

Sept. 13, 1949.

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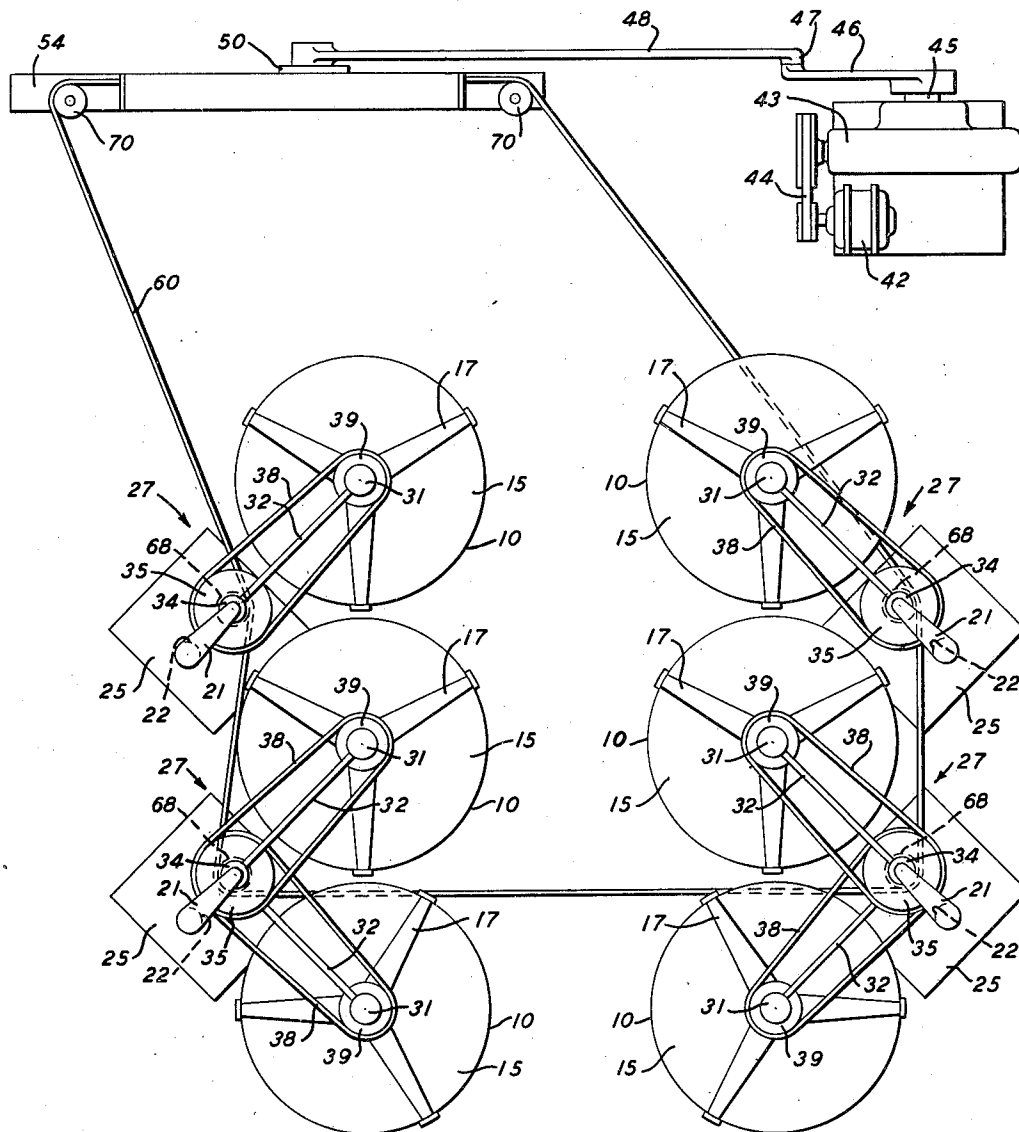
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DRIVING MECHANISM FOR ARTICLE FORMING APPARATUS

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3 Sheets-Sheet 1

FIG. 1



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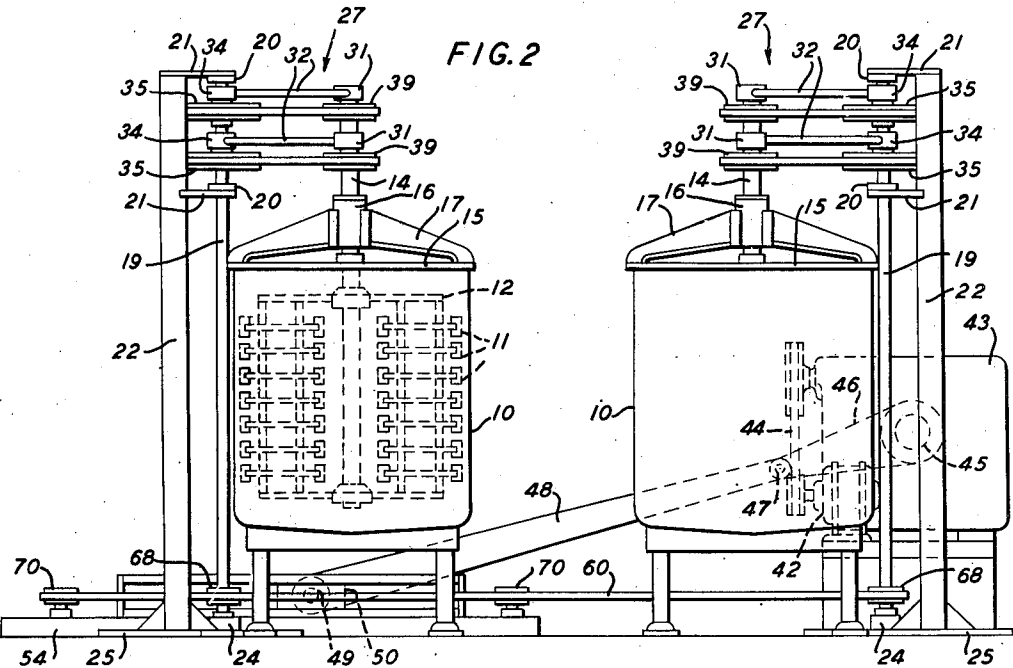
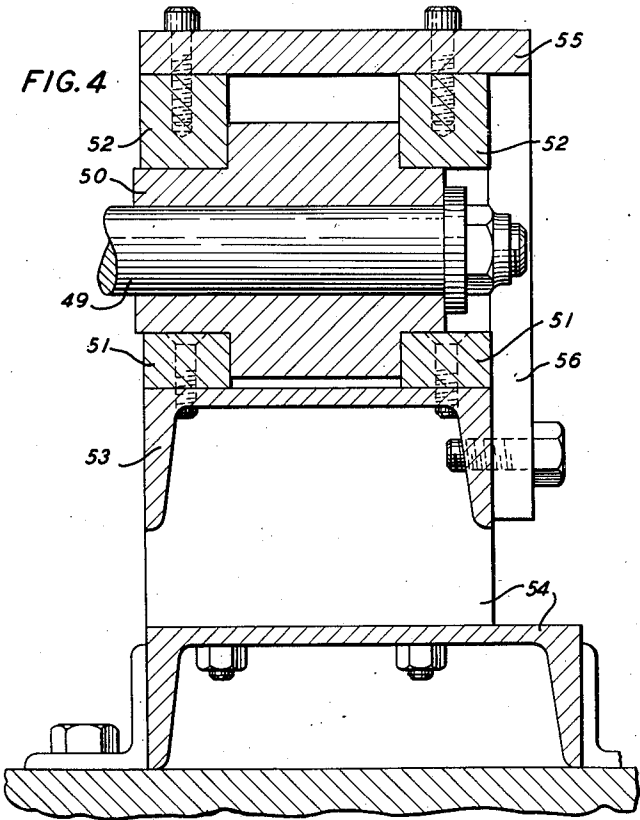
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DRIVING MECHANISM FOR ARTICLE FORMING APPARATUS

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3 Sheets-Sheet 2



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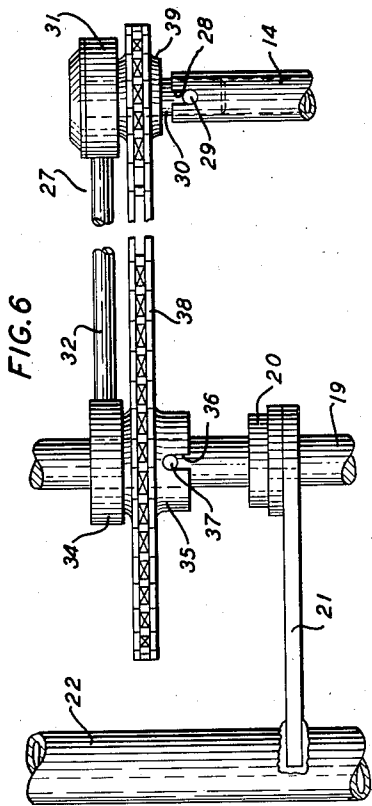
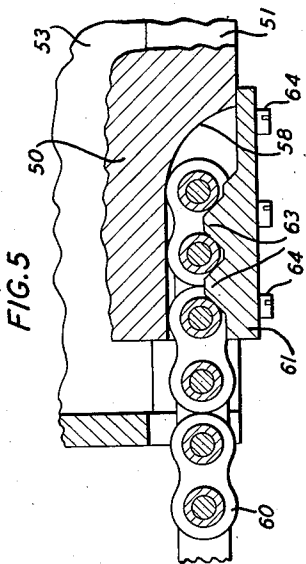
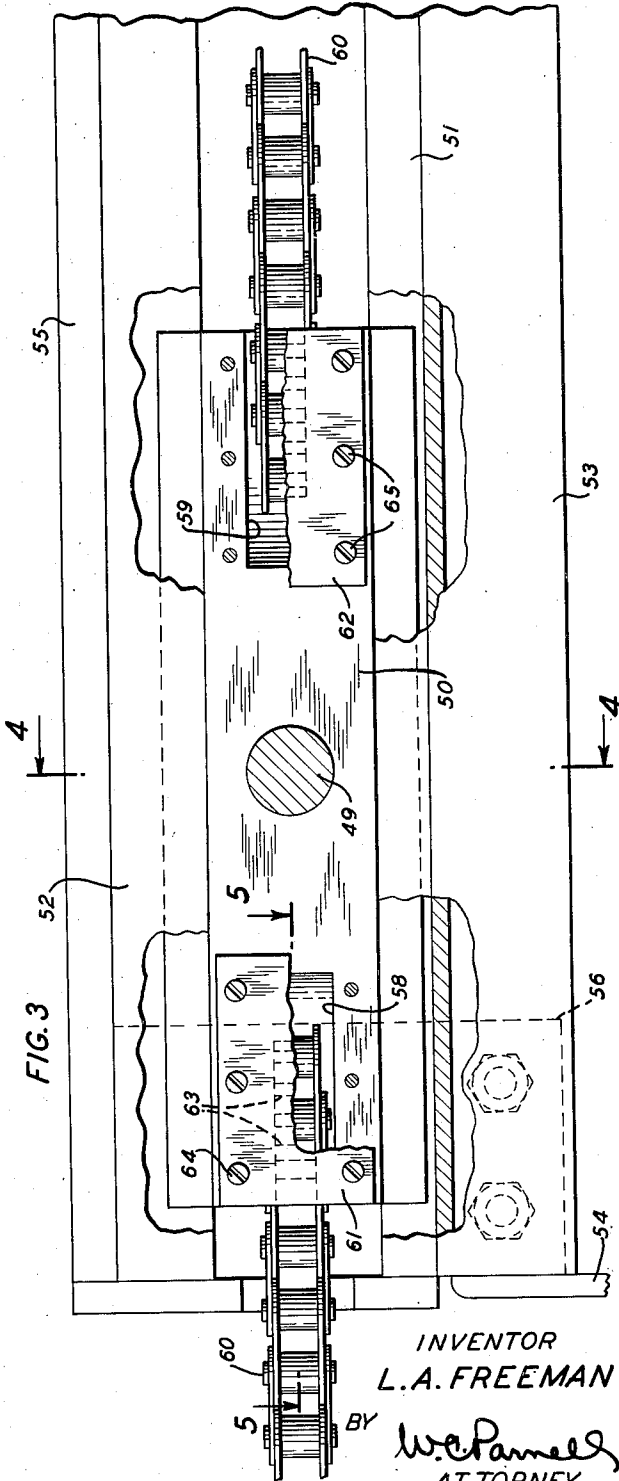
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DRIVING MECHANISM FOR ARTICLE FORMING APPARATUS

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3 Sheets-Sheet 3



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DRIVING MECHANISM FOR ARTICLE FORMING APPARATUS

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7 Claims. (Cl. 23—273)

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This invention relates to article forming apparatus and more particularly to the driving mechanism for crystal supporting spiders in the manufacture of synthetic crystals.

Synthetic crystals commercially known as EDT crystals, with reference to the solution of ethylene diamine tartrate from which they are formed, have been developed as a substitute in the communication arts for quartz crystals. During the initial development of these synthetic crystals, seeds were mounted on a spider positioned in a tank of the solution and rotated continuously, each seed traveling in a circular path. In order to grow the crystals from the seeds to produce perfect stones, each seed should travel in a portion of the solution undisturbed and unoccupied at any time by any other seed. Furthermore, to complete the desired result, the motion of the seed and the growing crystal in the solution was an important factor in that substantially continuous movement must be applied thereto in a manner to avoid agitation of the solution and disturbance to the growing crystals.

An object of the present invention is to provide a simple, efficient and highly practical apparatus for moving articles, particularly crystal supporting spiders for the growing of synthetic crystals.

With this and other objects in view, the invention comprises a plurality of article supporting elements mounted for rocking movement, an actuating member, a single drive means to reciprocate the member between given limits and means connecting the member to the elements to impart like movements to the elements.

More specifically, the apparatus includes a plurality of spiders supported for rotation in tanks containing solutions for forming synthetic crystals, the spiders supporting seeds for movement in their individual portions of the solutions, a power unit driving a crank at a given speed to reciprocate a slide member between given limits at varying speeds whereby there will be slow starts from the limits, gradual accelerations to full speed and gradual decelerations to slow stops. An intermediate means connects the slide member to all of the spiders whereby substantially the same motion will be imparted thereto to move the crystal seeds in their individual portions of their solutions.

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Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a top plan view of the apparatus;

Fig. 2 is a front elevational view of the apparatus;

Fig. 3 is an enlarged fragmentary detailed view of the driven member;

Fig. 4 is a vertical sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view taken along the line 5—5 of Fig. 3; and

Fig. 6 is a fragmentary detailed view of a part of the driving means for the spiders.

Referring now to the drawings, attention is first directed to Fig. 1 which illustrates a plurality of tanks 10 identical in structure and containing solutions for the forming of synthetic crystals. These solutions may be of ethylene diamine tartrate essential for the formation of synthetic crystals from seeds 11 mounted on spiders 12 positioned in the solutions in the tanks 10. The spiders 12 include vertical hollow spindles 14 extending through covers 15 for the tanks and journaled in suitable bearings 16 in brackets 17 fixedly mounted on the covers 15. Some of the spindles 14 are longer than others to complete their driving connections with vertical shafts 19 as shown in Figs. 1 and 2. The vertical shafts 19 are journaled in bearings 20 carried by brackets 21 supported by and extending laterally from vertical posts 22. The lower ends of the shafts 19 are supported by thrust bearings 24 positioned on base plates 25.

Connecting units indicated generally at 27, shown in detail in Fig. 6, are removably connected to their respective spindles 14. It will be noted that the hollow spindles 14 have diametrically opposed notches 28 in their upper ends to receive pins 29 of stub shafts 30 of their respective units 27 when the stub shafts are positioned within the upper ends of their spindles 14 to form a positive driving connection therewith. The shafts 30 in each of the units 27 is journaled in a bearing 31 in the outer end of an arm 32, the inner end of the arm having a bearing portion 34 to rotatably support a sprocket 35. The sprocket 35 of each unit 27 has diametrically opposed notches 36 in an integral hub thereof to removably receive

a pin 37 carried by its respective shaft 19. A chain 38 operatively connects the sprocket 35 with a sprocket 39 mounted on the stub shaft 30 of each unit 27. This completes the formation of the units 27, one of these units being provided for each of the spindles 14, a pair of the units being connected to each of the foremost shafts 19 as shown in Figs. 1 and 2.

In the present embodiment of the invention, the single power means for driving the shafts 19, the units 27 and the spindles 14 of the spiders 12 includes an electrical motor 42 and its speed reducing unit 43, the motor being connected to the unit by a belt 44. The output shaft 45 of the unit 43 has a crank arm 46 of a given length mounted thereon, the length of the crank arm depending upon the length of the rocking motion to be imparted to the spiders. The outer end of the crank arm 46 is pivotally connected at 47 to a link 48, the link in turn being pivotally connected at 49 to an element 50. The element 50 has a cross-sectional contour as illustrated in Fig. 3, its corners being recessed to receive lower guides 51 and upper guides 52 jointly controlling movement of the element 50 in a given path. The lower guides 51 are mounted upon a channel member 53 which constitutes a part of a supporting frame 54 mounted in a given position with respect to the tanks 10. A bracket 55 having leg portions 56 secured to the channel member 53 has the upper guides 52 secured thereto as illustrated in Fig. 3. Grooves 58 and 59 are formed in one side of the element 50 at opposite ends thereof to receive the ends of a chain 60 or other suitable flexible means to operatively connect the element 50 with the shafts 19. Mounting clamps 61 and 62, identical in structure and shown in cross-section in Fig. 5 are formed with projections 63 to extend between the lateral portions in the ends of the chain to positively fix the ends of the chain within their grooves 58 and 59 of the slide or element 50. The clamps 61 and 62 are secured in place by the aid of screws 64 and 65. Sprockets 68 are mounted in a given plane on each of the vertical shafts 19 and sprockets 70 are rotatably mounted on the frame 54 adjacent opposite ends thereof to control the travel of the chain 60 as illustrated in Fig. 1.

Considering now the operation of the driving mechanism, let it be assumed that the spiders 12 are disposed in their respective tanks 10 and the covers 15 with the brackets 17 secured in place. The units 27 may then be rotated about their respective shafts 19 until the shafts 30 are moved into alignment with the spindles 14 of their respective spiders and then moved downwardly until the pins 29 rest in their notches 28 (Fig. 6) and the pins 37 of the shafts 19 are positioned in the notches 36 of their sprockets 35.

In actual practice, the spiders 12 support articles, namely crystal seeds which are to be moved in their individual portions of a solution of ethylene diamine tartrate in their tanks 10. It is important that the articles or seeds move in their respective portions of the solution, substantially continuously but in a manner whereby there will be little or no agitation of the solution. This motion is brought about through operation of the motor 42, the unit 43 and continuous rotation of the crank arm 46 which will impart a reciprocating motion to the element 50 between given limits. The motion imparted to the element 50 is such that there will be slow starts of the element from its limits, gradual accelerations to full speed and gradual decelerations to slow stops at the limits.

This straight line motion of the element 50 is translated into similar rotary motions to all of the spiders 12 through the chain 60, the sprockets 68, the vertical shafts 19, the units 27 and the spindles 14 of the spiders 12. In this manner, the crystals may grow from the seeds on the spiders into the perfect stones desired.

After a given length of time necessary for the crystals to grow to the desired size, the motor 42 may be deenergized, stopping movement of the element 50 as well as the spiders 12, after which the units 27 may be readily disconnected from their spiders by moving the units vertically to free the pins 29 and 37 from the notches 28 and 36. The units 27 may be rotated then about their respective shafts 19 away from the tanks 10 whereby the spiders may be removed from the tanks and the solutions therein. This having been accomplished, other spiders equipped with articles or seeds may be lowered into the tanks and readily connected to the driving mechanism by moving the units 27 about their shafts 19 and allowing them to be connected to their respective spiders 12.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. The combination with an article support mounted for movement, of a driving means therefor comprising a slide mounted for reciprocable movement, means to reciprocate the slide between given limits whereby there will be slow starts from the limits, gradual accelerations to full speed and gradual decelerations to slow stops at the limits, and means including a sprocket and chain connection, or the like, between the article support and the slide to impart a similar motion to the article support.

2. The combination with spaced article supports mounted for movement, of a single driving means therefor comprising a slide mounted for reciprocable movement, means to reciprocate the slide between given limits whereby there will be slow starts from the limits, gradual accelerations to full speed and gradual decelerations to slow stops at the limits, and means operatively connecting the article supports to the slide to impart similar motions thereto.

3. A driving mechanism for units mounted at spaced positions for rocking movement about their respective axes, the driving mechanism comprising an element mounted for reciprocation in a given path remote from the units, means to impart a given reciprocable motion to the element, and means operatively connecting the element to all the units to translate the straight line motion of the element into similar rocking motions to the units about their axes.

4. A driving mechanism for units mounted at spaced positions for rocking movement about their respective axes, the driving mechanism comprising shafts rotatably mounted adjacent the units and operatively connected thereto, an element mounted for reciprocation in a given path remote from the units, means to impart a given reciprocable motion to the element, and a flexible member connecting the element to the shafts to translate the straight line motion of the element into similar rocking motions through the shafts to the units.

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5. A driving mechanism for crystal supporting spiders mounted for rocking movement in solutions in tanks disposed at spaced positions relative to each other, the driving mechanism comprising an element mounted for movement in a path between given limits, means to move the element between its limits, and means to transfer the motions of the element to all the spiders to cause rocking motions of the spiders in their solutions.

6. A driving mechanism for crystal supporting spiders mounted for rocking movement in solutions in tanks disposed at spaced positions relative to each other, the driving mechanism comprising an element mounted for movement in a path between given limits, means to move the element between its limits whereby there will be slow starts from the limits, gradual accelerations to full speed and gradual decelerations to slow stops at the limits, and means to transfer the motions of the element to all the spiders to cause rocking motions of the spiders in their solutions.

7. A driving mechanism for crystal supporting spiders mounted for rocking movement in solu-

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tions in tanks disposed at spaced positions relative to each other, the driving mechanism comprising an element mounted for movement in a path between given limits, vertical shafts rotatably mounted adjacent the tanks, units carried by the shafts to operatively connect the shafts to the spiders, the units being disengageable from their spiders and their shafts for movement about their shafts out of alignment with the tanks, means to move the element between its limits, and a member movable by the element to transfer the motions of the element through the shafts and units to the spiders to cause rocking motions of the spiders in their solutions.

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