The present invention broadly relates to electroplating apparatus and more particularly to an improved box-type plating rack which is particularly adapted for plating a lining on the inner semi-cylindrical surfaces of semi-cylindrical articles such as precision bearings and the like.

While the plating rack comprising the present invention is applicable for applying a substantially uniform plating on any one of a variety of articles having a semi-cylindrical surface, its construction and operating advantages as herein described are particularly directed to its use in conjunction with the plating of a lining on the inner surfaces of precision shell-type bearing housings. Bearing racks of the general type to which the present invention is applicable are in widespread use in industry, and particularly the bearing industry, for providing a precision plating or over-plate on the inner surfaces of shell bearings. Box-type plating racks of this type comprise a substantially liquid type enclosure having one of its side panels provided with a longitudinally extending slot there-through which is disposed in communication with the inner cylindrical surfaces of a plurality of stacked half bearings positioned with their parting edges disposed in abutting contact against the inner surface of the panel.

As a result of the increased use of automatic electroplating machines and conveyor apparatuses for transferring the loaded plating racks through the processing sequence, improvements have correspondingly been made in loading and unloading fixtures effecting thereby a rapid loading and unloading of the bearing halves from the rack. Various devices have heretofore been employed for holding the stacked column of bearings firmly against the inner surface of the face panel during the movement of the plating rack through each of a plurality of treating stations. To facilitate loading and unloading of the bearings, it has been found most desirable to employ an end holding shoe for clamping the stacked column of bearings in place against the inner surface of the face panel in lieu of alternative methods requiring elaborate springs, clamping rods, and the like. The desirability of advancing the work racks as rapidly as possible through the treating stations in combination with the holding characteristics provided by such end holding shoe clamping devices has in some instances occasioned a collapse of the stacked column of bearings in the rack resulting in improper treatment therefrom and in some instances requiring the bearings to be scrapped. The collapse of the stacked column of bearings in the rack is due to the hydrostatic pressure of the treating liquid or electrolyte entering the slot in the face panel of the rack and exerting an inward force against the rearwardly unsupported bearing column. Due to the substantially liquid type integrity of the box rack necessitated by the avoidance of any significant plating on the back or outer cylindrical surfaces of the bearings, a substantially longer time period is required to fill the back compartment of the box rack rearwardly of the bearings with liquid to exert an equal and opposite hydrostatic pressure in opposition to that exerted through the slot in the face panel.

In addition to the foregoing problem it has been found that the box racks have a tendency to float or resist immersion in a liquid treating solution during the rapid downward movement of the rack above the treating receptacle. This, in some instances, has a tendency of dislodging the rack from the movable supporting rail or deflects its entry angle so that it might strike other components in the plating tank such as the anodes, heaters, thermostats, etc. The difficulty of liquid entering the rearward compartment of the plating rack results in further disadvantages due to excessive solution drag-out from one treating receptacle and drag-in into the next adjoining receptacle effecting a progressive contamination of the relatively expensive solutions impairing treating results and requiring more frequent replenishment or change. To reduce this drag-out and drag-in problem, drainage time periods of the plating rack have been increased which has resulted in an undesirable increase in the total processing time with a corresponding reduction in the efficiency of the process. The poor drainage characteristics of such box racks of the types heretofore known has also interfered with the proper rinsing of the treated parts detracting from the quality of the resultant coatings formed.

Attempts to overcome the foregoing problems by providing drainage ports in the rearward or base panels comprising the box enclosure has been unsatisfactory due to the excessive migration of ions to the rearward chamber of the rack during an electroplating operation resulting in an undesirable degree of metal deposition on the rear surfaces of the articles which in the case of bearings, interferes with their close precision fit in the bearing retainers.

It is accordingly a principal object of the present invention to provide an improved box-type plating rack which overcomes the problems and disadvantages present in box-type plating racks of similar type heretofore known.

Another object of the present invention is to provide an improved box-type plating rack incorporating valve means therein which enable rapid fillup and drainage of liquid from the rear compartment of the box rack while preventing the migration of ions to the rear surfaces of the articles being treated thereby preventing the deposition of an undesirable plating on the rear surfaces thereof.

Still another object of the present invention is to provide an improved box-type plating rack which incorporates valve means therein comprising for rapid fillup and draining of the rear compartment of the rack enabling its use in high speed automatic processing equipment without encountering any of the difficulties present in box-type plating racks of similar type heretofore known.

A further object of the present invention is to provide an improved box-type plating rack which is of simple design, of durable construction, of reliable operation, of simple and quick loading and unloading, and of economical manufacture.

The foregoing and other objects and advantages of the present invention are achieved by providing a box-type plating rack comprising a three dimensional enclosure including a face panel having a longitudinally extending slot therealong against the rearward surface of which a stacked column of bearings are adapted to be disposed with their parting edges in abutting relationship thereagainst. The bottom panel or lower portion of the enclosure is provided with valve means operable to open communication with the interior of the enclosure rearwardly of the bearings for permitting liquid to flow inwardly and outwardly therethrough during immersion and withdrawal, respectively, of the rack from a treating liquid and for closing communication with the interior of said enclosure when the rack is immersed in the liquid at a constant level.

Other objects, features, and advantages of the present invention will become apparent from the subsequent de-
scription, taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a fragmentary side elevation view partly in section of a box-type plating rack constructed in accordance with the preferred embodiments of the present invention;

FIG. 2 is a fragmentary front elevational view of the box-type rack shown in FIGURE 1;

FIG. 3 is a perspective view of the upper surface of the box rack illustrating the configuration thereof and the disposition of parts there-through; and

FIG. 4 is a fragmentary transverse sectional view of the lower end portion of the plating rack shown in FIGURE 1 and taken along the line 4—4 thereof.

Referring now in detail to the drawings, the box-type plating rack comprising the present invention includes an enclosure consisting of a pair of side panels 10, a face panel 12, a rear panel 14, and a bottom panel or base 16 which are arranged and secured together along their edges forming a three-dimensional enclosure which is open at the upper end thereof. The several panels comprising the enclosure are of a nonconductive material and may suitably be fabricated from any one of a number of materials including synthetic and natural rubber, synthetic resins, and the like. Alternatively, the panels can be constructed from metallic sheet stock having a durable nonconductive insulating coating over the surfaces thereof. Preferably, the panels comprise synthetic resin materials such as phenol-aldehyde resins, polymethyl methacrylate resins, polyolefin resins, and the like, which may be suitably reinforced or laminated with nonconductive reinforcing materials to provide the requisite strength.

The entire enclosure is affixed to and supported at its upper end by a supporting and clamping assembly comprising an integral bronze casting consisting of an angle member 18 affixed to the upper end of the face panel 12 from which a clamp frame or arm 20 extends and is formed at its upper end with a conical head 22 which is adapted to be disposed in a seated position in a corresponding contoured bore 24 of a work carrier arm 26 mounted on a suitable automatic conveying apparatus (not shown). The provision of the conical head 22 on the clamp frame 20 enables the work rack to be simply removed from or loaded on the conveying apparatus at the completion of or the initiation of a treating sequence.

The conical head 22 is simply disengaged from the conical bore 24 by raising the work rack and supporting and clamping assembly upwardly and sliding the reduced neck portion 28 of the clamp frame 20 outwardly through a slot 30 in the flange 32 defining the conical bore 24. Suitable latching means can be provided for restricting relative vertical movement between the conical head and bore 24 when the rack is loaded on the machine. In addition, the flange 32 as shown in the drawings, is preferably provided with a pair of inwardly projecting pins 34 which are adapted to engage suitable longitudinally extending slots 36 in the periphery of the conical head 22 so as to prevent relative rotation of the rack when seated in the work carrier arm 26.

The supporting and clamping assembly on the work rack is provided with a resiliently biased clamping mechanism for clamping a stacked column of semi-circular articles such as bearings 38 between the inner surface of the bottom panel 16 and the lower end of the clamping mechanism. The clamping mechanism as shown in FIGURES 1 and 2 comprises a tubular sleeve 40 which is slidably disposed in a bore 42 extending axially through the conical head 22 and neck portion 28 along its upper end and in a bore 44 disposed in axial alignment with the bore 42 extending through the horizontal flange of the angle member 18 at its lower end (not shown). A helical coil spring 46 is positioned around the tubular sleeve 40 and is seated at its upper end against the lower edge of the neck portion of 48 and at its lower end against a stop block 48 securely affixed to the tubular sleeve 40. The stop block 48 is formed with a transversely extending bore 50 which extends through the wall of the tubular sleeve 40 and in which a pair of split clamping jaws 41a, 41b are slidably mounted for frictionally engaging and adjusting a rod 43 slidably disposed within and projecting from the lower end of the tubular sleeve 40. The clamping jaws 41a, 41b are held with their engaging surfaces in engaging contact with the rod 43 by means of a socket head screw 50 having its threaded Shank disposed in threaded engagement in a threaded bore in the clamping jaw 41b. The clamping jaw 41a is slidably disposed on the sleeve 40 and is biased in engaging relationship toward the clamping jaw 41b by the head portion of the clamping screw 50. It is the function of the stop block 48 to transmit the resilient downward biasing force of the coil spring 46 to the tubular sleeve 40 and rod 43 carried thereby and moreover to limit the maximum downward movement of the rod 43 relative to the support and clamping assembly.

A rod 45 is threadedly secured in the upper end portion of the tubular sleeve 40 and is formed with an eye 52 through which a pin 54 extends for engaging the rod 45 with a suitable cantilever lever 56 disposed between the inner surfaces of the bottom panel 16 and tubular sleeve 40 as shown in FIGURE 1 for withdrawing the tubular sleeve 40 and the rod 43 upwardly in opposition to the spring 46 and releasing the clamping mechanism as is necessitated during the loading and unloading operation of the work rack.

To the lower laterally disposed end portion of the rod 43 a clamping shoe 58 is removably affixed which is adapted to be disposed in resiliently biased bearing relationship against the side edge surface of the uppermost bearing 38 in the stacked column effecting a clamping of the stacked column between the bottom panel and clamping shoe. The mutually contacting side edges of the adjacent bearings in the stacked column are disposed in relatively tight abutting relationship forming a substantially liquid type seal therebetween to prevent migration of ions in the solution during an electroplating operation toward the rear surface of the bearings. The forward parting edges of each of the bearings in the stacked column are positioned in firm abutting relationship against the inner surface of the face panel 12 as shown in FIGURES 1, 2 and 4. As best seen in FIGURE 2, the face panel 12 is provided with a longitudinally extending slot 60 having outwardly tapered side edges which extends centrally along the face panel from a point adjacent to the bottom panel 16 to a point spaced from the angle member 18 at the upper end thereof. The parting edges of the bearings 38 are disposed in substantially symmetrical alignment relative to the slot 60 and for substantially the entire length thereof.

The alignment of the stacked column of bearings 38 relative to the slot 60 assures that a substantially uniform plating will be deposited on the inner circumferential surfaces of each of the bearings avoiding thereby the necessity of subjecting the plated bearings to a supplementary machining operation. Electroplating of the stacked column of bearings with an electrical charge opposite to that of an anode disposed in the treating solution is achieved by means of a conductor 62 adapted to have its upper end connected to a suitable bus bar (not shown) or other current source and its lower end to a magnetic contact 64 adapted to be placed and magnetically held to the rearward surface of the stacked column of bearings as shown in FIGURES 1 and 2.

In accordance with the construction of the box-type plating rack as thus far described, it will be apparent that as the rack is lowered into a liquid treating station the treating solution will enter through the longitudinal slot 60 in the face panel 12 and become disposed in contact with the inner cylindrical surfaces of the bearings stacked therealong. As the rack is progressively lowered into the treating solution, the hydrostatic pressure exerted by the solution against the inner surface of the stacked bearing column is counterbalanced and offset by the liquid in the
rearward compartment of the enclosure in a manner hereinafter described to prevent a collapse of the bearing column. The rack is conventionally immersed in a treating liquid to a depth such that the liquid level is above the uppermost bearing 38 in the column but not above the upper end of the open enclosure.

As shown in the drawing, the bottom panel 16 is formed with an outlet or drainage port 66 and two laterally spaced inlet ports 68 which are provided with suitable check valves to provide for a controlled flow of liquid into and out of the rack in response to its immersion and withdrawal from a liquid treating receptacle. The ports 66, 68 are disposed in communication with the rearward compartment of the enclosure and employ the radial outer surfaces of the stacked column of bearings defining one wall thereof. The inlet ports 68 are each provided with a check valve 70 which preferably comprises a resilient tubular member 72 having the upper end portion thereof molded or fabricated in a flattened condition such that the inner surface of the adjacent sides in the normal unpressed condition are disposed in close contact relative to each other. Any one of a variety of suitable resilient materials can be satisfactorily employed for the inlet check valve provided that they are resistant to the acidic and alkaline solutions in which the plating rack may be immersed. Of these materials, rubber constitutes a preferred material.

The performance of the inlet check valves 70 is predicated on the hydrostatic pressure imposed against the flattened section 74 during the lowering of a rack in the treating solution. As the liquid moves upwardly through the tubular member 72, further downward movement of the rack causes the hydrostatic pressure of liquid to spread the flattened section 74 enabling unidirectional inward flow of liquid into the rear compartment of the box rack. This continues until the rack has attained the fully lowered position whereupon the hydrostatic pressure of the liquid within the resilient tubular member 72 and around the outside of the flattened section 74 reach an equilibrium condition enabling the return of the flattened section to the closed position as shown in FIGURE 4 preventing circulation of solution through the inlet valve during the balance of the electroplating operation at that station. During the withdrawal of the work rack from the treating solution the greater hydrostatic pressure of the liquid inside the enclosure maintains the flattened section 74 closed and the liquid is rapidly drained from the interior of the rack through an outlet check valve 76 of a type identical to that of the inlet check valves 70.

As shown in FIGURES 1, 2, and 4, the drainage or outlet check valve 76 comprises a resilient tubular portion 78 integrally connected to a downwardly extending flat section 80 identical to that of the inlet check valve 70.

As best seen in FIGURES 4, both the inlet check valves and outlet or drainage check valves are retained in the inlet ports 68 and drainage ports 66 respectively, by means of a circular clip or wire 82 which is radially outwardly biased and effects a deformation of the resilient tubular portion into an annular engaging groove 84 extending around substantially the midpoint of the ports.

In order to facilitate drainage of the liquid through the drainage check valve 76 and to assure substantially complete drainage of the enclosure, the upper or inner surface of the bottom panel 16 as best seen in FIGURE 3, is formed of a dish-shaped inverted polyhedron configuration as defined by angularly inclined surfaces 85 at the lowermost point of which the drainage port 66 is located. In order to provide adequate support for the lowermost for the lowermost bearing 38 as shown in phantom in FIGURE 3, a T-shaped surface 86 disposed in a plane substantially perpendicular to the inner surface of the face panel 12 is defined by the nonrecessed forward edge of the base panel 16 and the upper surface of a rearwardly extending ramp 88. The size of the T-shaped surface 86 is selected so as to enable the treatment of a large variety of sizes of bearings 38,

As best seen in FIGURES 3 and 4, the downwardly inclined surfaces 85 disposed adjacent to the ramp 88 provide a gap between the bottom edge of the lowermost bearing 38 along those portions not positioned in supported relationship on the T-shaped surface 86. This gap is effective to enable drainage of treating solution which becomes entrapped along the forward face of the bearings as a result of surface tension over the drainage port 66 during withdrawal of the rack from a liquid treating tank. The gap provided, however, is of sufficiently small area to prevent any significant migration of ions therethrough toward the rear surface of the stacked column of bearings during an electroplating operation.

The use of the contoured base panel as shown in the drawings has obviated the necessity of using a dummy bearing as the lowermost bearing in the stacked column due to inadequate drainage of the treating liquid adjacent to the base of the rack. The prior practice of employing such as dummy bearing was costly and inefficient due to the reduction of the effective capacity of the rack and the necessity of discarding or stripping of the dummy bearing after each processing cycle. The contour of the base panel of the plating rack comprising the present invention enables a full load of bearings to be loaded into the rack each processing cycle and substantially eliminates solution drag-out and draining from one treating tank to the next adjacent treating tank.

The operation of the drainage check valve 76 is achieved automatically in response to the withdrawing movement of the box rack from a liquid treating receptacle. As the rack moves upwardly, the hydrostatic pressure of the liquid within the box rack exceeds the hydrostatic head of liquid operating against the flattened section 80 of the drainage check valve enabling unrestricted outward flow of the liquid from the interior of the rack. After the rack is completely withdrawn from the treating solution, further draining of any residual liquid within the interior of the rack quickly continues during the completion of the ascending movement of the box rack. It will be noted that the interior of the enclosure and the dried or inverted tetrahedron contour of the inner surface of the bottom panel 16 is such that no undesirable depressions or obstructions are present which would occasion any entrapment of the solution.

On immersion of the work rack into a liquid treating station, the hydrostatic pressure acting on the outside of the flattened section 80 of the drainage check valve 76 maintains the valve closed and liquid is admitted into the interior of the box rack through the inlet check valves in a manner as previously described. While the rack is in the fully lowered position in the liquid treating receptacle, the equilibrium of hydrostatic pressure within and around the flattened section 80 maintains the drainage valve in the closed position as shown in FIGURE 4 restricting the undesirable migration of ions into and out of the rearward chamber of the box rack.

It will be apparent from the foregoing description of the box plating rack constructed in accordance with the preferred embodiments of the present invention that the inclusion of inlet and outlet check valves in the base thereof enables rapid filling of the rack as well as rapid and substantially complete drainage thereof overcoming the problems associated with similar type racks heretofore known. The specific size, number and disposition of the inlet and drainage ports in the base panel of the enclosure can be varied consistent with the interior volume of the rack, the rate of immersion and withdrawal of the rack in a liquid treating receptacle, and the particular configuration of the workpieces being treated. Alternative suitable check valves can be employed in lieu of the resilient tubular check valves employed in the exemplary embodiment shown in the drawings which are operative to enable fluid flow into and out of the interior of the rack during immersion and withdrawal thereof, respectively, which cause communication and restrict liquid circulation into
3,290,239

and out of the interior of the rack when it has attained equilibrium while immersed in a liquid at a constant depth.

While it will be apparent that the preferred embodiments herein illustrated are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, means for clamping a plurality of workpieces in said enclosure against said face panel with said concave surfaces disposed centrally of and in communication with said aperture, and normally closed valve means in said enclosure operable in response to a pressure differential between the interior of said rack and the exterior thereof to open communication with the interior thereof for permitting liquid flow into and out of the interior of said enclosure during the downward and upward movement of said rack in a liquid and for closing communication with the interior of said enclosure when said rack is disposed at a constant level in the liquid.

2. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a face panel provided with a longitudinally extending aperture therealong and a bottom panel, means for supporting said enclosure at a liquid treating station, means for clamping a plurality of workpieces in said enclosure against said face panel with said concave surfaces disposed centrally of and in communication with said aperture, and normally closed valve means in said bottom panel operable in response to a pressure differential between the interior of said rack and the exterior thereof to open communication with the interior of said enclosure for permitting liquid flow into and out of the interior of said enclosure during the downward and upward movement of said rack in a liquid and for closing communication with the interior of said enclosure when said rack is disposed at a constant level in the liquid.

3. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, means for clamping a plurality of workpieces in said enclosure against said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, and check valve means in said bottom panel operable in response to the downward movement of said rack in a liquid for opening communication with the interior of said enclosure permitting liquid to flow therethrough, second check valve means in said second port for opening communication with the interior of said enclosure permitting liquid to flow outward therefrom in response to the upward movement of said rack in a liquid, said first and said second check valve means operable to close communication with the interior of said enclosure when said rack is disposed at a constant level in the liquid.

4. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, clamping means on said enclosure for clamping a stacked column of a plurality of workpieces against the inner surface of said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, and check valve means in said bottom panel operable to close the interior of said enclosure for permitting liquid flow into and out of the interior of said enclosure in response to the downward and upward movement of said rack in a liquid and for closing communication with the interior of said enclosure when said rack is disposed at a constant level in the liquid.

5. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong for supporting said enclosure at a liquid treating station, means for clamping a stacked column comprising a plurality of workpieces in said enclosure against said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, the inner surface of said bottom panel formed with a dish-shaped configuration and including a first port and a second port therein, a first check valve in said first port operable to open communication with and permitting liquid to flow into said enclosure in response to the downward movement of said rack in a liquid, a second check valve disposed in said second port for opening communication with and permitting liquid to flow out of the interior of said enclosure in response to the upward movement of said rack in a liquid, said first and said second check valve operable to close communication with the interior of said enclosure when said rack is disposed at substantially constant level in a liquid.

6. A plating rack for plating the concave surfaces of semi-cylindrical shell bearings comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, means for clamping a stacked column of bearings in said enclosure with the parting edges thereof disposed in abutting relationship against said face panel and with said concave surfaces disposed centrally of and in communication with said aperture, and check valve means in said bottom panel formed with a first port and a second port therebetween, a first check valve in said first port and a second check valve in said second port, said first and said second check valve comprising a resilient tubular body disposed around the periphery of said first and said second ports integrally connected to an elongated flattened section the inner surfaces of which in the normal unstressed condition are in substantially close contact with each other, said first check valve oriented so as to open communication with and permit flow of liquid into the interior of said enclosure in response to the downward movement of said rack in a liquid, said second check valve oriented so as to open communication and permit liquid to flow out of said enclosure in response to movement and said rack upwardly in a liquid, said first and said second check valves operable to close communication with the interior of said enclosure when said rack is disposed at substantially constant level in the liquid.

7. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, means for clamping a stacked column of workpieces in said enclosure against said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, and check valve means in said bottom panel operable to close communication with the interior of said enclosure when said rack is disposed at a constant level in the liquid.

8. A plating rack for plating the concave surfaces of workpieces comprising an enclosure including a bottom panel and a face panel provided with a longitudinally extending aperture therealong, means for supporting said enclosure at a liquid treating station, means for clamping a stacked column comprising a plurality of workpieces in said enclosure against said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, the inner surface of said bottom panel formed with a dish-shaped configuration and including a first port and a second port therein, a first check valve in said first port operable to open communication with and permitting liquid to flow into said enclosure in response to the downward movement of said rack in a liquid, a second check valve disposed in said second port for opening communication with and permitting liquid to flow out of the interior of said enclosure in response to the upward movement of said rack in a liquid, said first and said second check valve operable to close communication with the interior of said enclosure when said rack is disposed at substantially constant level in a liquid.
tending aperture thereof, means for supporting said enclosure at a liquid treating station, means for clamping a stacked column of workpieces in said enclosure against said face panel with the concave surfaces thereof disposed centrally of and in communication with said aperture, said bottom panel formed with a recessed polyhedron configuration provided with a port extending through said bottom panel at the lowermost point thereof and including an upstanding portion defining a T-shaped surface disposed in a plane substantially perpendicular to said face panel and oriented with the cross leg thereof positioned adjacent to said face panel and the other leg thereof extending substantially centrally and for at least a portion of the width of said bottom panel, said T-shaped surface operative to engage the edge of the lowermost workpiece in the stacked column for supporting the stacked column in appropriate position within said enclosure.

References Cited by the Examiner

UNITED STATES PATENTS
2,500,206 3/1950 Schaefer et al. 204—297
2,697,690 12/1954 Beebe 204—297
2,727,858 12/1955 Klein 204—297

JOHN H. MACK, Primary Examiner.
D. R. JORDAN, Assistant Examiner.