advantage of this design, since it permits removal of the targets from the *PTP* tubes in the *HFIR* pool area, with subsequent transportation to the hot cell processing area using the same carrier which is currently in use. A special "carousel" unit is currently being installed in the *HFIR* pool for loading and unloading the *HT* targets from the the *PTP* units (Figure 4).

Examples of Reactor Production Pathways for Therapeutic Radioisotopes

Single Neutron Capture Production Pathway - Several useful therapeutic radioisotopes can be produced by this route (Tables 1). Rhenium-186 is a key example of a radioisotope of current interest which is produced by neutron capture of enriched rhenium-185. Although the neutron capture cross section is relatively high, very high specific activity rhenium-186 is required for antibody labeling, which may not be possible with many low flux reactors. However, low specific activity rhenium-186 can be used for preparation of phosphonates (Table 2) for palliative treatment of bone pain from cancer. Because of the high thermal neutron cross-section for the rhenium-185(n,γ)rhenium-186 reaction, *HFIR* irradiation of enriched rhenium-185 yields high specific activity rhenium-186. Typical production values for a one week irradiation in the *HFIR* are 13-15 Curies/mg rhenium-185. Samarium-153 is another example of a β^--emitting therapeutic radioisotope for bone pain palliation which can be produced in large amounts with high specific activity in even moderate flux reactors. One agent which is currently under development is the Sm-153-*EDTMP* phosphonate analogue. Palladium-103 can be reactor-produced by irradiation of enriched palladium-102 and represents a major radioactive implantation device for the treatment of prostatic carcinoma. Iodine-125 is manufactured and used for the same application.

Therapeutic Radioisotopes Available From Beta-Decay of Reactor-Produced Radioisotopes - Another useful approach which provides carrier-free radioisotopes for therapy is by "batch" chemical separation of the product formed by β^--decay of the reactor-produced parent. Examples produced *via* this route include silver-111, arsenic-77 and gold-199. Silver-111 is readily obtained by anion exchange chromatographic separation of palladium-111, and the 7.47 day half-life readily permits shipment to other sites. Silver can be complexed with functionalized tetraazaheterocycles for attachment to antibodies or other therapeutic agents. Arsenic-77 is readily separated from the germanium-77 reactor product and has chemistry similar to phosphorus, permitting preparation of arsonates and other potentially useful species. The last example, gold-199, has been of interest for many years and in carrier-free form can be attached to antibodies.