

Aug. 11, 1942.

H. K. MARKEY ET AL

2,292,387

SECRET COMMUNICATION SYSTEM

Filed June 10, 1941

2 Sheets-Sheet 2

Fig. 7.

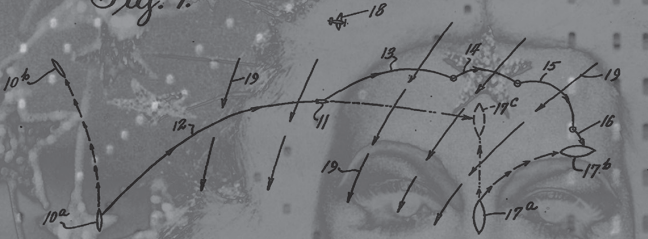
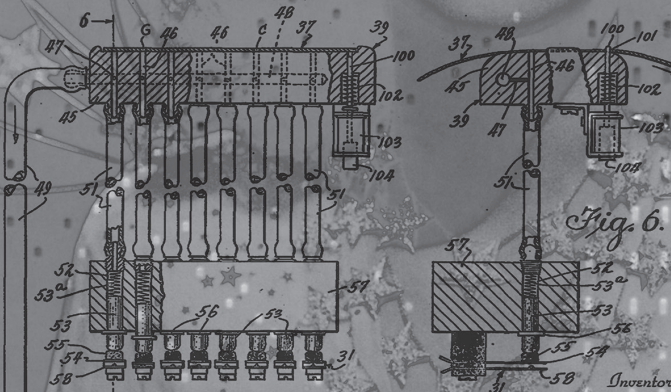
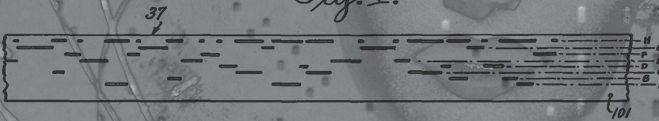


Fig. 4.



Aura Satz, Impulsive Synchronisation preparatory sketch, 2018, © and courtesy the artist

# AURA SATZ Impulsive Synchronisation

HAYWARD GALLERY PROJECT SPACE  
Friday 22 March – Sunday 26 May  
Free

THE  
REST  
IS  
NOISE

Inspired by Alex Ross' book *The Rest Is Noise*



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*Impulsive Synchronisation*, a work realised especially for the Hayward Project Space, centres on the invention of ‘frequency-hopping’, patented in 1941 by Hollywood star Hedy Lamarr and composer George Antheil. Their wartime ‘Secret Communications System’ drew on Antheil’s unsuccessful attempt to synchronise 16 pianolas in his 1924 avant-garde masterpiece *Ballet Mécanique*. It has since become the basis for today’s spread-spectrum technology, widely used in wireless telephone and wi-fi technology. In her new film and sound installation, Aura Satz refers to these technologies in order to explore visual, musical and data notation, as well as its encryption, synchronisation, and decipherment.

## Background notes

### ‘Secret Communications System’

In June 1941, Hedy Lamarr and George Antheil submitted their application to patent a new ‘Secret Communications System’, which was granted to them the following year. In a bid to help the war effort, they had devised a system of ‘frequency-hopping’ to protect radio-controlled torpedoes from enemy jamming or interference, by synchronising frequency changes in transmitter and receiver. They suggested the use of a mechanism similar to pianola (player piano) rolls to synchronise rapid changes between 88 frequencies (the number of keys on a piano). The idea of ‘frequency-hopping’ was not implemented by the U.S. military until 1962.

### Hedy Lamarr (1913 – 2000)

Born in Vienna, Austria, Hedy Lamarr was an international film star renowned for her beauty and came to prominence for her role in the controversial 1933 Czech film *Ecstasy*. The same year she married Austro-fascist arms dealer Fritz Mandl, through whom she gained knowledge about military weaponry technology, before fleeing to America in 1937. It was only in 1997 that she was properly recognised as the co-inventor of ‘frequency-hopping’.

### George Antheil (1900–1959)

George Antheil was an American avant-garde composer, pianist, writer and inventor. Pursuing a career as a concert pianist in Paris, he developed a reputation for performances using modern industrial and mechanical sounds in unusual arrangements. In 1924 he composed a score which called for pianolas, airplane propellers, sirens and bells, originally intended to accompany Fernand Léger’s film *Ballet Mécanique*.

## Aura Satz talks to Stephanie Rosenthal, Chief Curator, Hayward Gallery

**Stephanie Rosenthal:** What was your interest in using Hedy Lamarr and George Antheil’s invention as a starting point for *Impulsive Synchronisation*?

**Aura Satz:** I am interested in inhabiting the unstable, uncertain moments of technologies on the cusp of invention. Inventions are often an amalgam or hybrid of other technologies – in Lamarr and Antheil’s case, perforated paper of pianola rolls, radio-controlled torpedoes, etc. A patent text or drawing is somewhat hermetic, at once specific and open enough to disclose the invention, but not to allow someone else to steal it. It needs to be vague to encompass its potential future developments and applications. An idea that is patented is not necessarily yet worked out, nor put into practice or even used. I am repeatedly drawn to exploring texts, notation systems, languages or codes which are not quite fixed, only just surfacing, hovering between noise and signification, interference and meaning, abstraction and the figure. To me this is the most appropriate way of approaching all texts, as a kind of code which is unfixed in its reading, like a visual score, open to a plurality of interpretations, and very much in tune with the notion of sharing voices and authorship. The collaborative aspect of Lamarr and Antheil’s invention is fascinating, the fact that their authorship