Sept. 12, 1961 R. V. ROGERS 2,999,392

POSITIONING DEVICE

Filed Oct. 29, 1957

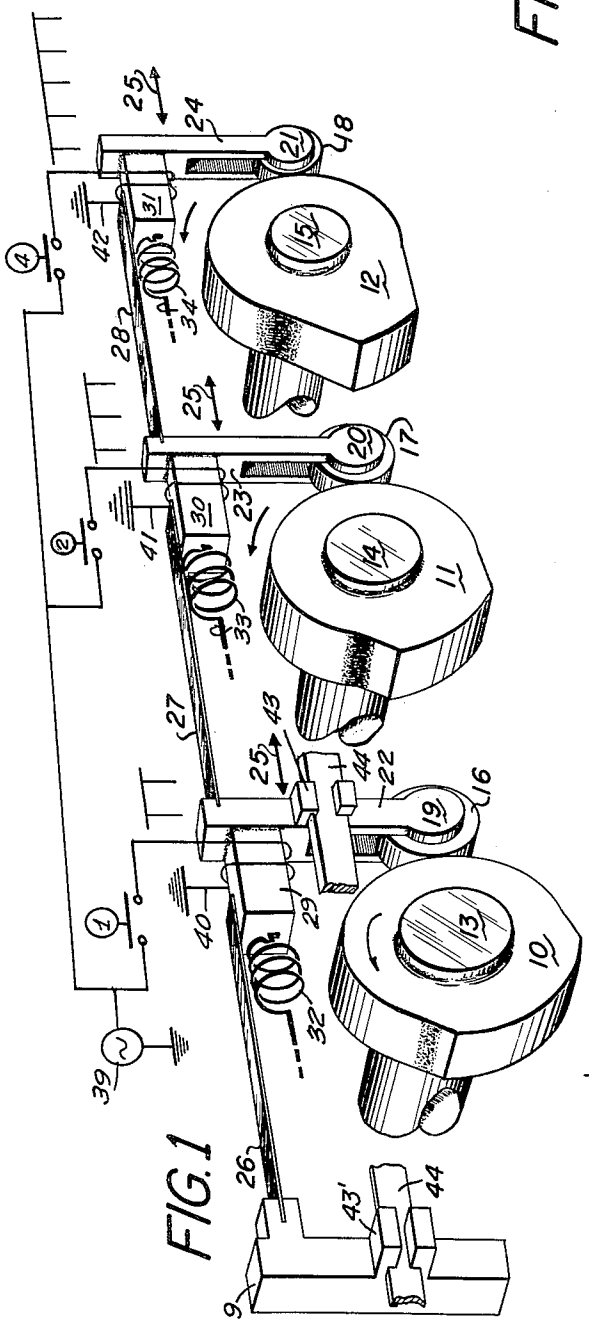


FIG. 1

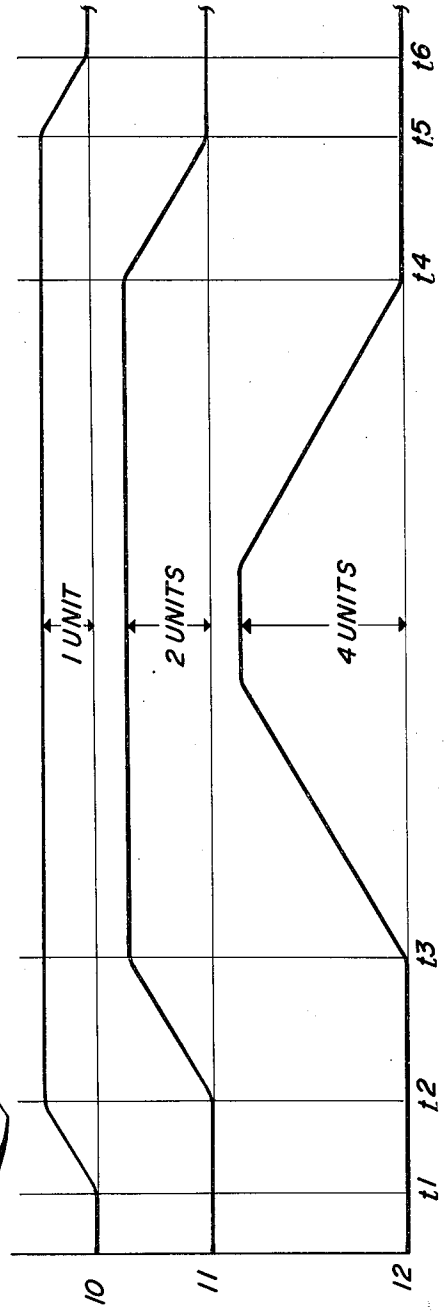


FIG. 2

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POSITIONING DEVICE

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The present invention pertains generally to positioning devices and relates more particularly to such devices wherein incremental displacements are added for determining total displacement.

According to the invention, a plurality of camming devices are arranged for cyclically displacing corresponding followers and means are provided for interconnecting the followers during selected time intervals for determining total displacement according to the selected time intervals.

An object of the invention is to provide an improved positioning device.

Another object is to provide a positioning device wherein displacement is determined according to the interconnection of cyclically displaced members.

A further object is to provide a positioning device wherein displacement is determined according to the selection of time intervals during which a plurality of cyclically displaced members are interconnected.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawings:

FIG. 1 is a partial perspective view of an embodiment of the invention.

FIG. 2 is a graphic representation of the cams shown in FIG. 1.

Referring now to FIG. 1, the embodiment of the invention there shown for laterally displacing a member 9 over selected distances comprises three cams 10, 11 and 12, which are secured to corresponding shafts 13, 14 and 15. These shafts are journalled in suitable bearings and are driven by means (not shown) for rotating the cams at the desired angular velocity. Associated with cams 10, 11 and 12 are corresponding followers 16, 17 and 18, respectively, journalled on shafts 19, 20 and 21, respectively, which are affixed to and are supported by corresponding yokes 22, 23 and 24. The yokes 22, 23 and 24 are supported in any convenient manner to permit linear displacement thereof in the directions indicated by arrows 25 under control of the various cams 10, 11 and 12.

Associated with each yoke is a tape and coupling arrangement, there being three tapes 26, 27 and 28 and three couplings 29, 30 and 31. These couplings are affixed to the corersponding yokes, the coupling 29 being secured to the yoke 22 and the coupling 30 being secured to the yoke 23, etc. The tape 26 is arranged for releasable engagement by the coupling 29 at selected time intervals, as will be described. Similarly, tapes 27 and 28 are arranged for engagement by couplings 30 and 31, respectively, the tape 27 being secured to the yoke 22 and the tape 28 being secured to the yoke 23.

The tapes 26, 27 and 28 are arranged normally to slide over the opposed surface of the corresponding couplings; however, when energized, the couplings cause the tapes to adhere firmly thereto. The couplings may be of any convenient design, as, for example, magnetic, electrostatic or mechanical. In the present embodiment, it is assumed that the coupilngs are magnetic and that

the tapes are constructed of magnetic material. The means of coupling the tapes 26, 27 and 28 to their respective opposed surfaces in proper time sequence is shown as including some kind of power supply or generator 39 which selectively energizes the coils 40, 41 and 42. The coil or coils which are energized are determined by the switches associated wtih the keys identified by the numerals 1, 2 and 4 within the circles. These numbers correspond to the units of movement imparted to the output tape 26 by the depression of these keys. Thus, when the couplings are energized, the corresponding tapes are held thereto for movement therewith under control of the cams 10, 11 and 12. Before proceeding with the description of the operation of the invention, it should be noted that each of the followers 16, 17 and 18 is resiliently held against its associated cam 10, 11 and 12 by means of a corresponding spring 32, 33 and 34, each spring being arranged to extend between a fixed base member (not shown) and the corresponding coupling for returning the mechanism to its initial position, as shown in the drawing, upon completion of the displacement operation.

The cams 10, 11 and 12 have profiles arranged to effect displacements as indicated in FIG. 2. Thus, when the high dwell on cam 10 engages the follower 16, the follower is displaced an amount equal to the height of the high dwell which, in the present embodiment, is equal to one unit of displacement. The high dwells on the cams 11 and 12 are similarly arranged to displace the various members cooperating therewith by two and four units, respectively.

The structure described hereinabove is provided for displacing the member 9 according to the displacement effected by one or more of the cams 10, 11 and 12. For this reason, means are provided for selectively energizing the couplings during time intervals determined by the desired total displacement. The various times involved and their relationship to the cam profiles are indicated in FIG. 2 as t_1 through t_6. To effect a displacement of the member 9 equal to a selected number of units, the various couplings 29, 30 and 31 are energized and deenergized according to the chart shown below:

Displacement (units)	Coupling Timing		
	#29	#30	#31
1	t_1–t_6		
2	t_2–t_5	t_2–t_5	
3	t_1–t_6	t_2–t_5	
4	t_2–t_5	t_3–t_4	t_3–t_4
5	t_1–t_6	t_3–t_4	t_3–t_4
6	t_2–t_5	t_2–t_5	t_3–t_4
7	t_1–t_6	t_2–t_5	t_3–t_4

Although any convenient means well known to those skilled in the art may be used for selectively energizing the couplings to achieve any desired number of units of displacement of the member 9 a manual means is herein disclosed and described. By depressing the proper keys during the proper portions of a time cycle any desired number of displacement units can be obtained. For instance, to obtain one unit of displacement key 1 is depressed during the entire time cycle. This means the tape 26 is coupled so as to follow the movement of the follower 16 during the entire time cycle to achieve one unit of displacement. To achieve three units of displacement, key 1 is pressed to close its associated switch during the entire time cycle (t_1—t_6) and from t_2 to t_5 key 2 is depressed to close its associated switch. This provides the

proper time relationship of energization of coils 40 and 41 to move tape 26 and the member 9 three units during the time cycle.

Referring to the chart, it will be seen that to displace the member 9 by one unit the coupling 29 is energized from t_1 through t_6 time and the couplings 30 and 31 are not energized. Thus, the tape 26 is engaged by the coupling 29 while the follower 16 is on the low dwell of cam 10, and as this cam is rotated to position the high dwell thereof beneath the follower 16, the tape 26 is displaced by one unit. The tape 26 remains in this position until returned to the initial position under cam control, and at t_6 time the coupling 29 is deenergized, thereby releasing the tape.

When it is desired to obtain two units of displacement of the member 9, the couplings 29 and 30 are energized from t_2 through t_5 time, the coupling 31 being deenergized. Thus, the coupling 29 is not energized until after the cam 10 has displaced the follower 16 relative to the tape 26 and the coupling 30 is energized while the follower 17 is still on the low dwell of cam 11. Under these conditions it will be understood that the tape 26 is displaced by two units under control of cam 11, since no displacement is effected by either of the cams 10 and 12.

Three units of displacement of the member are obtained by adding the displacements provided by both of the cams 10 and 11. This is accomplished by energizing the coupling 29 from t_1 through t_6 time and by energizing the coupling 30 from t_2 through t_5 time. Since the coupling 29 is energized at t_1 time, the tape 26 is displaced by one unit under control of the cam 10. Additionally, since the coupling 30 is energized at t_2 time, the tape 26 is displaced by two more units under control of cam 11. The coupling 31 is not energized under these conditions and the total displacement of tape 26, therefore, is equal to three units. In a similar manner, four, five, six or seven units of displacement are obtained according to the chart shown above. It should be understood that by the provision of additional displacement devices including cams, followers, couplings, etc., according to the teaching given herein, the member 9 may be displaced by any selected number of units for use as may be desired. It will be noted that the various displacements provided by the cams 10, 11 and 12 are cyclically available for effecting the desired displacement in the member 9 according to the energization of the couplings 29, 30 and 31, with the member 9 being returned to its initial position under cam control at all times.

Any convenient means may be employed for supporting the followers 16, 17 and 18 for movement in the direction of the arrow 25. The specific means illustrated here includes a means 43 mounted to the followers, which means engages a bar 44. Similar structure is provided in association with followers 17 and 18 also.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A device for selectively displacing a member comprising first coupling means engaging said member when said first coupling means is operated, first displacing means displacing said first coupling means during a first time interval, second coupling means engaging said first coupling means when said second coupling means is operated, second displacing means for displacing said first and second coupling means when said second coupling means is operated during a portion of said first time interval and means for operating said first and second coupling means at selected times whereby said member is displaced with said coupling means according to said selective times.

2. A mechanism for selectively displacing a member comprising first engaging means for selectively engaging said member in response to a first signal, first displacing means for displacing said first engaging means a first predetermined distance, second engaging means for engaging said first engaging means in response to a second signal, second displacing means for displacing said first and second engaging means a second predetermined distance and means for controlling said first and second engaging means according to said first and second signals during selected time intervals for effecting displacement of said member by an amount equal to one or both of said predetermined distances according to said selected time intervals.

3. A mechanism for displacing a member selected distances comprising first engaging means for engaging said member for displacement therewith prior to a first time interval and in response to a first signal, said first engaging means being additionally arranged to engage said member for dispalcement therewith after said first time interval and in response to said first signal, first displacing means for displacing said first engaging means a first predetermined distance during said first time interval, second engaging means for engaging said first engaging means for displacement therewith prior to a second time interval and in response to a second signal and a second displacing means for displacing said first and second engaging means a second predetermined distance during a second time interval following said first time interval whereby said member is displaced with said engaging means a distance equal to said first predtermined distance, said second predetermined distance or the sum of said first and second predetermined distances according to the timing of said first and second signals.

4. A displacement mechanism comprising a member to be displaced, first engaging means for engaging said member for displacement therewith during first predetermined time intervals, said first engaging means being responsive to first signals for engaging said member prior to said first time intervals and for engaging said member after said first time intervals, first displacing means for cyclically displacing said first engaging means a first distance during successive first time intervals, second engaging means for engaging said first engaging means for displacement therewith during second predetermined time intervals, said second engaging means being responsive to second signals for engaging said first engaging means after said first time intervals and for said second time intervals, second displacing means for cyclically displacing said first and second engaging means a second distance during second predetermined time intervals following said first time intervals, whereby displacement of said member by said engaging means is determined according to the timing of said first and second signals.

5. A device for displacing a member, comprising a plurality of displacing means having different time-displacement characteristics, a plurality of coupling means each having two selectively engageable movable elements and an element for selectively engaging the two movable elements for movement as a single assembly, the movable elements of said coupling means connecting said member to be positioned to said displacing means in seriatim, and means for enabling said coupling engaging elements selectively and at successive times to displace said member by an amount equal to the displacement of one or a plurality of said displacing means.

6. A device for displacing a member, comprising a plurality of displacing means each having a cam element and a follower element, said cam elements having different time-displacement characteristics, a plurality of coupling means each having two selectively engageable movable elements and an element for selectively engaging said two movable elements together for movement as a single assembly, the movable elements of said coupling means connecting said member to be positioned to said follower

elements in seriatim for movement as a single assembly when said engaging elements are enabled, and means for enabling said coupling engaging elements selectively and at successive times to displace said member by an amount equal to the displacement of one or a plurality of said displacing means.

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