Artur Ketnath

HOW TO CONSERVE MOTION*

In addition to the three dimensions possessed by any object, kinetic objects have a fourth: motion. This poses a very special problem for their restoration. Motion, of course, does not remain in the object but vanishes when the mechanical system is switched off or defective. Improper handling or rashly performed restoration work may alter or distort the sequence of motions – it can be slowed down or accelerated, the time intervals can be changed. As a rule, such objects are documented through photographs. The sequence of their motions is rarely recorded.

Yet, the human capacity for recalling motion is always subjective, characterised by moods and feelings. One person may remember a motion as "resembling a steam engine", whereas another person might describe the same motion in the same object as being "as gentle as a heart beat". It is not enough to simply document such objects in photographs and writing, which is common museum practice. A photograph does not show any motion and a written description of movement is always based on subjective feelings.

As a basic prerequisite for later, authentic restoration it is imperative that the sequence of movements in kinetic objects be carefully stored on film or video and the time sequence documented.

In the case of a damaged object for which there is no documentation of the sequence of movements, it is necessary to conduct examinations and extensive research in order to be able to reconstruct it as far as possible. Surveys into the motion sequence of an object conducted among relatives, previous owners, or the artists themselves, have produced a variety of opinions in the past. However, they are indispensable within the overall context of such an examination.

In any case, the entire structure, design and the mechanism's mode of operation has to be examined very closely. An analysis is required to determine which parts are secondary and what transmission ratios enable what speeds. Is the motor original, does it match the type of materials that the object's creator normally used? Is the movement of the motor correctly transmitted to the mechanical elements? Do the drive belts run on the drive wheels with the correct length, in the right order and in the correct direction? Are counterweights balanced correctly and is their weight correct? Are the axles in their original position, has the adjustment of various motion transmitting elements altered? Has the entire chassis changed or become deformed?

These are questions that cannot be conclusively answered individually. One has no other option but to refer to the rest of the artist's work, taking the time to study the objects, analyse the mechanisms, examine the technical methods used, note the types of materials used by the artist, and at the same time consider the progressive development of the work and material-development aspects as well.

From these fragmentary observations it may be possible to reconstruct the missing motion. This remains an arduous and uncertain business. Detecting the sources of the faults may pose great problems because they are frequently imperceptible. They may be concealed within mechanical components that are not accessible and are difficult to inspect. It may be possible to detect such sources from an overview of the way the entire mechanical system functions, but this requires a certain understanding of technical processes that cannot be learned directly. A sound technical training is required.

A tiny, even banal defect in one of the mechanical elements may disrupt the entire sequence of movements. Such a small defect can destroy whole sections of the mechanism. For this reason, and in order to avoid further damage, it is often impossible to put the mechanism into motion. Moreover, elimination of one defect may trigger further faults. The machine has become accustomed to the defect, as an ill person gets used to his chronic disease. Once the recovery process starts, additional symptoms suddenly appear that can only occur as a result of the healing of the original disorder.

Modern Art: Who Cares? (1999), p. 369-372.

Faults in the sequence of motions are not necessarily caused by later defects, however. The objects may have left the artist's workshop in a faulty condition right from the beginning. To assert whether this is the case, much time has to be spent on a precise analysis of the sequence of motions and the functions of the mechanical system. Then, a very difficult question rises: how legitimate is it to repair such a fault and reinstall the motions as originally designed?

It is virtually impossible to solve these questions alone. Specialists have to be called in and should be involved in all preliminary investigations, since experience has shown that they can often provide valuable ideas. It may be necessary to have a precision mechanic or watchmaker in the team, electricians for the various electronic installations, metal conservators or goldsmiths to restore moving components made of thin metal sheet or foil for example, and painting conservators to restore surfaces which, as far as the degree of difficulty is concerned, may be comparable to restoring a monochrome, unvarnished picture.

Installing the object and setting it into motion, as well as any repairs at the installation site, should only be carried out by people who are genuinely familiar with the objects. There are ample examples of restoration work which has been performed by people who lack the necessary knowledge about the object and has resulted in permanent damage.

Finding spare parts to restore objects is another aspect that requires a great deal of time and patience. Again and again one is confronted with the absence of entire mechanical components that perhaps have broken off at some stage and carelessly been mislaid – or damaged to such an extent that they are no longer reparable and have to be completely replaced. It then becomes apparent that the materials are no longer in production and cannot be found in local retail shops. Usually these materials are produced for industry or the crafts trade and were modified by the artist for his or her specific application. It may be difficult in some cases to identify the original purpose in order to find a suitable manufacturer.

So the conservator has to become a collector. A collection of various screws, metal spirals, rubber bands, plastic washers and discs, and so on – the list is endless – can save a great deal of time and make it possible to carry out a repair with the suitable materials. Contact with the artist or the artist's family may uncover suitable left-over materials. Rummaging in relevant retail stores while travelling, for example, can also be a way of finding long sought-after materials.

If a material cannot be procured at all, it has to be reconstructed in some way. Suitably skilled technicians must be found for this purpose, which is not always easy in our industrialised world. If the original material is also missing, a great deal of imagination has to go into such a reconstruction. For five small pieces of paper missing from an object by Gerhard von Graevenitz, for example, so-called 'coloured paper' was needed that had been common in notebooks in any stationery shop thirty to forty years ago. Such simple coloured paper is no longer available; paper today shines and shimmers and does not have the 'post-war' touch of the paper used in the object. It was not easy to hit the mark regarding the type of material, the shade, the surface finish and the traces of the past.

This example demonstrates that it is not enough simply to meet the well-known demand for replacement motors. It is important to think about which of these industrial products should be immediately procured for a 'spare parts store' to avoid difficult and expensive reconstruction at a later date.

A spare parts store of 'original' parts takes on even greater importance in light of the demand that restoration should also tackle the non-visible parts of the mechanisms so as to retain the work's original state as far as possible. This means that the restoration of faulty, 'old-fashioned' technology should not be limited to the application of improved modern technology.

One problem that may arise in this context, however, is that components may be missing or have become unusable through wear and tear. Acquiring replacements for such components after forty or fifty years often proves to be a difficult task.

Modern Art: Who Cares? (1999), p. 369-372.

Due to these problems, it would be useful to limit the running times of kinetic objects to an absolute minimum, analogous to reducing the time watercolours are exposed to light, for example. The less a mechanical system moves, the less the wear and tear there will be on the components.

An additional point is that of the qualified maintenance of such objects. The objects need to be cleaned and oiled at certain intervals. Bare metal parts that are prone to rust must be treated with gun oil; signs of wear must be found and analysed, because these may point to possible sources of faults in the mechanism that have not yet led to a visible defect and which, in most cases, can be easily eliminated at this stage.

Another preventive measure is to keep the objects in a balanced climate. Kinetic objects of the 1960s and 1970s are often made of low-quality, extremely hygroscopic materials. Roof battens, pressboard, hardboard and plywood as well as other materials may have been used for their chassis. If the climatic conditions change, these materials warp. This can disrupt the entire operation of the mechanism and may lead to destruction of sensitive mechanical parts. Keeping such objects in a balanced climate is therefore just as important as it would be for medieval wooden panels.

It would also be desirable to avoid shipping objects made of these or similar materials. In reality, however, objects have to be transported sometimes. This places great demands on appropriate packaging. Simply making use of a climatic box is not sufficient in many cases. Provisions to protect moving parts of the object from impact, tipping and similar influences during transportation have to be considered in advance. Thought must be given to supporting or locking these parts. Mechanical components may have to be dismantled prior to transportation and be shipped separately.

This text was an introduction to seminar 11: The conservation of kinetic art.

*The article has been published in: Hummelen, IJ., Sillé, D., *Modern Art: Who Cares?,* Amsterdam: Foundation for the Conservation of Modern Art/ Netherlands Institute for Cultural Heritage, 1999, p. 369-372.