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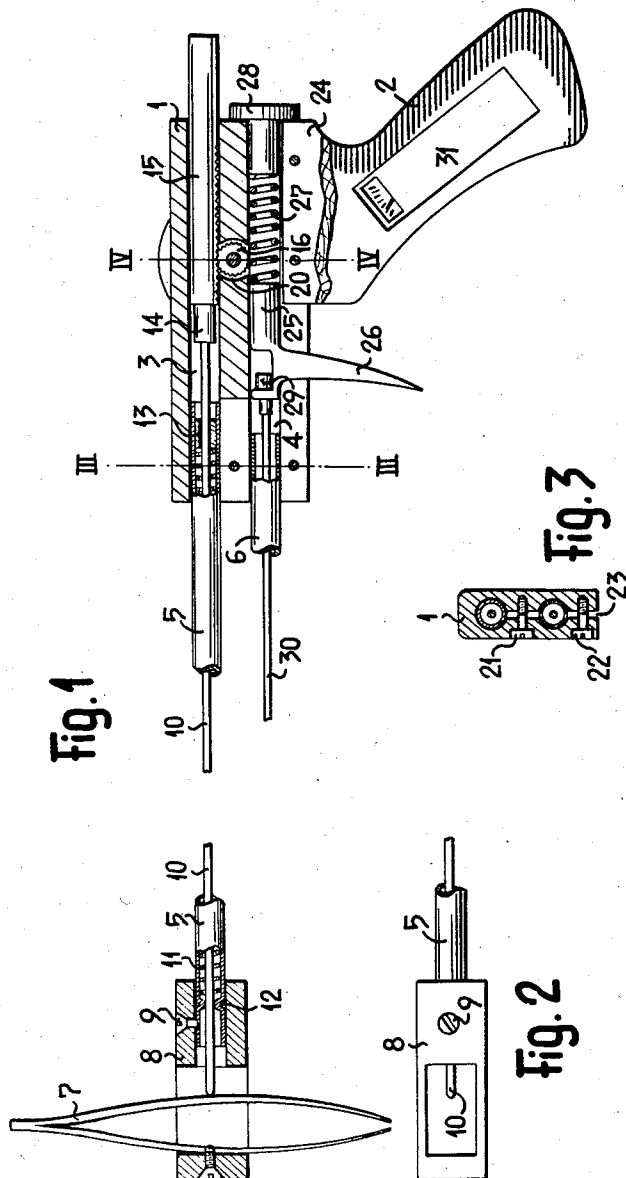
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APPARATUS FOR HANDLING RADIOACTIVE MATERIALS

Filed Aug. 3, 1956

2 Sheets-Sheet 1



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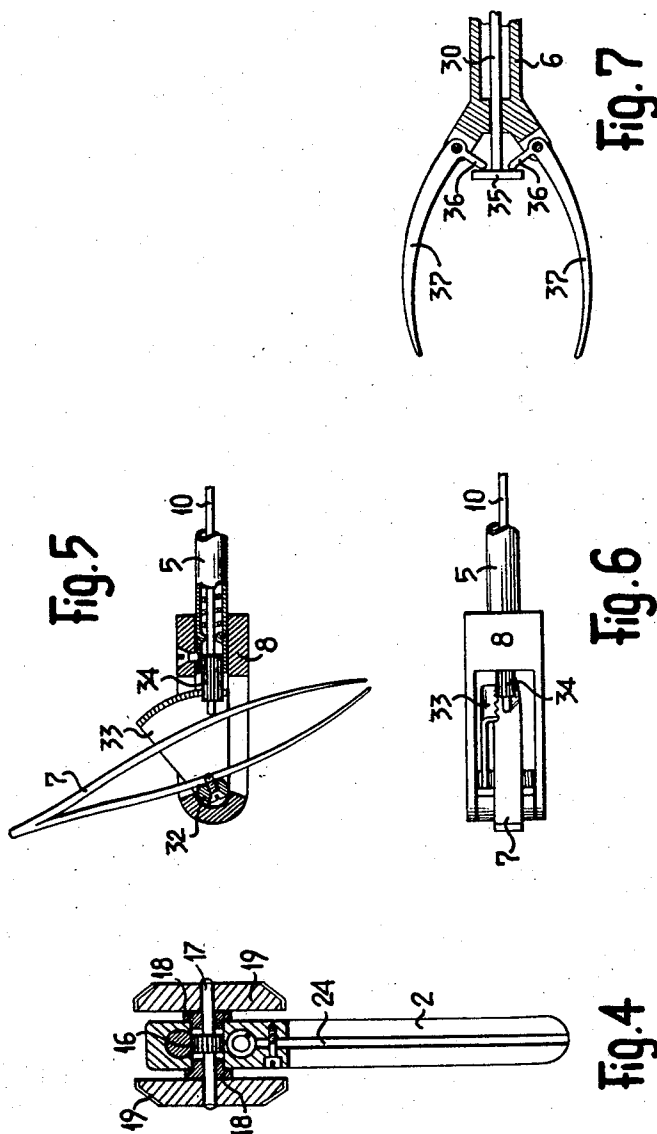
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APPARATUS FOR HANDLING RADIOACTIVE MATERIALS

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Claims priority, application Switzerland August 6, 1955

3 Claims. (Cl. 294—100)

This invention relates to remotely controlled apparatus for handling radioactive materials.

Presently known and available is remotely controlled apparatus for handling radioactive material comprising a connecting element carrying a working instrument at one end thereof for grabbing the radioactive material, an actuating member at the other end thereof for actuating said working instrument and a gripping means for holding said apparatus.

In using this apparatus, the working instrument contacts the radioactive materials or the containers therefor or the working instrument is exposed to the radioactive materials and thus becomes radioactive itself. Also, in many instances, the connecting element becomes radioactive, thereby requiring expensive and remote storage places and procedures therefor. Since this apparatus is expensive and since this apparatus is oftentimes used at various time periods and for various handling jobs, it is necessary to have at the disposal of the laboratory or radioactive material handling facility many pieces of such handling apparatus, thereby making for considerable expense.

The remotely controlled apparatus for handling radioactive materials of this invention comprises a device comprising a working instrument detachably connected to a connecting member which is in turn operatively associated with a handle member.

It is thus possible to provide the whole of a set of different instruments whilst having only a single handle available. It will be appreciated that the cost of said latter is of less importance, as a single handle suffices for the equipment of a laboratory. It is therefore possible to provide a more refined construction of said handle for the purpose of facilitating to the maximum the employment of said apparatus.

An object of this invention is to provide apparatus for handling radioactive materials which is remotely controlled and comprises a working instrument detachably connected to a connecting member operatively associated with a handle member.

Another object of this invention is to provide a remotely controlled apparatus for handling radioactive materials having in operative association therewith at its handle and at its working instrument portions, respectively, a radiation measuring instrument for detecting and measuring the strength of radioactive emanations from the radioactive material being handled.

Other objects and features of this invention will become apparent from the following detailed description which is set forth by way of example only and is not limiting in any way whatsoever.

Fig. 1 is a diagrammatic section of said apparatus.

Fig. 2 is a plan view of a part for connecting the instrument to the connecting element.

Figs. 3 and 4 are sections on the lines III—III and IV—IV respectively of Fig. 1.

Fig. 5 to 7 refer to different working instruments.

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The apparatus shown in Figure 1 comprises a handle 1 including the grip 2. Handle 1 has therethrough the longitudinally positioned cylindrical bores 3 and 4 in which are fixedly secured the respective ends of the two tubes 5 and 6, as clearly shown in Figure 1. Detachably secured about the end of tube 5, by means of tightening screw 9 is connecting member 8. The working instrument is in the shape of a spring clip 7 and is detachably secured to member 8 at one of its limbs, as clearly shown in Figures 1 and 2, by means of a screw member. The other limb of spring clip 7 is actuated by a rod 10 slidably positioned in tube 5. A spring 11 is positioned in tube 5, as clearly shown in Figure 1, and bears, at one end, against a deformed part 12 thereof, and at the other end, against a sleeve 13 secured to the rod 10 in such a manner as to act on the latter so as to maintain it in its extreme position.

The end of the rod 10 which is in the part 1 is formed by a cylindrical part 14. Said latter is applied against another cylindrical part 15 of which a portion forms a rack and is in engagement with a toothed pinion 16 which is secured to a transverse shaft 17 (Fig. 4). Said shaft turns in two sleeves 18 forming bearings and partly engaged in a transverse bore 20 of the part 1. At each end of the shaft 17 is secured a wheel 19 adapted to be actuated by the user. The outer face of the wheels 19 is conical and has radial grooves to avoid slipping of the finger of the user on its faces. In fact the position of said wheels relatively to the handle 2 is so provided that the user can control the rotation of one of the wheels by the lateral edge of the thumb. The securing of the wheels 19 to the shaft 17 may be ensured in different ways, for example by a radial screw or by a resilient clamping element. The sleeves 18 are held in the transverse bore 20 solely by the wheels 19, so that after removal of these it is easy to dismantle the shaft 17 and the sleeves 18.

The securing of the tubes 5 and 6 in the part 1 is obtained by deformation of the end of said part by means of two screws 21 and 22 as shown in Fig. 3. It will be seen that the part 1 is provided for this purpose with a vertical notch 23, for increasing its pliancy, said notch extending up to the rear portion of the part 1 so as to enable it to be secured to a metal plate 24 of the handle 2.

In the lower bore 4 of the part 1 is located a cylindrical part 25 having a portion 26 in the form of a trigger. Said part is subjected to the action of a spring 27 located in the bore 4 and bearing against a plug 28. The front portion of the part 25 is curved and forms a fork between the limbs of which can engage a part 29 forming the end of a rod 30 sliding in the tube 6. The end of said tube may carry various operating instruments, particularly that hereinafter described with reference to Fig. 7.

An instrument 31 for measuring radio-active radiations is provided in the handle 2 so as to enable the user to control, at any instant, the radio-active field to which it is subjected. Said instrument contains a semiconductor sensitive to radio-active radiations, a source of current constituted by a pile and a galvanometer said three elements being connected in series. The instrument may be provided with an electrical connection enabling connection of the pile and the galvanometer to an outer cell sensitive to radio-active radiations. This cell may, for example, be placed on one of the tubes 5 or 6 by means of an elastic clip for measuring the radio-active field at a point nearer to the source than the handle during manipulation. Preferably the instrument is provided with two dials located on one of the main sides opposed to the handle, so as to permit of easy read-

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ing even when the user holds the handle in the left or right hand.

Figs. 5 and 6 show a working instrument formed by a spring clip 7, which can be inclined more or less relatively to the connecting part 8. One of the limbs of said clip is secured to a part 32 which is hinged on the connecting part 8. Said part 32 carries a sector 33 of an edge toothed wheel, said sector being in engagement with a pinion 34 carried by the end of the sliding rod 10. When causing the latter to turn in the tube 5, the user can modify the inclination of the clamp 7 relatively to the tube 5 and by moving the rod 10 axially in the tube 5, he can produce the closing of the clamp by the action of the end of the rod on the free limb of said clamp. In this case the end of the tube 5 which is secured in the part 1 should be introduced sufficiently deeply into this so that the terminal part 14 of the rod 10 projects from the rear of the bore 3 and can be actuated directly by the user, the rack 15 being naturally removed. In this case, the axial movements of the rod can be produced by the action of the thumb of the hand which holds the handle 2, said thumb bearing against the rear face of the terminal part 14.

According to the type of working instrument used, it is more practical to control its actuation by producing the axial movement of the rod 10 directly by pressure with the thumb on the rear part thereof. It is possible to obtain the same result in the case of Fig. 1, by pressing with the thumb against the rear face of the rack 15. For reducing the inertia of said part in motion, it may be advantageous to remove the wheels 19 and the shaft 17 of the handle. However, when the axial movement of the rod 10 is to be capable of adjustment with great precision, it is more convenient to actuate it through the medium of the wheels 19, the pinion 16 and the rack. Said precise control is particularly useful when the operating instrument is formed by a pipette for sucking up liquids, the aspiration of the liquid in the pipette being effected by means of a piston secured to the end of the rod 10.

Fig. 7 shows another form of construction of a clamp adapted to be actuated by a pull of the sliding rod. Said clamp may advantageously be secured to the end of the tube 6 (Fig. 1) containing the rod 30 actuated by the part 26 in the form of a tumbler. The end of the rod 30 has a part 35 bearing against two fingers 36 secured to two movable jaws 37. Springs, not shown, are provided for maintaining said jaws 37 spaced from one another. It will be seen that a pull on the rod 30 results in tightening the jaws 37 against one another and said clamp may be used effectively for moving flasks containing radio-active materials. The handle may carry, at the same time as said clamp, another instrument secured to the end of the tube 5, for example a pipette, so that the operator can, without the necessity of changing the instrument, move the flasks and effect the transfer of their liquids.

I claim:

1. Remotely controlled apparatus for handling radioactive materials, comprising in combination, a handle member including a hand gripping member, said handle member having a first longitudinally positioned bore therethrough, a first tubular member positioned, at least one end thereof, in said first bore and projecting from said bore, a first rod member slideably positioned in said first tubular member and projecting from said first tubular member at the end thereof away from said handle member, a sleeve member slidably positioned in said first tubular member at one end thereof, said sleeve member being positioned about and fixedly secured to said first rod member, a shoulder member projecting inwardly from the inner wall of said first tubular member at the other end thereof away from said handle member, spring means positioned in said first tubular member and

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about said first rod member and between said shoulder and said sleeve member for urging said first rod member towards said handle, a connecting member detachably secured to and about said first tubular member at the end thereof away from said handle member, a first radioactive material holding working instrument member positioned in and detachably secured to said connecting member at one portion thereof and operatively associated with said first slideably positioned rod at the end thereof at another portion thereof, means for causing said first rod to slide in said first tubular member both against and away from said other portion of said first working instrument, said means being operatively associated with said handle member, said handle member having a second longitudinally positioned bore therethrough, said second bore having its longitudinal axis parallel to the longitudinal axis of said first bore, said first and second bores being spaced from each other, a second tubular member positioned, at least one end thereof, in said second bore and projecting from said second bore, a second rod member slideably positioned in said second tubular member and projecting from said second tubular member at the end thereof away from said handle member, means for tightening said first and second tubular member in each of said bores, respectively, a cylindrical member positioned in said second bore, spring means for urging said cylindrical member away from said handle, said spring means being positioned in said second bore and abutting one end of said cylindrical member, thereby rendering said cylindrical member spring-loaded, said cylindrical member being operatively attached to said second rod at its other end thereof with said second bore, a trigger means operatively connected to said cylindrical member for actuating said spring-loaded cylindrical member and said second rod attached to said cylindrical member, whereby said second rod is caused to move in said second tubular member and said second bore, and a second radioactive material holding working instrument member operatively associated with and detachably secured to said second rod at the end thereof projecting from said second tubular member, whereby each of said working instrument members may be each remotely manipulated and may be each replaced by another working instrument member.

2. Remotely controlled apparatus for handling radioactive materials, comprising, in combination, a handle member including a hand gripping member, said handle having at least one longitudinally positioned bore therethrough, a tubular member positioned, at least one end thereof, in said bore and projecting from said bore, a rod member slidably positioned in said tubular member and projecting from said tubular member at the end thereof away from said handle member, a sleeve member slidably positioned in said tubular member at one end thereof, said sleeve member being positioned about and fixedly secured to said rod member, a shoulder member projecting inwardly from the inner wall of said tubular member at the other end thereof away from said handle member, spring means positioned in said tubular member and about said rod member and between said shoulder and said sleeve member for urging said rod member towards said handle, means for tightening said tubular member in said bore, a connecting member detachably secured to and about said tubular member at the end thereof away from said handle member, a radioactive material holding working instrument member positioned in and detachably secured to said connecting member at one portion thereof and operatively associated with said slideably positioned rod at the end thereof at another portion thereof, said handle having another bore therethrough, the axis of said other bore being on a plane perpendicular to the plane of the axis of said longitudinally positioned bore, two spaced sleeve members positioned in said other bore at each respective end portion thereof, a shaft member positioned in said other bore and

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said sleeve members having the ends thereof projecting from said bore and through each of the respective sleeve members, a pinion member fixedly secured on a portion of said shaft between said sleeve members, a rack member operatively attached to said slideably positioned rod member within said longitudinally positioned bore, said rack member projecting out of said longitudinally positioned bore at the rear end of said handle, said pinion member being in mesh with said rack member, and wheel members each fixedly secured to said shaft member at the respective ends thereof from said other bore and through the respective sleeve members, each of said wheel members having a radially fluted face, whereby said working instrument member may be alternately remotely manipulated by actuating said wheel members and by manually actuating said rack member at its projecting end and whereby said working instrument member may be replaced by another working instrument member.

3. Remotely controlled apparatus for handling radioactive materials, comprising, in combination, a handle member including a hand gripping member, said handle member having at least one longitudinally positioned bore therethrough, a tubular member positioned, at at least one end thereof, in said bore and projecting from said bore, a rod member slideably positioned in said tubular member and projecting from said tubular member at one end thereof away from said handle member, a sleeve member slidably positioned in said tubular member at one end thereof, said sleeve member being positioned about and fixedly secured to said rod member, a shoulder member projecting inwardly from the inner wall of said tubular member at other end thereof away from said handle member, spring means positioned in said tubular member and about said rod member and between said shoulder and said sleeve member for urging said rod member towards said handle, thereby to render said rod spring-loaded, a rod-manipulating member rotatably and slideably positioned in said bore and projecting from said bore at the end thereof opposite to the end at which said tubular member projects from said bore, said rod manipulating member being operatively connected to said slideably positioned rod at the end thereof within said bore, means for tightening said tubular member in said bore, a connecting member detachably secured to

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and about said tubular member at the end thereof away from said handle member, said connecting member having at its end portion away from the projecting portion of said spring-loaded slideably positioned rod and there-within a socket-shaped portion, said slideably positioned spring-loaded rod having a pinion member fixedly secured thereto at its end projecting portion, a ball member operatively associated with said socket-shaped portion, a sector member operatively associated with said ball member, said sector member having a toothed portion in mesh with said pinion member, a spring-clip radioactive material holding member positioned in said connecting member, said spring-clip member having at least two limbs, at least one of said limbs being detachably secured to said ball member and at least another of said spring-clip member being in operative and movable association with the end of said slideably positioned rod member, whereby said holding member may be simultaneously remotely manipulated angularly and longitudinally.

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