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## TANGIBLE MOTION SCULPTURE

Motion sculpture is a distinct form of modern art, as is evident in the mobiles of Calder, the revolving sculptures of De Rivera, and the kinetic construction of Tinguely. Many sculptors and painters have composed visual forms of abstract motion, although not all of them make it their main form of creative expression. Kinetic constructions date back to the twenties in the creations of Moholy-Nagy, Gabo, Leger, Man Ray, Duchamp, and others.

Currently, many sculptors and some experimental film makers in the United States are working in kinetic construction. For example, eighteen American sculptors, painters, and film makers, including some of the above names have been invited to exhibit in a large scale historical "Movement In Art" exhibition organized by the Moderna Museet of Stockholm and to be shown first at Amsterdam.

My tangible motion sculpture, extending the infinite variety of fundamental patterns of movement, emphasizes the beauty of motion *per se*. If Constable painted his quick oil sketch notes to convey cloud movement, he, in a sense, only pretended. Why not create cloud shapes that move in reality?

When a fireworks sparkler describes a figure eight, the persistence of after-image isolates its motion as design. The sparkler becomes a subsidiary to the visible tangibility of the design it describes. Emphasis on motion rather than on the object describing it distinguishes the tangible from other forms of sculpture in movement. Mobiles and revolving sculpture retain an emphasis on the beauty of the objects describing the movement. In tangible sculpture the aesthetic value of objects becomes secondary to that of their motion.

When an illuminated stainless steel rod is set in motion, one gets the impression of a solid form. This effect is produced by moving the reflecting surface of the work in fast repetition so that the shapes of its motion is retained.

Beauty of movement can be created by imparting vibration to materials. Variations of swaying arcs, symmetrical curves, "standing waves," and other shapes are created by means of vibration on varied metals, plastics, and kinds of wood. Variations of shapes stemming from the resonant frequency of steel and other metals may be unfolded by electrical force. These variations may be choreographed and controlled to create an artistic composition of motion.

I have created the tangible *Revolving Harmonic* (fig. 1) by applying a reciprocating force to the base of an upright stainless steel rod, so that it forms a simple curve. Because it

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vibrates rapidly from side to side, this curve appears as a double-pointed oval standing on end.

Manual control over the force wired to an electric motor which activates a motion sculpture may be achieved by turning the knob of a Veriac type of Rheostat. The tangible composition *Revolving Harmonic* is produced by this means. The manual control may be readily replaced by an electronic system of automation. This pre-set, pre-timed, and fully automatic system would program the choreography of *Revolving Harmonic* as follows:

Almost imperceptibly a polished metal rod seven feet high begins to quiver from side to side. As the force increases, the sideways motion increases, until the upright rod assumes a fundamental curve. This gives it the appearance of an elliptical loop standing seven feet high and measuring sixteen inches across at its widest point.

To the rapidly vibrating sideways motion we add rotary motion. The fundamental curve moves out of its two-dimensional plane into a three-dimensional revolving orbit. It is now a cylindrical double-pointed oval. This illusion of an elliptic sculpture is actually evolved from a single rod.

By changing the radius and the force of the rotary motion applied to the foot of the rod, a series of harmonic curves may be formed one above the other. These curves may also be broadened or narrowed in a breathing-like action by accelerating or decelerating the force. The number and the shape of these double-pointed oval curves, standing end to end, one above the other, are at all times automatically controlled. The programming of such additional configurations constitutes a choreographed composition of motion.

A limited action of chance may also be incorporated in a choreographed work. A weight added to the rod would induce a random element into its performance. This adds the important element of spontaneity and unforeseen variation within a master pattern set by the sculptor.

In *Swaying Steel Fountain* (Fig. 2) the fluidity and power of water are combined with the strength and flexibility of steel. A bundle of one hundred and twenty upright stainless steel tubes are gathered together at their base so that they flare out and up in a symmetrical circular fan shape. The tubes possess a diameter and wall thickness to maintain their upright position and flexibility.

The tubes sway when the slightest force is applied to their revolvable base. When not driven by a mechanical force, their flexibility permits a light breeze to impart to them a gentle swinging motion.

The cylindrical container of the bundle of tubes sits in a cone-shaped base. Retractable water vanes move in and out of this cone and alternately engage and disengage streams of water. They automatically protrude and retract, causing the

fountain to rotate. The variation in the amount of water engaged by the vanes creates a gentle swaying back-and-forth motion to the bundle of tubes.

In *Water Whirler* (not illustrated), a fantastic choreography, jet-streams fling their spray in three dimensions from a perforated oscillating stainless steel tube rising thirty-five feet above a pool of water. The automatic system of action programs the motion thus: The highly polished steel tube begins to quiver from side to side. This action increasingly agitates the ten jets of water streaming from the side of the tube. As the force increases, the motion increases, until the upright tube assumes a fundamental curve. This gives it the appearance of an elliptical loop standing on end some thirty-five feet high and measuring about ten feet across at its widest point.

The continuously rapid action of the *Water Whirler* flings the thin jets of water from both sides of a parabola so that, as the jets of one side converge, the other side is diverging, and conversely, as the whirler vibrates to the opposite parabola. By adding rotary motion to the vibrating action of the water-flinging tube, the two-dimensional fundamental curve is made to move out of its lateral plane and into a three-dimensional ovoid orbit, while retaining its elliptical shape.

For fifteen minutes the thin powerful jets of water streaming from the rotating tube now follow the rotating direction, being flung some twenty to thirty feet from it. This is the climax. While the water jets diminish and cease, the whirler quivers gradually to a stop, taking about five minutes to complete its final slowing action.

As silence emphasizes sound, so motion, isolated as a form of beauty, will enhance quietude. The fluttering butterfly in the pleasant garden, the swaying branch emphasizing the still trunk of the parent tree—these give us examples of complementary elements in our empathy to both stillness and motion. In like manner, an unexpectedly vibrating metal sculpture, through its movement, will enhance the serenity of an architectural environment, whether this be an open court, an enclosed hall, a living room, or a garden.

The highly reflective surfaces of a tangible dictate a creative approach to illumination. Not only are beautiful effects

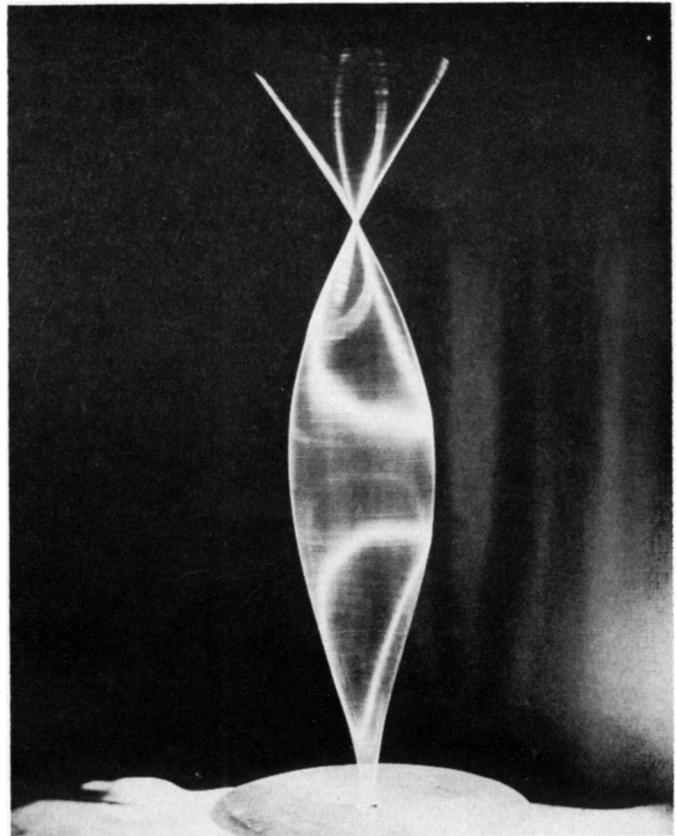


Fig. 1. Len Lye, *Revolving Harmonic*, stainless steel rod, in motion.

obtained by slowly animating moving light over the surfaces, but where there is rapidity of motion in a tangible, there is an opportunity to achieve a new aesthetic effect in the use of stroboscopic light.

As much as automation is felt to be contrary to artistic expression, it can be made part of a highly creative form. This apparent contradiction is aesthetically resolved in the beauty of tangible motion sculpture.

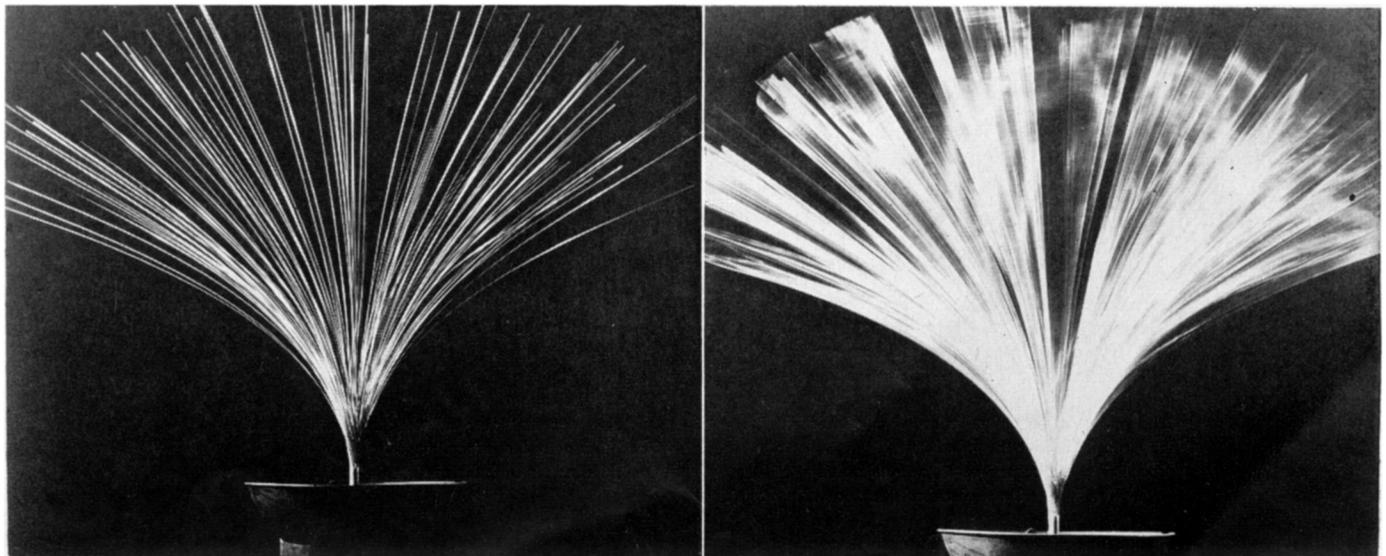


Fig. 2. Len Lye, *Swaying Steel Fountain*, left, at rest; right, in motion.