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NEUTRON SOURCE FORMED AS A FAST PULSED REACTOR

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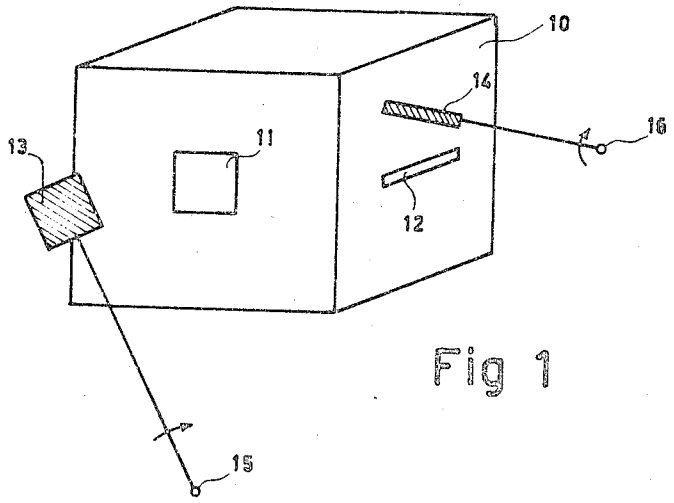


Fig 1

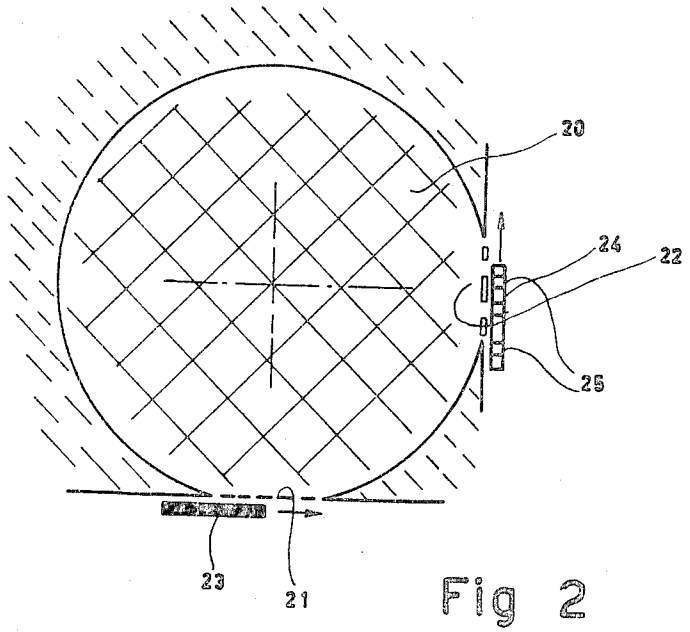


Fig 2

INVENTORS
Gustav KISTNER
Rolf MISENTA
Victor RAIEVSKI

BY

ATTORNEYS

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NEUTRON SOURCE FORMED AS A FAST PULSED REACTOR

Gustav Kistner, Garivate, and Rolf Misenta and Victor Raievski, Varese, Italy, assignors to European Atomic Energy Community—Euratom, Brussels, Belgium

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Claims priority, application Germany, Aug. 15, 1963, E 25,343
2 Claims. (Cl. 176—33)

The present invention relates to a pulsed neutron source in a reflector, formed as a fast reactor with two neutron outlet windows through the reflector and with screens movable in front of the windows, the screens being made of reactivity increasing materials. This construction, already suggested by others, is constructionally and operationally more advantageous than the known Russian system "IBR–DUBNA" which is for the same purpose but for substantially smaller outputs.

The pulsing of the reactivity takes place in two steps. In a first step one screen pulses the reactor at its window in the vicinity of the critical point (pre-pulse) and in a second step the other screen pulses the reactor at its window above the prompt critical point (excess pulse). The screen for the excess pulse thus determines the duration of the reactivity impulse and the screen for the pre-pulse determines the frequency of the neutron impulse. It is aimed to make the impulse duration as small as possible.

In our copending United States patent application Ser. No. 381,637 which relates to a pulsed reactor with only one window and two screens movable in front thereof, there is proposed for the screens a construction which makes it possible to obtain impulse durations of 40 μsec. and less. The solution consists in providing through the screen for the pre-pulse, narrow non-equidistant slots and in distributing the reactivity increasing material of the screen for the excess pulse in zones which correspond to the slots.

In accordance with the present invention the same advantageous result in regard to the neutron impulse duration is obtained in reactors with two windows by providing as a window for the excess pulses at least one individual slot which is narrow in relation to the window for the pre-pulse. If the window is replaced by a line of progressively or decreasingly spaced staggered slots and the related screen is correspondingly provided with zones of the same surface of reactivity increasing materials, there is obtained a sufficient reactivity lift and decoupling between the lift width and the impulse width.

The accompanying drawing illustrates schematically one embodiment for each of the above solutions.

In the drawings:

FIG. 1 is an arrangement with a window and a single slot and

FIG. 2 is an arrangement with a window and a line of slots.

In FIG. 1 reference numeral 10 indicates the reactor core, 11 the window, and 12 the slot according to the invention. The screens 13 and 14 with axes of rotation 15 and 16 move on circular tracks (not shown) in front of the window and slot. Screen 14 is arranged with its length in the direction of movement with respect to the width of the slot. To provide the required reactivity lift it is preferable to make the screen 14 of fissionable material.

In FIG. 2 reference numeral 20 indicates the reactor core, 21 the window for the prepulse, 22 the slot line for the excess pulses, and 23 and 24 indicate the screens. The screen 24 is provided with reactivity material only at the zones 25 corresponding to the slot line 22. The excess pulse which occurs when the slots are entirely covered is n times larger than the pulse of a single slot (n=the number of slots), as described in detail in the above-described copending application.

The two-window reactor has the advantage over the single window reactor that each of the screens operates as close as possible to the window and can be made thinner.

We claim:

1. In a fast reactor used as a pulsed neutron source wherein the reactor core is located in a reflector, said reflector provided with two neutron outlet windows and with a pre-pulse screen and an excess-pulse screen having synchronized movements and movable in front of the said windows, respectively, said screens composed of reactivity increasing material for pulsing the reactivity, means to operate the pre-pulse screen to bring the reactivity up to the vicinity of the critical point and means to simultaneously operate the excess-pulse screen to bring the reactivity at the other window above the prompt critical point; the improvement wherein the window for the excess-pulse screen is made up of at least one slot which is narrow in relation to the window for the pre-pulse screen.

2. The improvement according to claim 1 wherein said excess-pulse window is formed by several aligned slots spaced unequidistantly and the excess-pulse screen is provided with zones of reactivity increasing material, the spacing of said zones being such as to correspond to the spacing of the aligned slots of said excess-pulse window.

References Cited

UNITED STATES PATENTS

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CARL D. QUARFORTH, *Primary Examiner.*

L. DEWAYNE RUTLEDGE, *Examiner.*

H. E. BEHREND, *Assistant Examiner.*