Sept. 2, 1958

D. PRICE

2,850,634

CALUTRON STRUCTURE

Filed Aug. 8, 1945

2 Sheets-Sheet 1

FIG. 1.

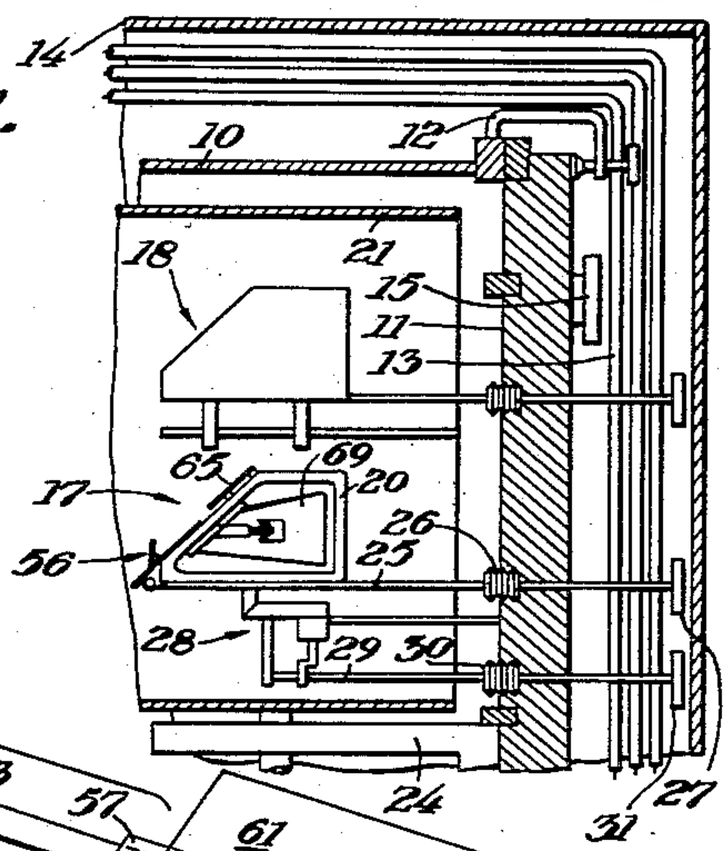

FIG. 3.

FIG. 4.

INVENTOR.
David Price.

BY

Robert G. Sarmade

Sept. 2, 1958

D. PRICE

2,850,634

CALUTRON STRUCTURE

Filed Aug. 8, 1945

2 Sheets-Sheet 2

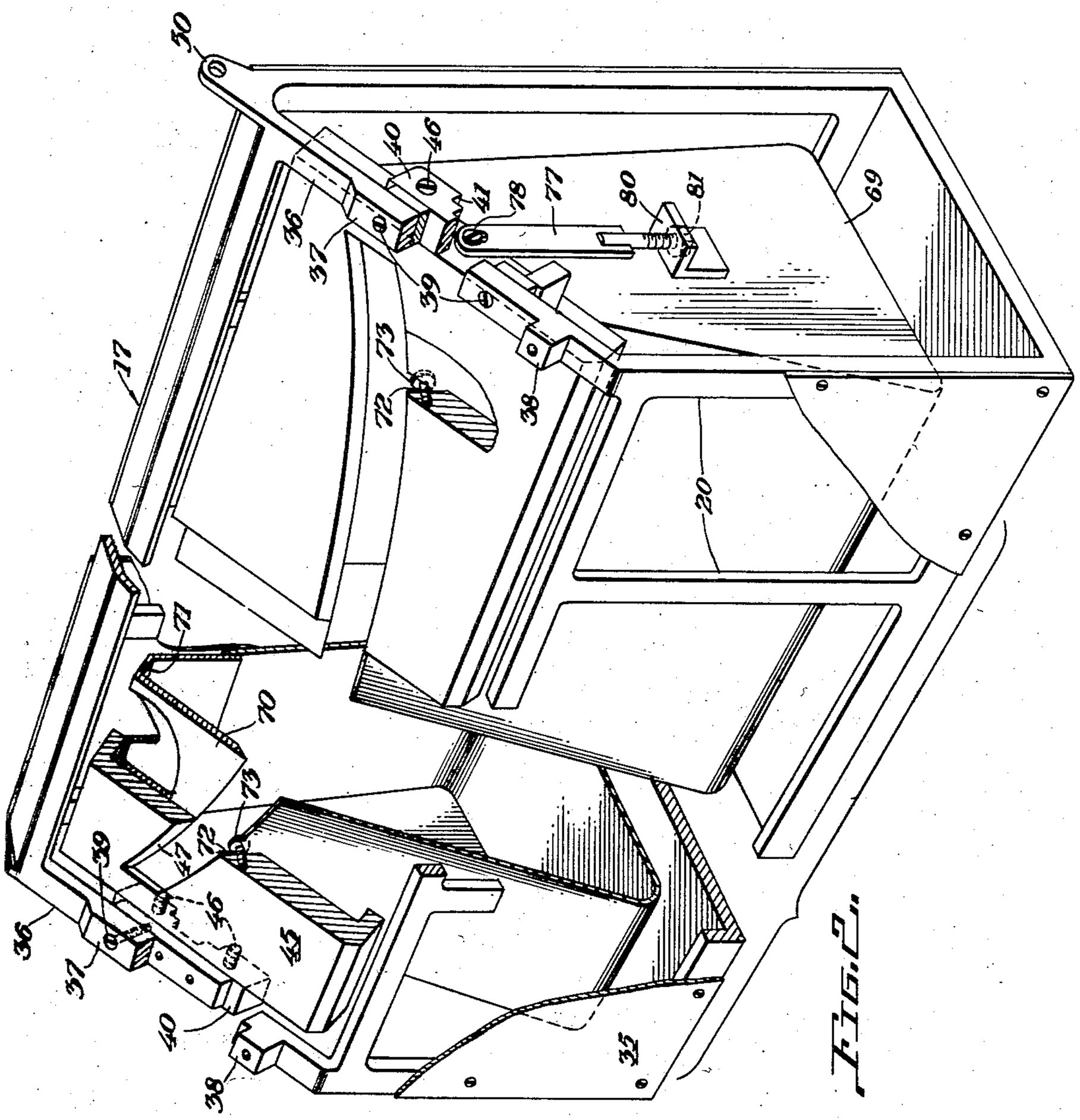

FIG. 2.

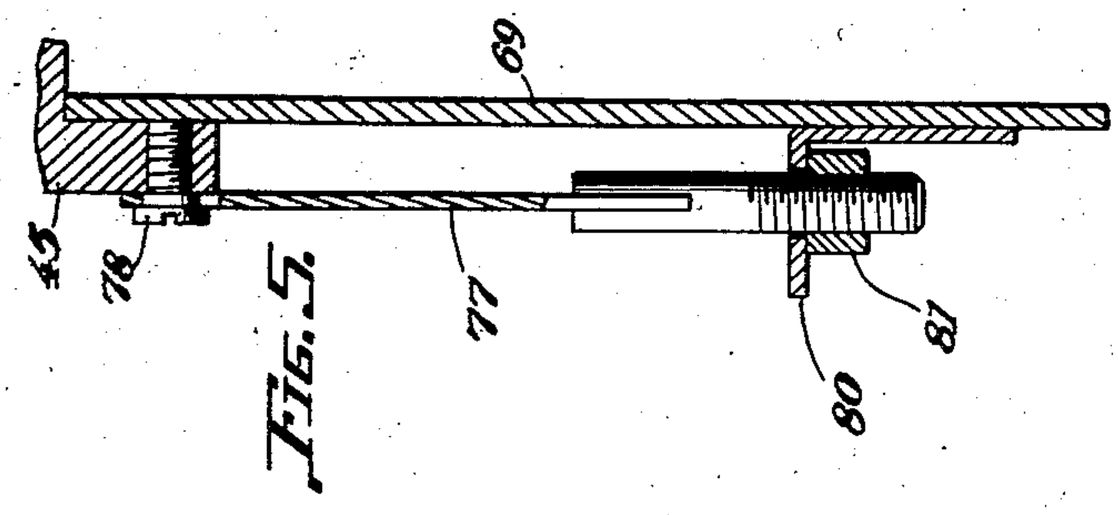

FIG. 5.

INVENTOR.
David Price.
BY
Robert G. Sarmeke

United States Patent Office

2,850,634

Patented Sept. 2, 1958

2,850,634

CALUTRON STRUCTURE

David Price, Knoxville, Tenn., assignor, by mesne assignments, to the United States of America as represented by the United States Atomic Energy Commission

Application August 8, 1945, Serial No. 609,581

1 Claim. (Cl. 250—41.9)

This invention relates to an improvement in a calutron and particularly to an improved means for removably installing and supporting a collector pocket in the calutron.

A calutron is the type of electro-magnetic isotope separating apparatus disclosed in detail in the earlier application of Ernest O. Lawrence, Serial No. 557,784, filed October 9, 1944, now U. S. Patent No. 2,709,222 granted May 24, 1955. In this apparatus one of the desired isotopes is received and collected in a removable container or pocket, the desired isotope being recoverable from the deposit formed in the pocket. The pocket is removed and treated chemically after each run or intermittent period of operation and then reinstalled in the apparatus.

One of the objects of my invention is to provide means for effecting installation of the pocket in an easy and time-saving manner and similarly providing for quick and easy removal thereof. The pocket is located in a rather confined space within the apparatus and when a large number of calutron units are operated, overall plant efficiency is considerably improved by reducing to a minimum the time required of personnel in installing and removing collector pockets. Any time saved in this way may also contribute to getting the calutron units back into operation sooner than otherwise.

Another object of the invention is to provide supporting means for a calutron collector pocket consisting of one or more suspension bolts engageable with the pocket at a point intermediate the top and bottom thereof, and having a nut or nuts so arranged that by turning up on the nut or nuts the pocket is lifted up to and suspended in the desired predetermined position.

Another object is to provide an arrangement, as in the previous object, wherein the suspension bolts are pivoted and engage brackets on the calutron pocket so that it can conveniently be hung therein and then lifted into position by turning up on the nuts.

Another object is to provide means at the upper part of the pocket and on the supporting structure mutually engageable to predetermine the position of the pocket.

Further objects and the manner in which they are achieved and numerous of the advantages of my invention will become apparent from the following detailed description and annexed drawing wherein:

Fig. 1 is a cross-sectional view of one corner of a calutron broken away therefrom and showing the receiver structure in which my invention is embodied.

Fig. 2 is a perspective view of the main portion of the receiver structure embodying my invention, some of the parts being partly broken away and with part of the upper overlying structure removed.

Fig. 3 is a perspective view similar to that of Fig. 2 but only of the upper part of the receiver structure and showing the overlying parts which are not shown in Fig. 2.

Fig. 4 is an end view of the collector pocket showing my invention associated therewith.

Fig. 5 is a detail view taken along line 5—5 of Fig. 4.

Referring to Fig. 1 of the drawings, there is shown one corner, broken away, of an isotope separating apparatus of the electro-magnetic type known as a calutron and as disclosed in detail in the application of Lawrence referred to above. This particular form of apparatus is also disclosed in detail in the earlier application of Hugh G. Neil, Ser. No. 573,615, filed January 19, 1945.

My invention is concerned with the receiver structure which is in the part of the appartus shown in Fig. 1. In Fig. 1, numeral 10 designates a tank which is evacuated to a relatively high degree of vacuum. One side of the tank is closed by a relatively heavy face plate 11 having a window 15, the face plate being secured to the tank by screw clamps as shown at 12, the tank and clamps having mutually engageable surfaces which produce a vacuum seal between the tank and face plate. Numeral 13 designates coil windings which, in conjunction with iron cores or pole pieces (not shown) produce a relatively strong magnetic field which is in a direction normal to the paper in Fig. 1. The windings 13 are within a housing 14. The apparatus of Fig. 1, as disclosed in the earlier application of Hugh G. Neil, embodies two ion sources from which two beams of ions are emitted and which are bent into arcs of a circle by the magnetic field, the desired isotopes of the ionized particles being received in receivers 17 and 18. Receiver 17 is shown in more detail, and the ensuing description will apply to it. The receiver 17 embodies a rectilinear enclosure frame 20, which is adjustably supported within the end of a liner 21 in tank 10, which liner is in the form of an arcuate duct and through which the beams of ions travel. The liner 21 is supported in part by structures as shown at 24. The frame enclosure 20 may be adjusted laterally by linkages 28 and stem 29 which passes through a suitable sealing device 30 and which has an operating handle 31 outside of tank 10. The adjustments are for the purpose of properly adjusting the receiver relative to the ion beam.

Receiver 17 is shown in greater detail in Figs. 2, 3, and 4, and reference is now made more particularly to these figures. As shown in Fig. 2, the frame enclosure 20 has a slanting upper part, is open at the ends, and may have sheet metal side plates as shown at 35 attached by screws. The frame structure 20 has slanting members 36 at its upper part, and these members have raised portions 37 including raised bosses 38. Attached to the under side of the members 36 by means of screws 39 are oblong members 40 which are made of Lavite, this being an insulating material. The under sides of members 40 are channelled out, as may be seen at 41 on Figs. 2 and 3, for a purpose which will presently be made clear. Numeral 45 designates a metal plate having inwardly extending flanges at its sides and ends, this plate being supported by means of screws 46 which extend inwardly transversely through the members 40. The plate 45 has an arcuate slot in it designated by numeral 47, and as may be seen on Figs. 2 and 3, the plate 45 is thicker on the convex side of the slot and the edge of the plate 45 defining the convex side of the slot has a slant as may be seen on the figures. Further reference will presently be made to the plate 45 and the arcuate slot 47.

Reference is now made more particularly to Fig. 3 in connection with the structure of receiver 17 which overlies the structure which has just been described primarily in connection with Fig. 2. As may be seen on Fig. 3, at the higher upper portion of frame structure 20 there are ears or brackets 50 having apertures in which is journalled a shaft 51 extending transversely of the structure 20. The shaft 51 has thereon a bevel gear

52 which meshes with another bevel gear 53 on the end of stem 25 so that by turning the stem 25 shaft 51 is rotated for a purpose which will presently become clear. Stem 25 passes through face plate 11, by way of a sealing device 26, and terminates in an operating handle 27, as shown in Fig. 1. The shaft 51 actuates a shutter which is designated generally by numeral 56. The shutter mechanism includes a frame designated by numeral 57 which has angular ears or brackets 58 which attach to the ends of shaft 51. The shutter mechanism includes carbon plates 60, 61, and a slanting carbon baffle plate 62, all of which are attached to the frame 57 by suitable means. The carbon plate 60 has a curved side as shown on Fig. 3, the curvature corresponds to the curvature of the arcuate slot 47 in plate 45 and the plate 60 overlying the slot 47 when the shutter 56 is in the closed position, that is, the position as shown in Figs. 1 and 3. Numeral 63 designates another carbon plate which is attached to the frame structure 20 and which overlies the plate 47 and which also has a curved side, the curvature of which conforms to the curvature of slot 47, but the plate 63 does not overlie the slot 47 as may be seen on Fig. 3. Numeral 64 designates another carbon member which is attached by screws to the plate 45, and as may be seen on Fig. 3, it has a raised portion or rather a thicker portion which is curved, the curvature corresponding to the curvature of slot 47, and this portion of member 64 partly overlies the slot 47 as may be seen on Fig. 3. Numeral 65 designates another carbon plate which is attached by screws 66 to the raised bosses 38 at the upper part of frame structure 20. Plate 65 has a curved side, that is, a concave side which lies adjacent the convex side of shutter 56 when the shutter is closed, the plate 65 overlying the carbon member 64. On the underside of plate 65 are alternate grooves and raised portions which serve to trap separated isotopic particles which are received in the receiver 17 and which impinge on the raised or thicker portion of member 64. When the shutter 56 is open, another one of the separated isotopes is received in the arcuate slot 47 and is collected in the collector pocket which is about to be described.

Referring to Fig. 2 again, the collector pocket is designated by the numeral 69, and its general shape and conformation can be seen on this figure. It is generally rectilinear, its sides tapering upwardly, one side, however, being curved as may be seen on Fig. 4, the curvature conforming to the contour of the arcuate slot 47. The pocket 69 has a slanting top portion 70 so that between the edge of this portion and the edge of the curved side of the pocket there is formed a slot which is of substantially the same shape and size as the slot 47 and registers with it when the pocket is in assembled position as shown in Fig. 2. The pocket 69 has another slanting portion 71 at its upper part so that the conformation at the upper part of the pocket is such that it conforms to the shape of plate 45 and one of its inwardly extending flanges so that the parts fit together nicely. At the top of the curved side of the pocket 69 are slots 72 which engage with screws 73 which extend outwardly from the slanting edge of that part of plate 45 which defines the concave side of slot 47. Thus the slots at the upper part of pocket 69, and the screws which they engage, and the conformation otherwise at the upper part of pocket 69 define and predetermine its position when it is assembled for receiving material in the frame structure 20 as shown on Fig. 2.

The pocket 69 is suspended or supported in receiving position by suspension members or bolts 77 which are carried at their upper ends on screws 78 extending outwardly from the ends of plate 45 in the channels in the members 40 previously described. (See Figs. 2 and 5.) The members 77 engage rather loosely on the screws 78 so as to be operable to swing thereabout. The members 77 have screw threaded portions at their lower

ends which engage with ears or angle brackets 80 on the ends of pocket 69 at an intermediate point between the top and bottom of the pocket. The screw threaded portions of members 77 have nuts 81 thereon which engage with the brackets 80 for holding the pocket in position.

From the foregoing it can be seen that to remove the pocket 69 from the frame structure 20, that is, from the isotope separating apparatus in order to remove and recover the isotopic material collected therein, the nuts 81 are removed from the members 77 and the pocket is allowed to drop down slightly within the frame structure 20 after which it can be removed manually endwise from the frame structure 20, the members 77 being swung to the side to facilitate removal. It will be understood that, prior to the removal of the pocket 69 from the frame structure 20 in the manner just described, the entire face plate structure 11 of Fig. 1 of the separating apparatus is removed and is supported in a position in which the face plate is horizontal, the receiver 17 then being in an upright position. The parts are in the position shown in Fig. 1 during operation.

To reassemble or reinstall the pocket it is slipped endwise into the frame structure 20, the members 77 being swung to the side as before to permit this, and the pocket is then hung or suspended from the members 77 by the brackets 80 and nuts 81. By then merely turning up on the nuts 81 the pocket is lifted up into position wherein the opening in its upper part registers with the arcuate slot 47. The structure previously described at the upper part of the pocket defines and predetermines the position of the pocket 69 within the structure 20 without the necessity of servicing personnel having to perform any manual operations in the vicinity of the upper part of the pocket. Such operations would require a considerable degree of manual dexterity in view of the confined nature of the structure and the interference which would be presented by the overlying structure described in connection with Fig. 3.

From the foregoing it will be observed by those skilled in the art that I have provided arrangements and means whereby collector pockets can be quickly and efficiently installed and removed in a minimum of time and by relatively unskilled service personnel. The mechanism provided to achieve this purpose is very simple and rugged in nature.

The form of my invention which I have disclosed herein is representative of the preferred embodiment, and it is intended that the disclosure be interpreted in an illustrative rather than a limiting sense and that the invention be limited only in accordance with the scope of the claim appended hereto.

I claim:

In apparatus of the character described, in combination, means forming an elongated container having an opening in its top, means forming an enclosure open at its ends fitting relatively closely around said container and having an opening in its top registering with said first mentioned opening, means forming suspension members at the ends of said enclosure, brackets on the ends of said container engageable by said suspension members, said brackets being substantially midway between the top and bottom of the container, said suspension members being pivoted at their upper ends whereby they may be swung out of the way to facilitate insertion of the container in the enclosure and removal therefrom, and said container and enclosure having mutually engageable means at their upper parts to predetermine the position of the container in said enclosure and to cause said openings to register with each other.

References Cited in the file of this patent

UNITED STATES PATENTS

130,931	Moore	Aug. 27, 1872
350,581	Cutler	Oct. 12, 1886