slow down the shaft on which the drum is mounted.

16. A doll as defined in claim 15, including a spring-biased manually-releasable latch for each drum to hold the shafts against rotation.

17. An animated doll comprising a doll body, containing a pair of shafts, each of said shafts having a limited rotative movement, a drum mounted on each shaft, each drum being encircled by two springs, one of said springs being a driving spring for rotating its shaft through an arc of movement, the second spring on each drum being a contractible braking spring exerting a frictional influence on its drum to thereby resist the rotative movement of the shaft under the torque imposed on it by the driving spring to thereby materially slow down the movement of each shaft, the convolutions of said braking spring extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten, a doll's head carried by one of the shafts, and arms carried by the second shaft, the head and arms being moved slowly from one position to another by the slow rotative movement of said shafts.

18. An animated doll as defined in claim 17, wherein releasable latches are provided for engagement with each drum to hold each shaft against rotation, the shafts crossing one another at substantially right angles, the arms and head each containing an insert, and stop means engaging a part of each insert to restrict the rotative movements of the arms and head.

19. A motion-delay mechanism comprising a shaft mounted for rotation with respect to a relatively fixed component, a coil spring encircling the shaft and serving as a driving means for imparting rotative movement to the shaft through a limited arc, one end of said spring being fixed to said fixed component and the other end being fixed with respect to said shaft, and a helical braking spring encircling and frictionally engaging said shaft and thereby acting to retard said movement, one end of said braking spring being fixed to said fixed component and

the other end being slidable with respect to said shaft as the latter rotates, the convolutions of said braking spring extending in a direction in which the rotative movement of the shaft in the driven direction induces them to tighten.

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