INFORMATION

EQUIPMENT FOR THE MANIPULATION UNIT
OF RADIOTHERAPY DEPARTMENTS

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In the modern medical radiotherapy department in which its sealed radioactive sources are used for the treatment of patients, an important stage in the general technology is work associated with the storage, preparation, processing, and transportation of these sources. This is the most laborious work in the department and associated with the risk of irradiation of the staff.

The problem of radiation protection of the staff of radiotherapy departments has received considerable attention from many investigators in the last two decades. Various types of special protective technological equipment have been designed [1, 2].

On the basis of research and analysis of experience gained with such equipment in use under practical conditions, the Medoborudovanie Research and Production Combine (RPC) has developed a radiological manipulation unit (RMU) for sealed radioactive sources, namely the model Ts1932 (Fig. 1) [1-5]. The unit facilitates work with sealed radioactive sources throughout the cycle of the technological process: reception, storage, preparation, processing, supply, return, analysis, and control of the movement of radioactive sources. It is intended for radiotherapy departments, both in the planning stage and in existence, built in accordance with the State Institute for Health Planning Research plans for 12, 18, and 30 active beds [5].

In its construction the RMU is a monoblock unitized system with two working sides: sterile (zone A), in which all the technological equipment for preparation, processing, and supply of the radioactive substances into the loading room is located, and clean (zone B), for receiving the radioactive preparations from the unloading room, dismantling them and processing them.

Fig. 1. General view of the RMU (from the zone B side).

To ensure the greatest convenience for the operator when controlling the components of the equipment, manipulating with sealed radioactive sources, and to enable maximal concentration of his attention actually during the work with these sources, the principal working place in each zone is organized in the central part of the front wall of the apparatus and is fitted with an inspection and observation system, remote-control instruments, regulating devices, switch-boards, and signalling systems, concentrated according to the grouped principle.

The external appearance of the equipment satisfies modern demands for such equipment. The external painting, based on a contrasting combination of dark and pale blue tones, enables the functional units of the system to be distinguished. Lead, steel, cast iron, and lead glass are used as protective materials. Local illumination of the working places is by means of luminescent and incandescent lamps.

**TECHNICAL SPECIFICATIONS**

Total activity of sources, not more than (in mg-eq radium):

<table>
<thead>
<tr>
<th>Component</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main safe</td>
<td>1200</td>
</tr>
<tr>
<td>Operating safe A</td>
<td>200</td>
</tr>
<tr>
<td>Operating safe B</td>
<td>200</td>
</tr>
<tr>
<td>Disinfection chamber</td>
<td>140</td>
</tr>
<tr>
<td>Sterilization chamber</td>
<td>120</td>
</tr>
<tr>
<td>Container for casts</td>
<td>100</td>
</tr>
<tr>
<td>Working container</td>
<td>40</td>
</tr>
<tr>
<td>Working table</td>
<td>40</td>
</tr>
</tbody>
</table>

Number of compartments in each operating safe: 6
Number of compartments in each chamber: 3

Force, N:
- For moving lid, turning turntable of main safe, bringing out containers from main safe, lifting working receptacles: ≤ 40
- Moving containers: ≤ 120

Speed of moving working containers along transportation system, m/sec: ≥ 0,3
Speed of moving cartridges along pneumatic delivery system, m/sec: 8–20

Power supply to apparatus from three-phase ac system:
- Voltage, V: 380/220
- Frequency, Hz: 50

Power consumption (without pneumatic delivery system), kW: 3

Dimension (without operating safes, walls, pneumatic delivery systems, and containers), mm: 1500 × 2000 × 1800

Weight of apparatus (without pneumatic delivery system), kg: 8000

The equipment is worked by a single operator. Due to the introduction of the operating safes A and B it is possible for unloading and loading in the treatment cabinets to be carried out parallel with work on the RMU.

The work process with the equipment consists of three principal stages: preparatory work, work with radioactive sources in zone A, and work with radioactive sources in zone B.

**Preparatory Work**

On the basis of a study of the currently assigned parameters for preparatory work in the radiotherapy department the operator draws a graph for obtaining the sealed radioactive sources from the main safe, for their preparation, assembly, and subsequent processing (sterilization and disinfection) in the chambers. The power supply to the apparatus is then connected, the local illumination system switched on, sets of tie-on labels, dummies, and so on are prepared, all the necessary manipulating instruments and devices, and the set of perforated receptacles are laid out on the working table, a set of working receptacles is loaded on the stage of the receiver of the operating safe B and into the compartments of the operating safe A, the presence of solutions and water in the appropriate chambers and compartments of the washing system is checked. The heater of the sterilizer is switched on.

**Work with Radioactive Sources in Zone A**

In accordance with the graph the necessary radioactive sources are obtained consecutively from the