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AERODYNAMIC TOY

Sol Friedman, Monsey, N.Y., assignor to Topper Corporation, a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

Electric fan directs air stream at a balloon to keep latter afloat. Fan mounted on universal joint linked to handle mounted on another universal joint so that direction of air stream can be varied by manipulating handle. Fan motor energized through rheostat so that velocity of air stream can be varied. Balloon carries legs to support it during lift-off and landing. A housing surrounds fan impeller, housing carrying vanes which minimize rotation of air stream.

This invention relates to a toy, and more particularly to a toy involving the movement of air for the purpose of keeping an unfettered object afloat in the atmosphere.

It is an object of the invention to provide a light-weight, but heavier-than-air, object in combination with means for directing an air stream at the object to keep it afloat.

It is another object of the invention to provide such a combination wherein the velocity of the air stream, and its direction, can be varied to alter the position of the floating object and in general control its movement.

It is a further object of the invention to provide an arrangement of the type referred to wherein the direction and velocity of the air stream can be controlled by readily manipulatable handles located at a conveniently arranged control panel.

It is an additional object of the invention to provide such an arrangement wherein the object may be lifted from a support surface, moved through the air, and brought to rest at a point remote from the lift-off point, all by means of a controlled air stream directed at the object.

To achieve these objectives, the invention employs an electric fan mounted on a universal joint, and a control handle for orienting the fan as desired. A second handle controls the speed of the fan motor, and hence the velocity of the air stream, via a rheostat. The object is preferably an air-filled balloon of generally spherical shape, the balloon having legs on one side to stabilize it when it is at rest.

The operation of the invention and further details of construction will be described below with reference to the accompanying drawings.

In the drawings:

FIG. 1 is a perspective view of an adjustable fan and an object it may control, in accordance with this invention;

FIG. 2 is a bottom view of the adjustable fan body, with the bottom cover of the body removed;

FIG. 3 is a fragmentary plan view of the fan portion;

FIG. 4 is an exploded perspective view of the mechanical linkages and electric circuit within the body;

FIG. 5 is a longitudinal cross-sectional view along line 5—5 of FIG. 2; and

FIGS. 6–9 are vertical cross-sectional views taken along the correspondingly numbered lines of FIG. 5.

Operation of the invention will be most readily understood by reference to FIG. 1. The adjustable air-directing means includes a hollow body, indicated generally by the reference numeral **10**, having a control panel portion **11** at one extremity, a fan support-joint enclosure portion **12** at the other extremity, and a bridging portion **13** between them. An electric fan, indicated generally at **19**, includes a motor **14** mounted on the upper end of a stem **15** (see FIGS. 4 and 5), the lower end of which is mounted on a universal pivot connection or joint within the enclosure **12**. The output shaft **16** (FIGS. 4 and 5) of the motor **14** extends upwardly and carries an impeller **17**. Surrounding the impeller is an annular housing **18** open at top and bottom.

A control handle **21** projects upwardly from the control panel **11**, the lower end of the handle **21** being mounted on a universal pivot connection. The control handle **21** may be swung in any direction, as indicated by the arrows in FIG. 1, and the fan **19** partakes of these movements by virtue of a linkage means extending through the bridging portion **13** between the handle and fan support joints.

In the present example, power for energizing the motor **14** is supplied by batteries **22** (see FIGS. 2, 4, and 5) within the control panel **11**. The connection between the motor and batteries is via a rheostat operable by moving a second handle **23** in the directions indicated by the arrows in FIG. 1. Consequently the speed of the fan may be varied.

A balloon **24**, shown in various locations in FIG. 1, is generally spherical and is provided with support means, such as legs **25**, on one side. The invention contemplates the use of a common variety inflated balloon. However, other types of objects having a large volume to weight ratio may be employed. The legs **25** serve a number of purposes. When the balloon **24** is at rest on a surface **26**, as indicated at A in FIG. 1, the legs **25** support it in stable fashion so that the balloon does not simply roll away when the air stream **27***a* approaches it. In addition, the legs **25** add an off-center weight to the balloon which maintains the balloon in the same orientation with respect to the earth, i.e., with the legs pointing downwardly, as the balloon moves about under control of the air stream. This is desirable in cases where printed matter is carried by the balloon surface, or if an item, such as a gondola or simulated space capsule (not shown), is hung from the balloon. For the purposes of this invention, the weight of the balloon must be positive. However, if extraneous items, such as mentioned above, are supported by the balloon, the balloon might be filled with helium to decrease its total effective weight, which would of course still be positive. In addition, it may be mentioned that the legs **25** may be indepndent elements secured to the balloon, or the balloon could be formed to present the legs as integral elements when inflated.

When the balloon is at rest on support surface **26** (position A), which may be part of the same surface supporting the body **10**, the handle **21** and hence fan **19** are tilted, as indicated by the broken lines in FIG. 1, to direct a stream of air **27***a* at the upper portion of the balloon **24**. Due to the well-known Bernoulli effect, the pressure above the ballon is decreased due to the air flow over the top of the balloon, and if the air velocity is high enough, the balloon rises. As the balloon rises, the handle **21** is manipulated to move the air stream toward the vertical, and as a result the balloon rises to, say, position B in FIG. 1. The balloon follows the movement of the air stream because the combination of two upward forces overcome the force of gravity on the balloon. These two upward forces are the vertical component of the Bernoulli force produced by the air flowing over the top of the balloon, and the vertical component of the force of the air striking the balloon directly. In addition, it may be mentioned that the horizontal component of the force of the air striking the balloon directly, and tending to blow the balloon away from the fan, is counterbalanced by the horizontal component of the Bernoulli force, tending to move the balloon

toward the fan. Thus, by proper adjustment of the air stream velocity, by means of handle **23**, the forces can be balanced and the floating condition of the balloon can be maintained.

If the handle **21** manipulated slowly, the direction of the air stream will be varied, and the balloon will remain positioned in the air stream. Thus, the balloon can be brought directly over the fan (position C) when the air stream is vertical, as indicated at **27***c*. Throughout the movement of the air stream and balloon, the distance of the balloon **24** from the fan **19** is controlled by the handle **23** which adjusts air stream velocity. Eventually, by continued manipulation of the handles **21** and **23**, the balloon can be brought to rest on another surface **28** (position D) which need not necessarily be at the same level as the surface **26**. Thereafter, the balloon can be lifted from surface **28** and moved throughout the effective range of the fan by means of the handles **21** and **23**.

The structure of the air-directing means will now be described in more detail with reference to FIGS. 2–9. The stem **15**, which carries the motor **14**, fits frictionally within a hollow extension **31** (FIGS. 5 and 8) depending from the motor. A similar stem **32** (FIGS. 4, 5, and 7) is rigidly connected at its upper end to the lower end of the control handle **21**. The stems **15** and **32** are located at the centers of relatively large holes **33** and **34**, respectively, in the upper faces of the portions **12** and **11**, respectively. These holes permit free maneuverability of the handle **21** and fan **19**.

A link **35** extends through the bridging portion **13** between the stems **15** and **32**. At one end, the link is pivoted at **36** to a point above the lower end of stem **15**, and at its other end, the link is pivoted at **37** to a point above the lower end of stem **32**. The pivot connections are such that they permit each stem to swing about a horizontal axis perpendicular to the link **35**. The link is supported in bearings at two points along its length. Each bearing comprises a block **40** (FIG. 2, 5, and 9) depending from the top wall of body portion **13**, the block having a notch in its lower face. A plate **41**, fastened against the lower face of block **40** by screws, supports the link **35**. The notches in the blocks **40** are large enough to permit the link **35** to rotate free about its longitudinal axis. However, collars **43** fixed to the link **35** abut the outer faces of the blocks **40** and prevent longitudinal movement of the link. The lower ends of the stems **15** and **32** are joined by a rod **42**, the ends of the rod being bent back upon themselves and passing through holes in the lower ends of the stems.

In view of the above discussion, the manner in which movements of the handle **21** are transmitted to the fan **19** will be obvious. For example, if the handle **21** is tilted about pivot **37** toward the right in FIG. 5, the lower end of stem **32** pulls rod **42**, and hence the lower end of stem **15**, toward the left. As a result, the fan **19** is tilted toward the right to the same extent as the handle **21**. Also, if the handle **21** is tilted in such a way as to rotate the link **35** about its longitudinal axis, this motion is transmitted via link **35** and rod **42** to stem **15** and hence to fan **19**.

The fan housing **18** is supported on a ring **44** (FIG. 5) which is in turn supported by arms **45** projecting radially from the housing of motor **14**. The housing **18** includes a plurality of vanes **46** extending radially from a central hub **47**, each vane being in a vertical plane, i.e., a plane perpendicular to the plane in which the impeller **17** rotates. These vanes serve to minimize the rotation of the air stream created by the rotating impeller **17**, and together with the annular wall of the housing **18** aligns and directs the air stream emitted by the fan.

The fan motor **14** is, in the present example, energized by four flashlight batteries **22** arranged end-to-end within the control panel portion **11**. At its ends, the line of batteries engages contacts **50** and **51** secured to the body **10**. A wire **52** connects contact **50** to a contact **53** within the body portion **13**, the contact **53** being in turn connected to the motor **14**. A wire **54** connects the contact **51** to the lower end of a movable contact **55**, the upper end of the contact **55** slidably engaging a resistor **56**. The resistor **56** is mounted at its ends on the body **10**, and one end of the resistor is connected via a wire **57** to a contact **58** within housing portion **12**, the contact **58** being connected in turn to the motor **14**.

The movable contact **55** is fixed to the vertical leg of an angle member **58** (FIGS. 2, 4, and 6), the horizontal leg of which is carried by the handle **23**. The lower end of the handle **23** is pivoted at **59** to a boss projecting from the body portion **11**. It will be apparent that as the handle **23** is swung about the pivot **59**, the contact **55** slides along the resistor **56** and places more or less resistance into the circuit between the batteries **22** and the motor **14**. Thus, the power reaching the motor may be varied by moving the handle **23** in one direction or the other, and hence the speed of rotation of the impeller varies. In this way, the velocity of the air emanating from the fan is adjusted.

Although the invention can be completely understood from the description above, it may be mentioned that a specific embodiment which has been found to operate satisfactorily involves a fan impeller 5¼ inches long and having a three inch pitch. Such a fan is capable of controlling an eight inch diameter balloon having a weight under 2½ grams. The balloon can be lifted off a support surface if the fan is run at about 3,000 revolutions per minute (r.p.m.), and the flight of the balloon controlled at a distance of as much as five feet from the fan when the fan is run at 3,500–6,000 r.p.m.

The invention has been shown and described in preferred form only, and by way of example, and many variations may be made in the invention which will still be comprised within its spirit. It is understood, therefore, that the invention is not limited to any specific form or embodiment except insofar as such limitations are included in the appended claims.

What is claimed is:

1. An aerodynamic toy comprising a light weight generally spherical body, means for directing a stream of air at said body to cause the latter to float while supported only by said air stream, and means for varying both the direction and velocity of said air stream to control the position of said body, said direction-varying means including a manually manipulable handle movable to a variety of positions, and means connecting said handle to said air-directing means for transmitting manual movements of said handle to said air-directing means, whereby the direction of the stream of air is varied in a manner corresponding to movements of said handle, and said velocity-varying means including a second manually manipulable handle movable independently of said first handle, and means operatively interposed between said air-directing means and said second handle and responsive to movements of said second handle for varying the velocity of said air stream.

2. A combination as defined in claim **1** wherein said body is a fluid-filled balloon.

3. A combination as defined in claim **1** including means for supporting said body on a support surface preparatory to its being lifted by said air stream, said support means serving to prevent said body from rolling along the support surface under the influence of said air stream.

4. A combination as defined in claim **3** wherein said support means are legs projecting from one side of said body.

5. A combination as defined in claim **1** wherein said air directing means is an electric fan mounted on a universal pivot connection.

6. A combination as defined in claim **5** wherein said first-mentioned handle is mounted on a universal pivot connection, and said connecting means includes linkage means between said handle pivot and said fan pivot for transmitting movements of said handle to said fan.

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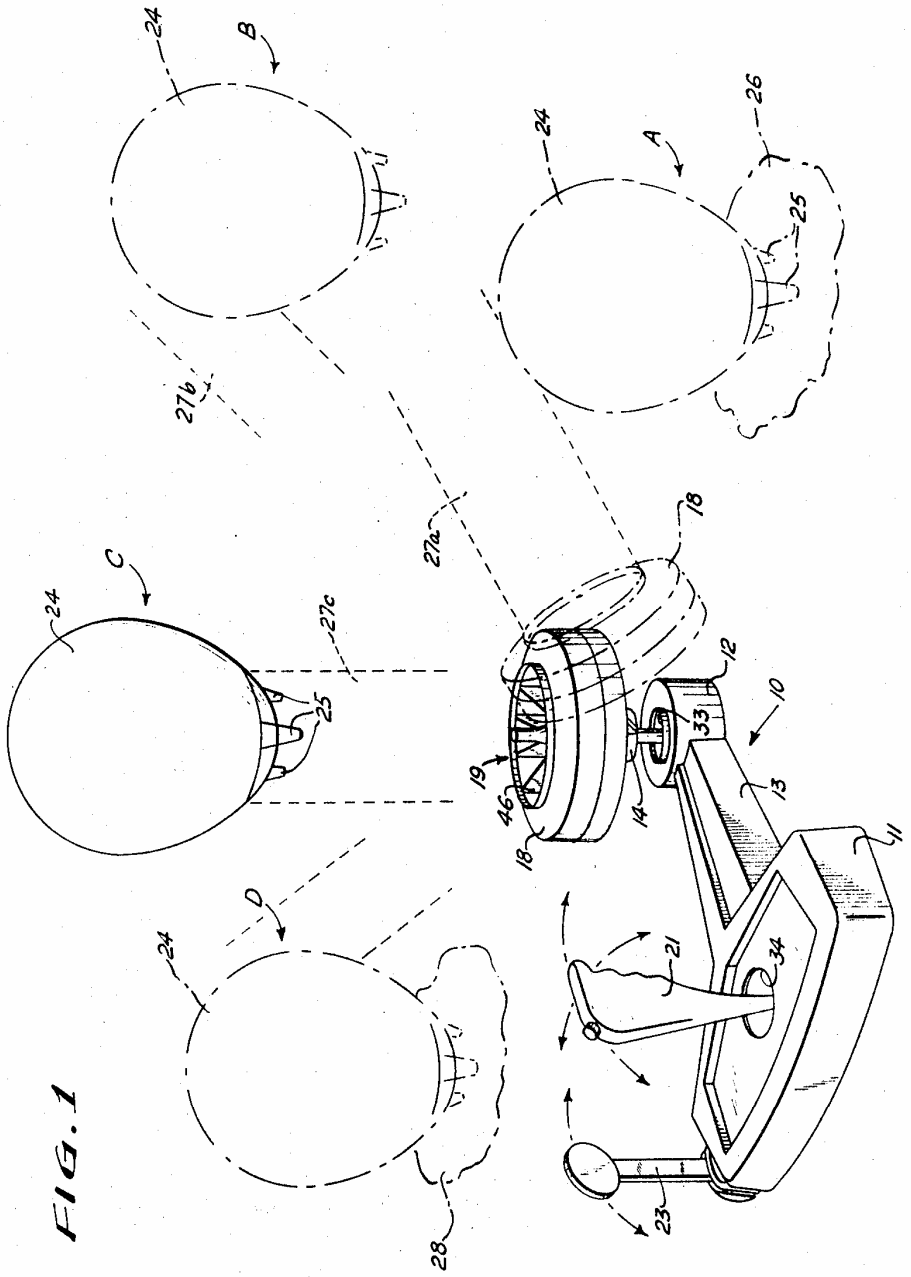

FIG. 1

INVENTOR:
SOL FRIEDMAN

BY Breitenfeld & Levine
ATTORNEYS