pulse appearing at the terminals 427 and 432 of plug 4 will cause a momentary movement of the pen 164 indicating that a container has been filled and an empty one put in its place.

SUMMARY

Figure 20 illustrates schematically the entire mechanism described in the foregoing paragraphs and illustrated in detail in the other figures of the drawings. In view of the complexity of the several parts, Figure 20 is believed helpful and desirable to summarize the entire disclosure and operation of the instrument 10. However, since said parts are believed to have been fully described herein, further specific reference to Figure 20 is believed unnecessary.

The operation of the apparatus, both mechanical and electrical, will now be summarized. Assuming that insufficient amounts of solute are being dissolved by a solvent passing through the fractionating column at the beginning of operation of the instrument 10, but that the product is being collected in a container, the comparator circuit will not be activated. Under these circumstances, the turntable is motionless; the fluid control mechanism is activated; the step relay is ready for operation, but is unactivated; the relay 454 is energized and holding the switch 453 in the circuit; and the step relay 455 is unenergized, but ready for operation. When the container is filled, the fill-control circuit will close the contacts 265 (Figure 16) and, through the circuit 406 (Figure 18), actuate the clutch solenoid 62 to turn the table 11 to place the succeeding, empty container 12 under the fractionating column. Simultaneously a pulse is delivered to the winding of the step relay 451 and its several arms each move to the first terminal of each respective bank therein.

Assuming that the multiple switches 452 and 453 are set at a point beyond the first terminal, such as the respective points shown in Figure 18, nothing further will happen, and a second container will be filled in the same manner as the first. According to the setting of the switch 453 in Figure 18, four of such containers will be filled even though said solvent is dissolving in sufficient amounts of solute to close the contact 664 in the relay 643 of the comparator circuit. Upon the filling of the fourth container the step relay will effect the following operations: make a contact through switch 453 and relay 454 to activate step relay 455 and move bank B thereof from the first terminal to the next adjacent terminal and thus effect a change in solvent introduced into the fractionating column 15; energize the reset relay 456, also through switch 453, by which the step relay 451 is returned to zero; supply an impulse to the recorder 163 to record the fact that the next solvent is now being used; the position of the relay 454 will be unchanged. If the step relay again goes through four positions without enough solute being dissolved by the new solvent to actuate the comparator circuit, the above described operation will be repeated. However, if sufficient solute is dissolved this time to actuate the comparator circuit, the following will occur: the relay 450 will operate and break the circuit to the winding of the step relay 451, thus terminating the counting function; energizing of the turntable starting circuit 406 through relays 514 and 531 to bring the next container into filling position; the circuit to the relay 454 will also open thus de-energizing this relay and taking the multiple switch 453 out of the circuit and placing the multiple switch 452 into the circuit. This condition will continue for so long as the comparator circuit is activated, although each time that a container is filled the fill-control circuit, including the turntable solenoid 62 and the portion of the recorder responsive thereto, will each be independently operated.

When a band of solute is completed and the concentration of solute in the solution falls below the predetermined minimum, the contact 664 of relay 643 in the comparator circuit will open and the following changes will occur: the relay 450 will be de-energized and will return to a position shown in Figure 18; the turntable will bring a new container into filling position; the winding of the step relay 451 will be energized and will again commence counting the containers filled with the product of the column 15; the relay 454 (Figure 18) will remain de-energized and the multiple switch 452 will remain in the circuit. As soon as the number of containers, determined by the multiple switch 452, has been filled with solution having less than the predetermined amount of solute therein, a connection will then be made through the switch 452 and the relay 454 to the relay 455 for again changing the solvent, and simultaneously another connection will be made by the relay 456 for returning the step relay 451 to zero position, and, lastly, a pulse will be conducted to the recorder 163 for indicating visually another change in solvents. The cycle will then repeat, and it will continue to do so, for as long as the operator desires. If it is desired to supply a larger number of solvents to the apparatus then there are connections on bank B of step relay 455, it will be necessary to return this relay to zero and replace the first group of solvents in the respective receptacles 141 with the next appropriate group.

CONCLUSION

It will be understood that the certain parts herein described, both the mechanical portions thereof and the electrical circuits utilized, are matters of choice and that they may be widely substituted by other equally well known elements. Such substitutions are contemplated within the scope of this invention and, unless they are specifically excluded from the scope of the hereinafter appended claims, they are to be considered as included within the meaning thereof.

We claim:

1. The method of carrying out a chromatographic fractionating operation employing a series of solvents in conjunction with a column, comprising the steps: withdrawing solution from a fractionating column; passing through said solution a beam of radiant energy of a character capable of being physically affected by a selected material expected to be in said solution; measuring the magnitude by which said beam is affected thereby and utilizing the affecting of said beam for changing solvents when said magnitude changes beyond a predetermined value.

2. In a device for separating a mixture of soluble materials, the combination comprising: a fractionating column having an inlet port and an outlet port; a plurality of containers providing independent sources of a plurality of solvents and means including valves for selectively conducting one of said solvents to the inlet port of said fractionating column; first opto-electric means including a conduit connected to the outlet port of said fractionating column for generating an electric potential variable proportionally