July 10, 1928.

1,676,296

J. A. SPENCER

FIGURE TOY

Filed Oct. 23, 1924

Fig. 1

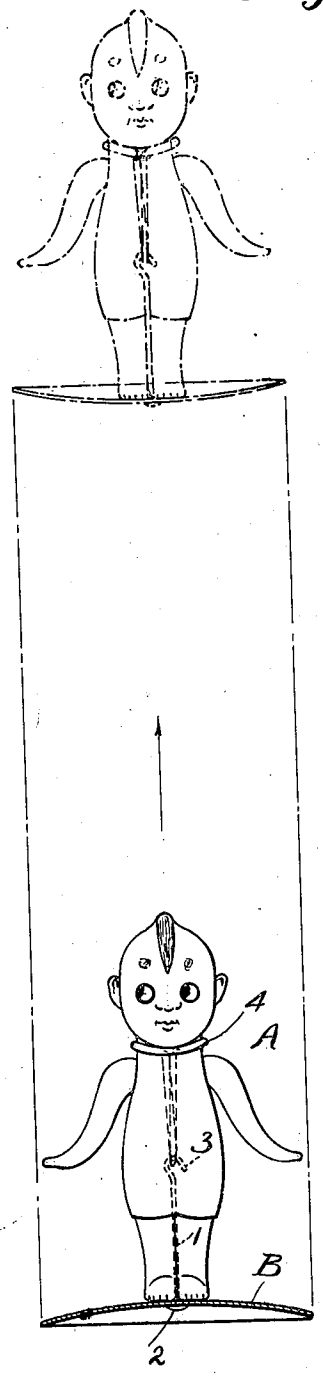
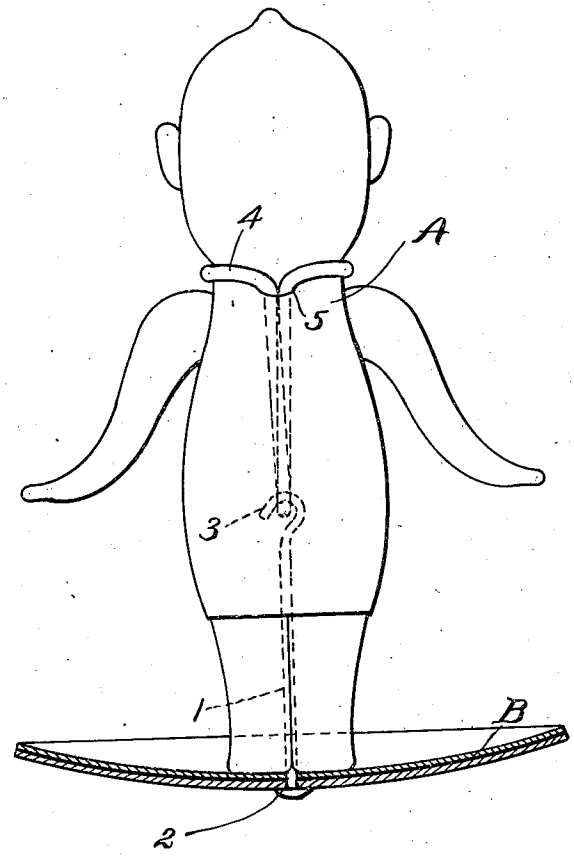


Fig. 2



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Patented July 10, 1928. 1,676,296

UNITED STATES PATENT OFFICE.

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FIGURE TOY.

Application filed October 23, 1924. Serial No. 745,410.

Objects of the invention are to provide a thermostatically controlled toy which is designed to jump into the air a considerable distance; and to provide a toy which is simple in its construction, easy to operate, and has the new and improved features of construction and arrangement hereinafter described.

For the purpose of illustration one concrete embodiment of the invention is illustrated on the accompanying drawings in which

Fig. 1 is a front elevation of the toy showing in dot and dash lines the toy in its impelled position; and

Fig. 2 is an enlarged rear elevation of the toy.

The embodiment of the invention illustrated comprises a fanciful figure A, in this instance a doll of celluloid or other light, non-breakable material which is suitably colored to present a pleasing and attractive appearance. Connected to the doll is a thermostatic disk B the construction and operation of which is hereinafter described.

The doll A is mounted in such a manner that it can swivel on the disk although yieldingly held in an upright position at all times. For this purpose a pin 1 having a head 2 extends through a hole in the disk and into the doll and the opposite end of the pin is bent to form a hook 3. Encircling the neck of the doll is a band 4 of rubber or other suitable elastic material which extends through a hole 5 in the back of the doll and engages the hook 3. It will readily be observed that swiveling of the doll is permitted on the disk and although it may be rocked to any position it will always be returned to a position at substantially right angles to the disk owing to the connection described.

The disk B is preferably bi-metallic being made up of two materials, such as iron and brass having different thermal coefficients of expansion so that a change in temperature will cause unequal expansion and contraction of opposite faces of the disk. This disk B is normally cupped (as by swaging) in such direction that the component part having the higher coefficient of expansion is on the concave side. Consequently upon raising the temperature the unequal expansion of the materials forming the disk will cause a tendency to flatten the cupped surface until at a predetermined temperature a sudden curving in the opposite direction occurs, which reversal of shape will be maintained until the temperature has been substantially lowered. Thereafter upon reaching a substantially predetermined temperature the sheet will suddenly return to its initial shape. In both of these movements the reversal of curvature is exceedingly abrupt and is caused by the expansion and contraction of the materials of which the thermostatic sheet is composed. The materials and thickness of the component parts and the degree of curvature are so chosen that the disk will remain cupped in one direction when above a predetermined temperature (e. g. 90° F.) and will snap back when below this temperature. Suitable materials are sheet brass and nickel steel having thickness of .0075 and .0075 respectively and suitable cupping for a disk one inch in diameter is $\frac{1}{32}$ inch.

It should be understood that the present invention is not limited to any particular combination of materials having different thermal coefficients of expansion but is intended to embrace in its scope any combination of materials having dissimilar thermal coefficients of expansion sufficient to cause the characteristic reversal of curvature. Furthermore, the two materials comprising the composite thermostatic sheet may be secured together in any desired manner by riveting, soldering, brazing or otherwise, although it is preferred to unite the materials comprising the sheet by welding or similar means to secure a substantially indivisible sheet.

In operating the toy the disk B is heated by hand to a temperature of approximately 90° F., and thereafter manually forced to reverse curvature instead of raising the temperature high enough so that the curvature will automatically reverse. A characteristic of these bi-metallic cupped disks is that when unrestrained by outside forces, they will remain stable when cupped in either direction if the temperature of the disk is between the temperatures at which it automatically reverses shape. For instance, if the disk B is made with the high expansive side concave it will reverse its shape if

raised to a temperature of approximately 250° F. and on cooling the disk will again reverse its shape at a temperature of about 80° F. but between 80° and 250° it will remain cupped in one direction or the other.

It will be evident that by placing the disk on a flat relatively cool surface such as a table, after being distorted, the doll and disk will be impelled upwardly a considerable distance when the disk suddenly snaps to its upwardly cupped position as indicated in Fig. 1. The uncertainty of the exact time when the toy will jump creates no little amount of interest and affords considerable amusement and excitement. Owing to the extreme simplicity of construction and great resiliency of the disk the toy can be operated indefinitely without liability of breakage or the parts getting out of order.

I claim:

1. A toy comprising the combination with a fanciful figure of a thermostatic member connected to said figure, said thermostatic member comprising a sheet consisting of a plurality of united components having different coefficients of expansion, a portion of said components being normally cupped but tending to flatten in response to temperature change in one sense, thereby setting up stresses which oppose said tendency until a predetermined temperature is reached, the stresses then abruptly changing the shape of the cupped portion thereby to create sufficient force to impel said member and figure from a position of rest.

2. A toy comprising the combination with a fanciful figure of a thermostatic disk resiliently connected to said figure, said disk comprising a bi-metallic sheet having different coefficients of expansion on opposite sides and being normally flexed in one direction, the peripheral portion of the disk being adapted to be stressed by differential expansion of said opposite sides with change of temperature until a predetermined temperature is reached, whereupon the stresses become effective abruptly to change the curvature of the disk thereby to create sufficient force to impel said disk and figure from a position of rest.

3. A toy comprising the combination with a fanciful celluloid figure of a thermostatic disk, means for yieldingly holding said figure in an upright position to the disk, said disk comprising a composite sheet of bi-metallic elements having different coefficients of expansion on opposite sides of the sheet, the disk being normally concave and the peripheral portion thereof being adapted to be stressed by differential expansion of the opposite sides of the sheet until a predetermined temperature is reached, whereupon the stresses become effective abruptly to reverse the curvature of the concave disk thereby to create sufficient force to impel said disk and figure from a position of rest.

4. A toy comprising the combination with a fanciful figure of a cupped thermostatic disk resiliently connected to said figure, said disk comprising portions arranged to react upon each other with change of temperature to set up stresses the magnitude of which changes upon change of temperature, at least one of the portions being formed of components having different coefficients of expansion, the disk reaching a condition of instability at a predetermined temperature by virtue of the arrangement of said portions and as a result of the change of temperature, whereupon said stresses become effective to change abruptly the relative position of said portions whereby when heated and concaved downwardly and placed on a relatively cool surface the toy will jump after the sheet has cooled to said predetermined temperature.

5. A toy comprising the combination with a fanciful celluloid figure, a thermostatic disk and means for resiliently connecting said figure to the disk to permit swiveling, the disk comprising a composite sheet of bi-metallic elements having different coefficients of expansion on opposite sides of the sheet, said disk being normally concave in one direction and tending to flatten in response to temperature change in one sense, thereby setting up stresses which oppose said tendency until a predetermined temperature is reached, the stresses then abruptly changing the curvature of the disk whereby when heated and concaved downwardly and placed on a relatively cool surface the toy will jump after the sheet has cooled to said predetermined temperature.

Signed by me at Cambridge, Massachusetts, this second day of October, 1924.

JOHN A. SPENCER.