Nov. 26, 1968 W. W. O'DELL, JR 3,412,426

APPARATUS FOR THE PREPARATION OF ELLIPTICAL STRUCTURES

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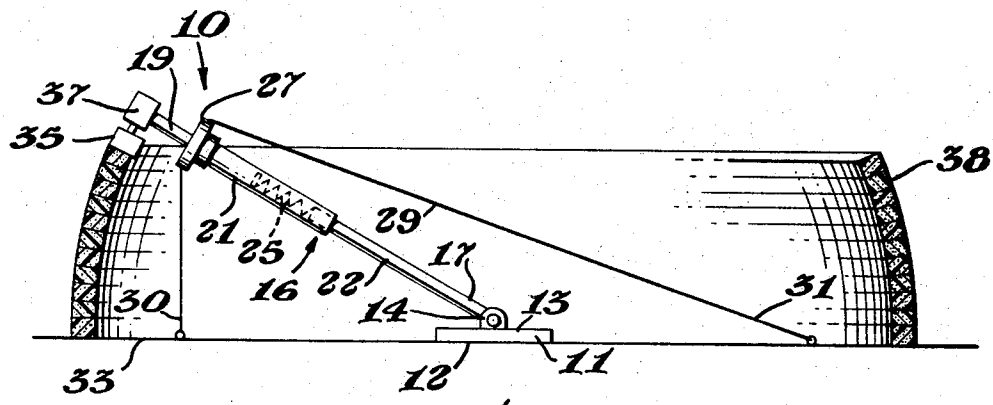


Fig. 1

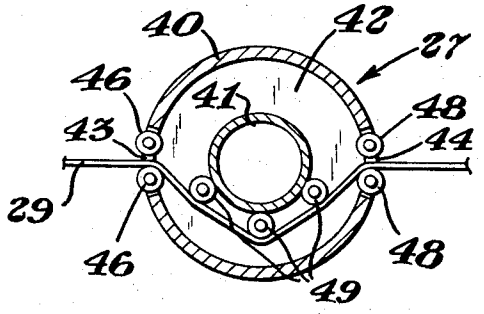


Fig. 2

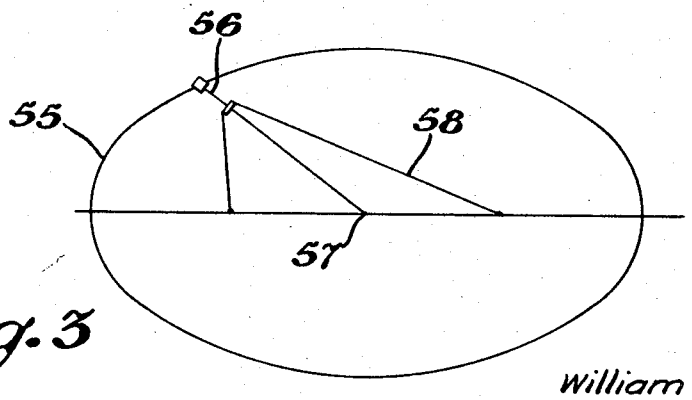


Fig. 3

INVENTOR.
William W. O'Dell, Jr.
BY
Robert E. Ingraham
AGENT

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APPARATUS FOR THE PREPARATION OF ELLIPTICAL STRUCTURES

William W. O'Dell, Jr., Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

An apparatus is described for the preparation of generally elliptical structures by sequentially depositing strips of a building material in a helical manner, the apparatus consists essentially of a three dimensional string and pencil control for a material depositing head.

This invention relates to an apparatus for the preparation of generally elliptical structures, and more particularly relates to an apparatus for the preparation of elliptical structures by the successive deposition of portions of a building material in a generally spiral pattern.

Various shapes and forms of walled structures are prepared in accordance with the teaching of U.S. Letters Patent 3,206,899. Many of these structures are generally circular in configuration and oftentimes offer less than the desired configuration. Frequently, it is desirable to prepare walled structures similar to those set forth in U.S. Patent 3,206,899 but having a hemiellipsoidal configuration. Such a configuration is oftentimes more desirable for many applications that circular or spheroidal structures. By the term "ellipsoidal surface" is meant a surface which generally conforms to the configuration of an ellipsoid or to any portion of such a surface.

It would be desirable if there were available an improved apparatus which would permit the deposition of the building material in a generally hemiellipsoidal configuration.

It would also be beneficial if such an apparatus were capable of generating ellipsoidal structures of varying proportions.

It would be highly desirable if such an apparatus were relatively light and simple to transport.

These benefits and other advantages in accordance with the present invention are achieved in an apparatus for the construction of walled structures by a spiral generation technique wherein a strip of building material is deposited in a generally helical configuration to form a walled structure, the apparatus comprising in cooperative combination a base, the base having a support-engaging surface and an oppositely disposed pivot surface, the pivot surface having supported thereon a pivot adapted to permit rotation of a member about the pivot in a generally hemispherical solid angle, an elongate member having a first end and a second end, the first end of the elongate member attached to the pivot and adapted to pivot within the solid angle, the elongate member having affixed to the second end a material depositing head adapted to deposit a material of construction in the form of an elongate strip, a flexible element restraining means secured adjacent the material depositing head, the flexible element restraining means being pivotally affixed to the second end of the elongate member and being adapted to generally rotate about the axis of the elongate element and remain in fixed spaced relationship to the depositing head. Intermediate the first end of the elongate element and the flexible element restraining means, means to vary the spacing between the foam depositing head and the first end of the elongate element, a flexible element passing through the flexible element restraining means and sliding therein,

the flexible element having a first end and a second end, the first and second ends of the flexible element secured in spaced relationship to the pivot end and in a plane adjacent to the pivot and generally equally spaced therefrom.

Further features and advantages of the present invention will become more apparent from the following specification when taken in connection with the drawing wherein:

FIGURE 1 is a schematic representation of an apparatus in accordance with the present invention.

FIGURE 2 is a representation of the flexible element restraining means of FIGURE 1.

FIGURE 3 schematically depicts motion of the foam depositing head of FIGURE 1.

In FIGURE 1 there is schematically represented an apparatus in accordance with the present invention generally designated by the reference numeral **10**. The apparatus **10** comprises in cooperative combination a base member **11**. The base member **11** has a support engaging surface **12**. Oppositely disposed from the support engaging surface **12** is a pivot surface **13** having affixed thereto a pivot **14**. The pivot **14** is so constructed and arranged so as to permit motion in a solid angle. An elongate element **16** having a first end **17** and a second end **19** is affixed to the pivot **14** at the first end **17**. The elongate element can pivot within a solid angle and is generally restricted in motion by the base **11**. The elongate element **16** comprises a first portion **21** and a second portion **22**. The portion **22** telescopes within the portion **21** and the portions are urged apart by means of an internal tensioning means or spring **25**. Affixed to the first portion **21** of the elongate element **16** is a flexible element restraining means **27**. The flexible element restraining means is pivotally affixed to the portion **21** and adapted to rotate generally about the longitudinal axis of the elongate element **16**. A flexible element **29** of fixed length passes through the flexible element restraining means. The flexible element **29** has a first end **30** and a second end **31**. The first and second ends **30** and **31** are affixed to a base or support **33**. The ends **30** and **31** are generally equally spaced from the pivot **14** and are disposed generally on a common line. A foam depositing head **35** is affixed to the second end **19** of the elongate element **16** and maintained in fixed spaced relationship from the flexible element restraining means. The depositing head **35** is adapted to pivot about the elongate element **16** on a bearing **37**. A portion **38** of generally hemieliptical structure composed of a plurality of strips is shown in operative engagement with the depositing head **35**.

In FIGURE 2 there there is depicted a schematic cutaway view of the flexible element restraining means **27** of FIGURE 1. The restraining means **27** comprises a housing **40**. The housing **40** defines a generally centrally disposed aperture **41** adapted to pass a portion of the second element **21** and rotate freely threabout. The housing **40** defines a generally annular chamber **42** having a first opening **43** and a second opening **44**. The openings **43** and **44** are generally diametrically opposed. Adajacent the opening **43** are friction reducing elements **46** such as rolls or the like. Similar friction reducing elements **48** are disposed adjacent the second opening **44**. Friction reducing elements **49** are disposed within the annular cavity **42** generally adjacent the opening **41**. The flexible element **29** such as a cable is depicted passing through the flexible element restraining means **27** and is shown in operative engagement with the friction reducing means.

In FIGURE 3 there is schematically represented an ellipsoidal path traced by an apparatus in accordance with the invention. One ellipsoidal path is represented by the

reference numeral **55**. The reference numeral **56** represents the second end of the elongate member such as the elongate member **16**. The reference numeral **57** indicates the pivot point whereas the flexible restraining element is depicted by the reference numeral **58**. The depositing head **56** is free to move to any position about the ellipse when it is positioned adjacent the plane of the paper or ground support. As the head is raised by the deposition of building material, the size of the ellipse decreases as the distance from a plane of the support increases, resulting in an ellipsoidal structure.

By employing an extensible boom or elongate member such as the member **16** of FIGURE 1, a foam depositing head is caused to folow an elliptical path as the effective distance between the flexible element restraining means and the pivot can vary within the desired mechanical limits. The foam depositing head being disposed adjacent the flexible element restraining means follows a path or traces a surface which is very close to hemiellipsoidal.

Employing the apparatus substantially as depicted in FIGURES 1 and 2, a wide variety of generally elliptical structures are readily prepared from foam plastic, concrete and the like.

As is apparent from the foregoing specification, the present invention is susceptible of being embodied with various alterations and modifications which may differ particularly from those that have been described in the preceding specification and description. For this reason, it is to be fully understood that all of the foregoing is intended to be merely illustrative and is not to be construed or interpreted as being restrictive or otherwise limiting of the present invention, excepting as it is set forth and defined in the hereto-appended claims.

What is claimed is:

1. An apparatus for the construction of walled structures by a spiral generation technique wherein a strip of building material is deposited in a generally helical configuration to form a walled structure, the apparatus comprising in cooperative combination:

a base, the base having a support engaging surface and an oppositely disposed surface,

a pivot surface having supported thereon a pivot adapted to permit rotation of a member about the pivot in a generally hemispherical solid angle,

an elongate member having a first end and a second end, the first end of the elongate member attached to the pivot and adapted to pivot within the solid angle, the elongate member having affixed to the second end,

a material depositing head, the material depositing head adapted to deposit a material of construction in the form of an elongate generally helical strip,

a flexible element restraining means secured to the elongate member adjacent the material depositing head, the flexible element restraining means being pivotally affixed to the second end of the elongate member and being adapted to generally rotate about the axis of the elongate element and remain in fixed spaced relationship to the material depositing head, intermediate the first end of the elongate element and the flexible element restraining means,

means to vary the spacing between the material depositing head and the first end of the elongate element,

a flexible element passing through the flexible element restraining means and sliding therein, the flexible element having a first end and a second end, the first and second ends of the flexible element secured in spaced relationship to the pivot end and in a plane to the pivot and generally equally spaced therefrom.

2. The apparatus of claim **1** wherein the elongate element comprises first and second portions, one telescoping within the other, and means to urge the first and second portions apart.

3. The apparatus of claim **1** wherein the material depositing head is slidably secured to the elongate element.

4. The apparatus of claim **3** including means to resiliently urge the material depositing head toward the second end of the elongate element.

5. The apparatus of claim **1** wherein the first and second ends of the flexible element and pivot are disposed generally on a line.

6. The apparatus of claim **1** wherein the material depositing head is adapted to deposit a synthetic resinous foam.

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FRANCIS K. ZUGEL, *Primary Examiner.*