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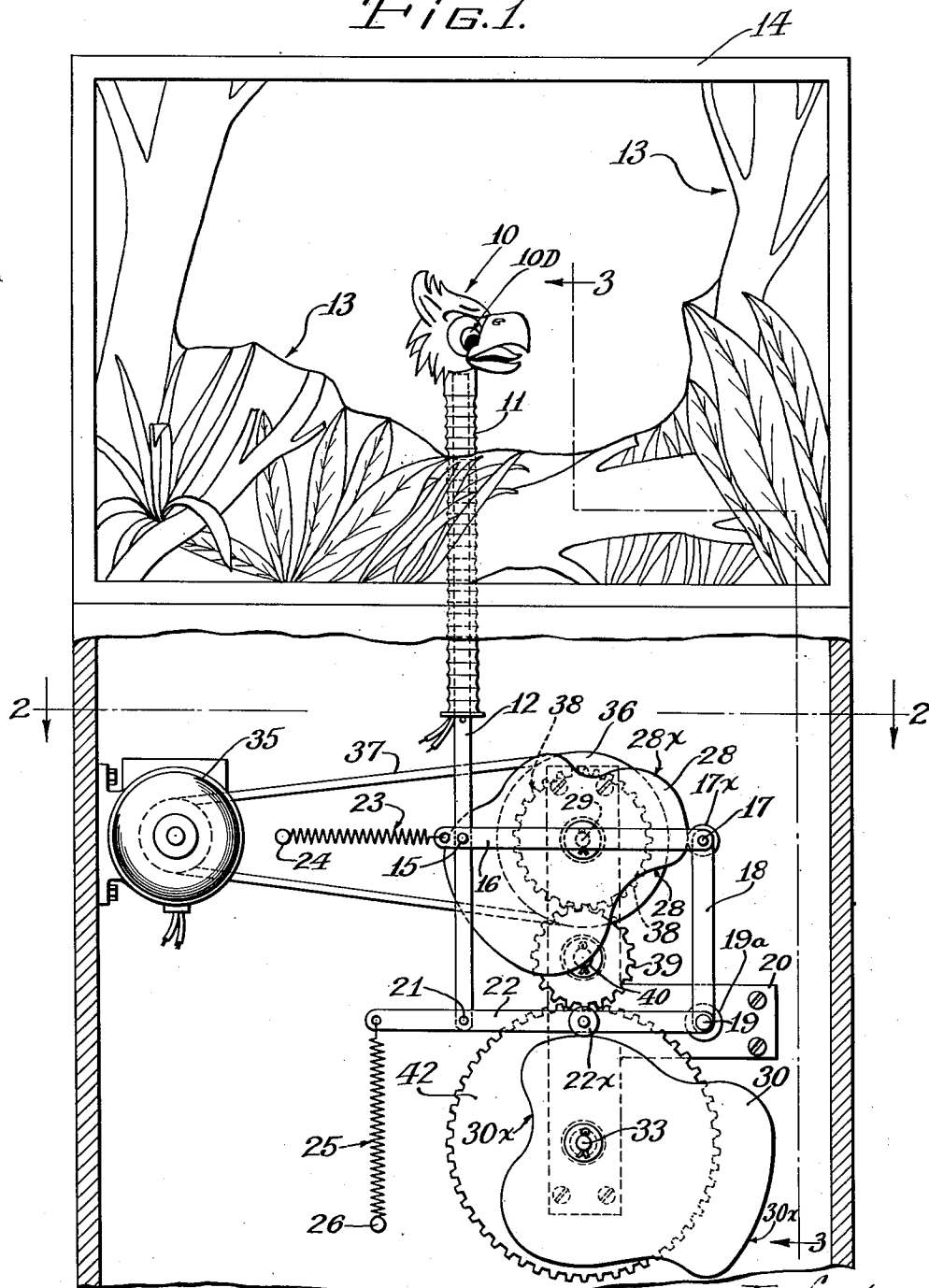
2,572,146

TARGET WITH IRREGULAR MOTION

Filed Feb. 10, 1949

2 SHEETS—SHEET 1

FIG. 1.



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2 SHEETS—SHEET 2

FIG. 2.

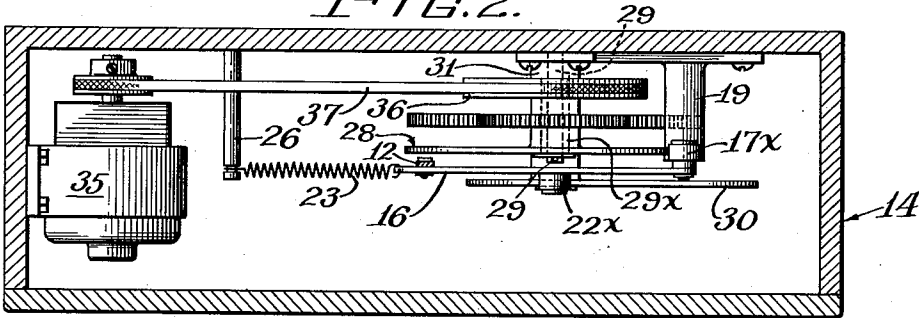


FIG. 3.

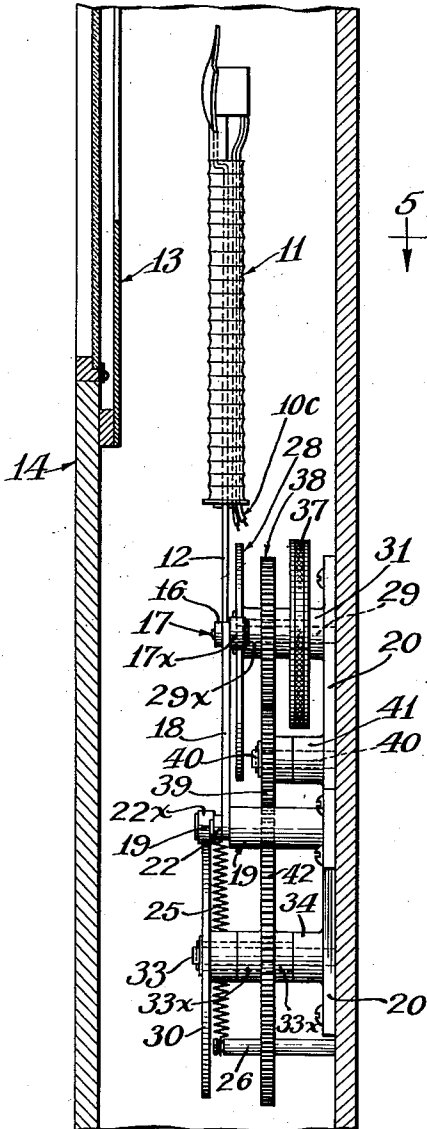


FIG. 4.

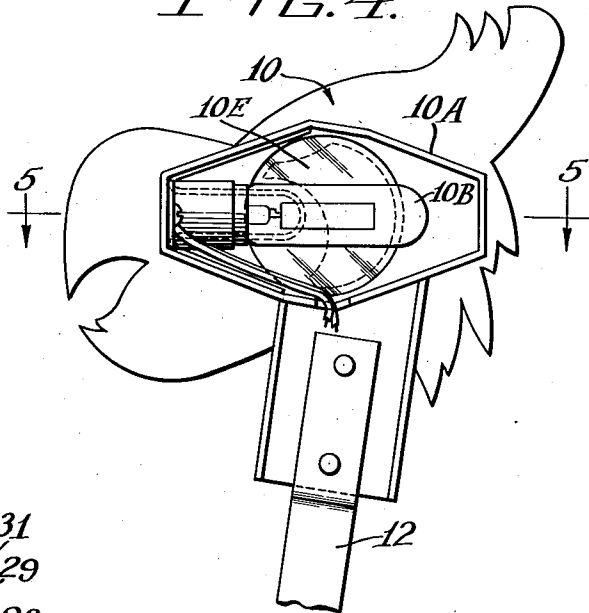
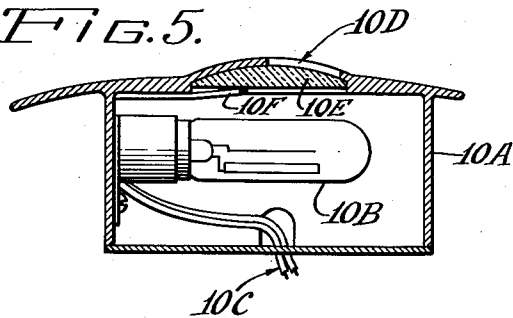


FIG. 5.



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TARGET WITH IRREGULAR MOTION

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3 Claims. (Cl. 273-105.2)

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This invention has as its principal object provision of a mechanical movement especially adaptable to use with photoelectric targets in marksmanship apparatus, gun games, and the like.

The novel mechanism is adapted to impart a complex motion to a desired object, such as a target, from a single driving device or motor.

The novel mechanism further provides a means for scrambling, or rendering substantially unpredictable, the movement of the object or target, utilizing nevertheless a minimum of parts to this end.

Viewed from another aspect, the invention provides a target moving means including a single driving motor, a compound lever system, and a special cam system coacting therewith for imparting at least two degrees of irregular motion to the object or target element.

Other objects and aspects of novelty relate to details of the construction and operation of the illustrative embodiment described hereinafter in view of the annexed drawing in which:

Fig. 1 is a vertical elevation of a target structure with parts shown in section to reveal the mechanical movement;

Fig. 2 is a horizontal section along lines 2-2 of Fig. 1;

Fig. 3 is a fragmentary vertical section looking in the direction of lines 3-3 of Fig. 1;

Fig. 4 is a rear elevational detail, to enlarged scale, of the target element;

Fig. 5 is a sectional detail through the target proper along lines 5-5 of Fig. 4.

Referring to Fig. 1, the novel mechanical movement is adapted to impart an irregular motion to a photoelectric target member in the form of a bird's head 10 surmounting a flexible tubular neck element 11 carried upon a first vertical lever arm 12.

A scenic backdrop 13 is provided in the upper portion of a cabinet 14 which houses the target mechanism.

Within the lower portion of the cabinet, the lower part of the vertical lever 12 forms part of a compound lever system in the nature of a pantographic or quadrilateral array, and in this respect is pivotally connected as at 15 to the end region of a second lever arm 16 which, in turn, at its opposite end, is pivotally connected as at 17 to a third lever 18.

The third lever 18 is pivotally connected to a fixed pivot 19 on pivot stanchion 19A carried on a bracket 20 mounted on a wall portion of the lower cabinet.

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The lower extremity of the first or vertical lever 12 is also pivotally connected as at 21 between the ends of a fourth lever 22.

To the free end portion of the second lever 16 is secured a normalizing spring 23 anchored in the cabinet as at 24; and to the free end of the fourth lever 22 is secured a second normalizing spring 25 anchored in the cabinet as at 26; the effort of the first spring 23 exerts a first directive component to the lever system in one direction, while the second spring 25 exerts a second directional component to the system in a second direction at right angles to that exerted by the first spring.

Means for imparting a complex and irregular motion to the lever system includes a pair of irregularly developed or evolved cams 28 and 30 mounted to rotate, respectively, substantially in parallelism with, and in the plane of, the compound lever system.

The cam 28, as shown to advantage in Figs. 2 and 3, is journaled on a sleeve 29X on a pin 29 fixed in a stanchion 31 forming part of the bracket 20.

The cam 28 (Fig. 1) is provided with an irregular periphery 28X against which rides a roller 17X which is part of pivot 17.

The second cam 30 is likewise provided with an irregularly evolved periphery 30X against which rides a cam roller 22X on the fourth link arm 22 at a point on the latter between the pivotal connections 19 and 21.

The cam 30 is journaled on a sleeve 33X on a pin 33 (Fig. 3 also) fixed in a stanchion 34 forming part of bracket 20.

Means for driving the cams including a single motor 35 (Fig. 1), driving a sheave 36, keyed to said sleeve 29X on pin shaft 29, through a suitable belt 37.

Also fixed on the sleeve 29X is a driving gear 38 meshing with an intermediate pinion 39 (Figs. 2 and 3 also) idling on a pin shaft 40 in stanchion 41 on bracket 20.

The pinion 39, in turn, meshes with a second and larger driving gear 42 fixed on the sleeve on pin shaft 33.

The target member or head 10, as shown in Figs. 4 and 5, includes a rear housing 10A fixed to the target head and adapted to house a photoelectric cell 10B from which leads 10C are carried down through the flexible neck tube 11.

The target face is provided with an eye opening 10D behind which is a lens 10E retained by a spring ring 10F.

Operation

Assuming the motor 35 to be running, sleeve 29X is driven through sheave 36, and sleeve 33X is similarly driven through the gear means 38, 39, and 42, so that cams 28 and 30 revolve together, but at different rates, and the cam rollers 17X and 22X under urgency of spring means follow the peripheral meander of the cams at relatively slow speeds, the motor 35 being of the type having a built-in reduction gear, whereby to impart a complex motion to the upper portion of the first target lever 12.

From the foregoing it will be understood that the pantographic or quadrilateral lever array, with cam displacements effected simultaneously on adjacent levers in the quadrilateral system, plus the divergent angular effort of the loading springs 23 and 25, will cause the target rod or member 12 to be displaced in an up-and-down sense as well as in a back-and-forth sense in the plane containing the rod 12 and target object 10, and this motion can be made relatively uncertain and irregular depending upon the nature of the peripheral developments of the cams 28 and 30.

The foregoing simple mechanism moves the target in a manner to provide interest, uncertainty, and unpredictability, and in a manner particularly useful in conjunction with target apparatus, and a variety of amusement devices.

Having thus described my invention in specific structural and functional detail, the appended claims point out the parts, combinations, and operations of the embodiment thus specified, which I claim as my invention.

I claim:

1. An irregular target movement comprising a primary arm pivotally anchored near one end, a spring urging said arm in a first direction, a first cam having an irregular cam pattern and rotatable to displace said arm oppositely to said first direction, a secondary arm normally parallel to said primary arm and a second spring urging the same in a second direction angularly displaced from said first direction, a second cam having an irregular cam pattern and rotatable to displace said secondary arm oppositely to said second direction, a tertiary link arm pivotally mounted at the aforesaid anchorage and pivotally connected remotely therefrom to said secondary arm, and a quaternary target arm pivotally joined to said primary and secondary arms and including an extension with a target thereon, operation of said cams and springs effecting an irregular displacement of said target arm as a function of the pattern of said cams and drive means including a driven gear for each said cam, and a driving gear common to said driven gears.

2. A target carrying and meandering mechanism

comprising four levers pivotally connected in series to form a quadrilateral array with one pivotal juncture fixed on a support and said array disposed in a vertical plane, a first one of said levers being elongated to have a vertical target arm extending upwardly beyond its pivotal connections with the remaining levers, target means at an upper end of said first lever, two separate meandering cams each turning on its own pivot and drivingly engaging one of said levers to displace said array in vertical and horizontal components of motion relative to said fixed point, and spring means acting oppositely to said motion components upon said array in opposition to said motion components of the cam means, and means for rotating said cams at different speeds.

3. Target apparatus comprising an elongated lever, target means carried at one end portion of said lever, and means for imparting irregular motion to said lever and the target means and including three additional levers pivotally joined in series and having one pivotal connection fixed to a mounting, two of said additional levers having pivotal connections at spaced points to an end region of said first lever remote from said target means, whereby the pivotally joined elements of all of said levers define a quadrilateral array capable of simultaneous compound motion relative to said fixed pivot for imparting a resultant compound movement to said target means, a first cam rider on one of said additional levers at a point between its connection with said first lever and said fixed pivot, an irregular cam drivingly engaging said first rider, a second cam rider at the pivotal connection between the remaining two of said additional levers, a second irregular cam drivingly engaging said second rider, and a motor and means providing a driving connection therefor with both said cams for simultaneously rotating the latter at different speeds to impart the aforesaid compound motion in irregular pattern to said target means, and spring means acting on said levers to maintain said cams respectively in engagement with said riders.

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