NEW PATENTS by ALFONS PUISHES

In this Section of NUCLEAR APPLICATIONS we briefly describe some recently issued patents which we think are particularly interesting. The patents themselves, which contain all the detailed descriptions of the inventions, may be obtained from the Commissioner of Patents, Washington, D. C. for 25c each. They also may be read in patent libraries in major cities.

PRESSED OXIDE FUEL COMPACTS. Fuel compacts are produced by pressing oxides of Pu or Th singly or in combination at pressures as high as 5 tons/in.^{2} (730 kg/cm^2), heating to 700°C in a hydrogen atmosphere, sintering at 1500 to 1700 °C and cooling in hydrogen. 3 168 601, P. D. St. Pierre, General Electric Company.

CONTINUOUSLY FUELED REACTOR. This reactor utilizes a fuel bundle traveling along a variable-contour feed track. The bundle comprises fuel tubes flexibly connected and spaced apart from one another along the track and at right angles to it. Bearings are mounted on the flexible connections to guide the bundle along the track while maintaining the proper arrangement of the fuel tubes. 3 167 484, W. F. Beutel, Martin-Marietta Corp.

ROTATING-DISC SOLID-FUEL ELEMENTS. Improved cooling, better burnup, and greater operating flexibility in a heterogeneous reactor are provided by solid-fuel elements made in the form of rotating discs. Each disc contains fissionable material of less than critical mass, but the discs are arranged to overlap one another so that a chain reaction can be maintained in the core formed by the overlapping areas. Continuous rotation of the discs affords opportunity for cooling the outside of the core. 3 172 818, H. J. Hibshman, Esso Research and Engineering Co.

BOILING-WATER REACTOR. A basketlike fuel holder removably positioned on the lower grid and containing two symmetrical fuel assemblies is said to improve operation by facilitating reactor-fuel charging and discharging. 3 161 571, J. M. Harrer, C. F. Bullinger, U. M. Kolba, USAEC.

PASTE FUEL FOR FAST REACTOR. Employment of 100-μm particles of UC, PuC or ThC packed to a density of 40 to 60 vol% in a liquid metal, preferably Na, eliminates distortion and centerline temperature limitations encountered with solid fuels. One usage embodies special fuel elements of shell-and-tube construction encasing the paste and providing for liquid-metal cooling. Alternatively, the paste may be pumped slowly or intermittently through a tubular core with liquid-metal crossflow cooling. 3 169 117, R. W. Dickinson, D. T. Eggen, USAEC.

PRODUCTION OF ENRICHED ISOTOPES such as ^{60}Co and ^{139}Ba via cation fixation. Bentonite-clay ion-exchange material is first treated with a solution of a compound of the element of the isotope to be produced until the appropriate cation is firmly fixed in the clay. Other cations are leached out or otherwise removed from the clay, which is then dried, heated to a high temperature, and irradiated with neutrons of predetermined energy. Appropriate chemical separation then yields the desired isotope. 3 167 479, P. Y. Feng, IIT Research Institute.

THERMONUCLEAR DEVICE of magnetic mirror type. Advancing the art of producing the controlled thermonuclear reaction, this device provides for injecting ionized plasma into an evacuated vessel surrounded by a succession of specially wound and interconnected magnetic coils. Successive pulses of current through the coils produce a "magnetic piston" effect, while other coils comprising a delay line cause compression of the plasma. Other pulses on different coils produce a "magnetic shutter" effect, releasing the constriction and injecting the plasma into the "magnetic bottle" portion of the vessel, where extremely high temperatures are attained. 3 166 477, H. Leboutet, Compagnie Generale de Telegraphie Sans Fil, France.

NUCLEAR REACTOR SAFETY CONTAINMENT. The necessity for a heavy containment vessel is eliminated by utilizing a water sprinkler condensing-and-dissolving system for steam and radioactive gases. The reactor vessel is enclosed in a light-weight steel containment having an elevated water tank positioned under the roof. Siphon lines connect from various levels in the water tank to sprinkler heads and condensing coils inside the containment. Rupture discs are located in pipes connecting the air space above the water level in the tank with air spaces in the reactor vessel and a condensate-collecting chamber. Increased pressure in the reactor chamber ruptures the discs and starts the siphons, putting the sprinklers and condensers into operation. Decreased pressure stops the siphoning. The system requires neither sensing nor releasing devices other than the rupture discs and hence is presumably very reliable. 3 168 445. A. Ziegler, G. Peterson, Siemens-Schuckertwerke Aktiengesellschaft, Germany.

CHARGING MACHINE FOR REFUELING OPERATING REACTOR. A trolley-borne pressure vessel surrounded with biological shielding contains within it a mechanism for removing, replacing, and storing fuel elements and provision for water-cooling removed elements. 3 168 443, T. Lindheim, Allmanna Svenska Elektriska Aktiebolaget, Sweden.

SLIDE RULE FOR RADIATION CALCULATIONS. This device embodies curves and nomographs for facilitating various calculations involving thickness of biological shielding required for electromagnetic radiation. Utilizing a slide and cursor moving over a family of suitable curves, it is said to be superior to existing circular calculators. 3 162 363, Jean-Marie Lavie, Commissariat à L'Energie Atomique, France.

FISSILE-FERTILE FUEL ELEMENT. A fuel element containing a combination of fissile and fertile material is

claimed to reduce the ratio of peak flux density to average flux density and power level and to provide better conversion. Various combinations of ^{238}U and ^{232}Th with material that is fissionable by thermal neutrons are positioned in the same fuel element. Results highly superior to other means, such as "spiking", for achieving the same effect are claimed. Curves indicate almost constant relative power level across the reactor core and a higher excess reactivity (Δ K/K) for all exposures up to as high as 12 000 MWd/t. 3 147 191, R. L. Crowther, General Electric Company.

MULTIPLE COOLED FUEL ELEMENT. Improved heat-transfer and temperature conditions within a fuel element are obtained in a liquid-cooled power reactor by taking advantage of the different rates of heat generation in different portions of the core. Rather than throttling coolant supply to areas of low-heat generation and increasing it to those of high-heat generation, this arrangement utilizes a number of separate coolant supplies of different temperature. The coldest coolant goes to the highest-heat-generation area, and the hottest coolant to the area of lowest-heat generation. These may be cascaded, arranged in successive counterflow, or variously incorporated in plant-heat balance. Only the hottest coolant, which may be superheated steam, discharges to power-generating machinery. The coldest discharges may be used for heating purposes. 3 162 581, A. Brunner, Sulzer Freres, S. A., Switzerland.

MULTIPLE COOLED POWER REACTOR. The basic idea disclosed in the preceding patent is used by the same inventor to improve the thermal efficiency in a CO_2-cooled power reactor. Three or more areas having differing heat-generation rate in the core are supplied with CO_2 at temperatures inversely proportional to the heat-generation rate. From the reactor the gas goes to a multistage steam generator. High thermal efficiencies are claimed. 3 164 527, A. Brunner, Sulzer Freres, S. A., Switzerland.