Sept. 24, 1963 R. K. SEDGWICK ET AL 3,104,989

MACHINE TOOL FOR REMOVING A MASS OF MATERIAL FROM A CONTAINER AND METHOD

Filed June 28, 1956 5 Sheets-Sheet 1

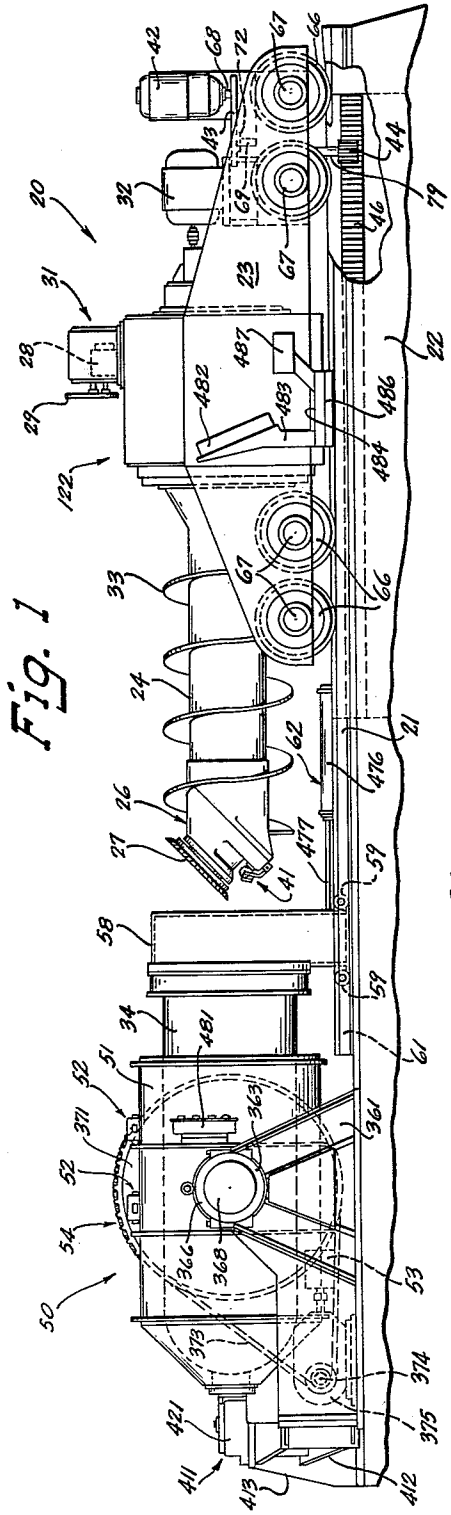


Fig. 1

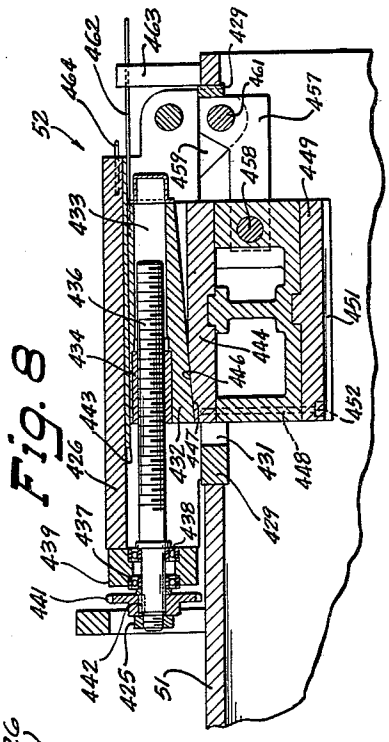


Fig. 8

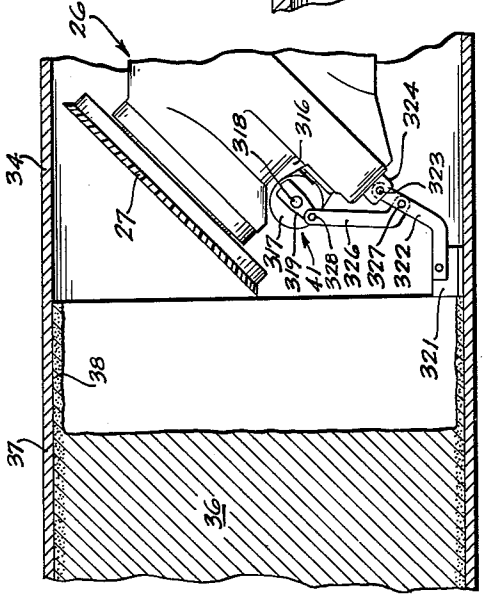


Fig. 9

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MACHINE TOOL FOR REMOVING A MASS OF MATERIAL FROM A CONTAINER AND METHOD

Filed June 28, 1956 5 Sheets-Sheet 2

Fig. 2

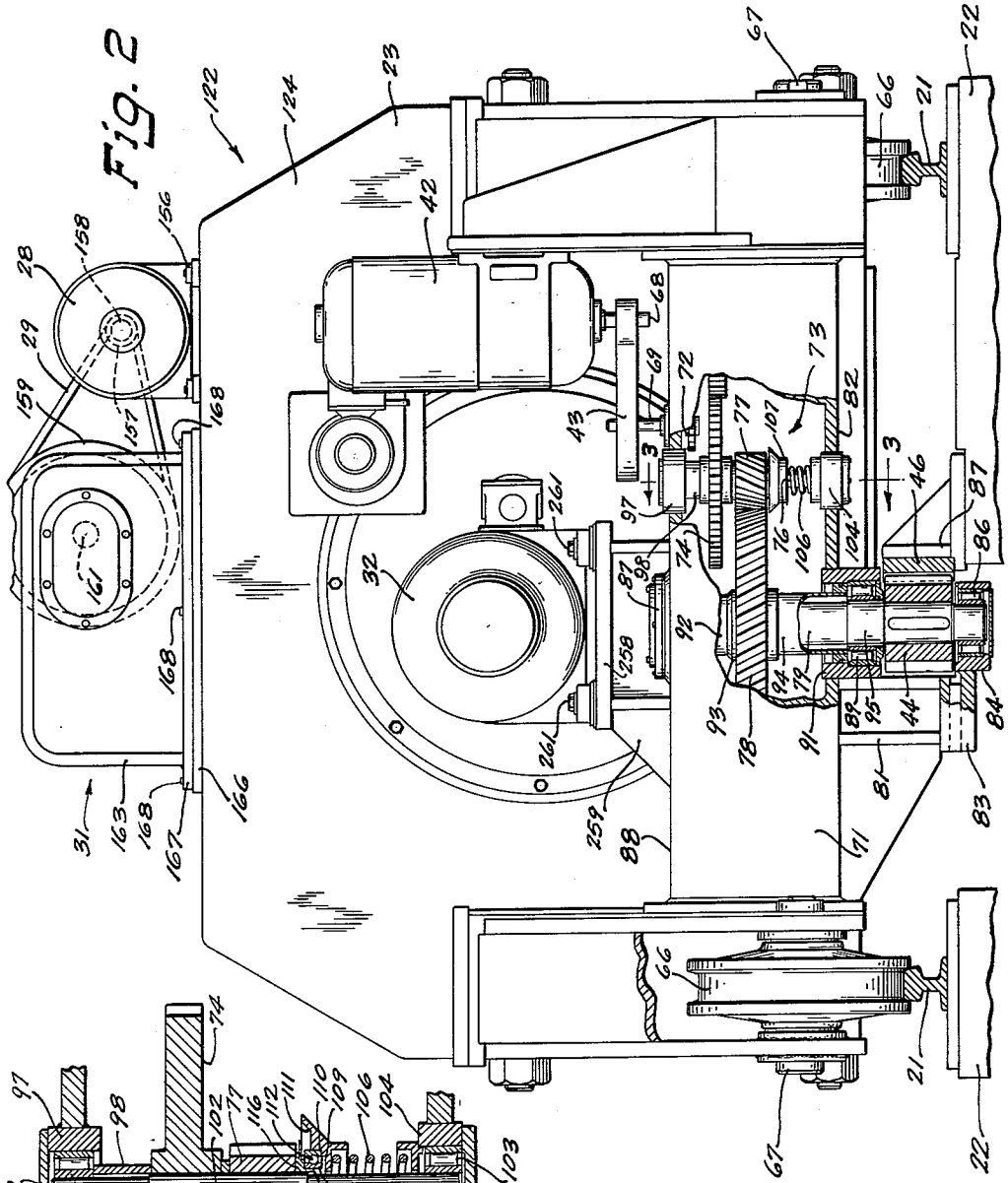
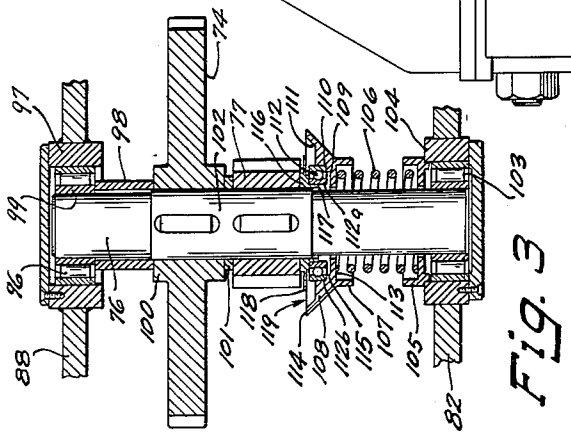


Fig. 3



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Filed June 28, 1956 5 Sheets-Sheet 3

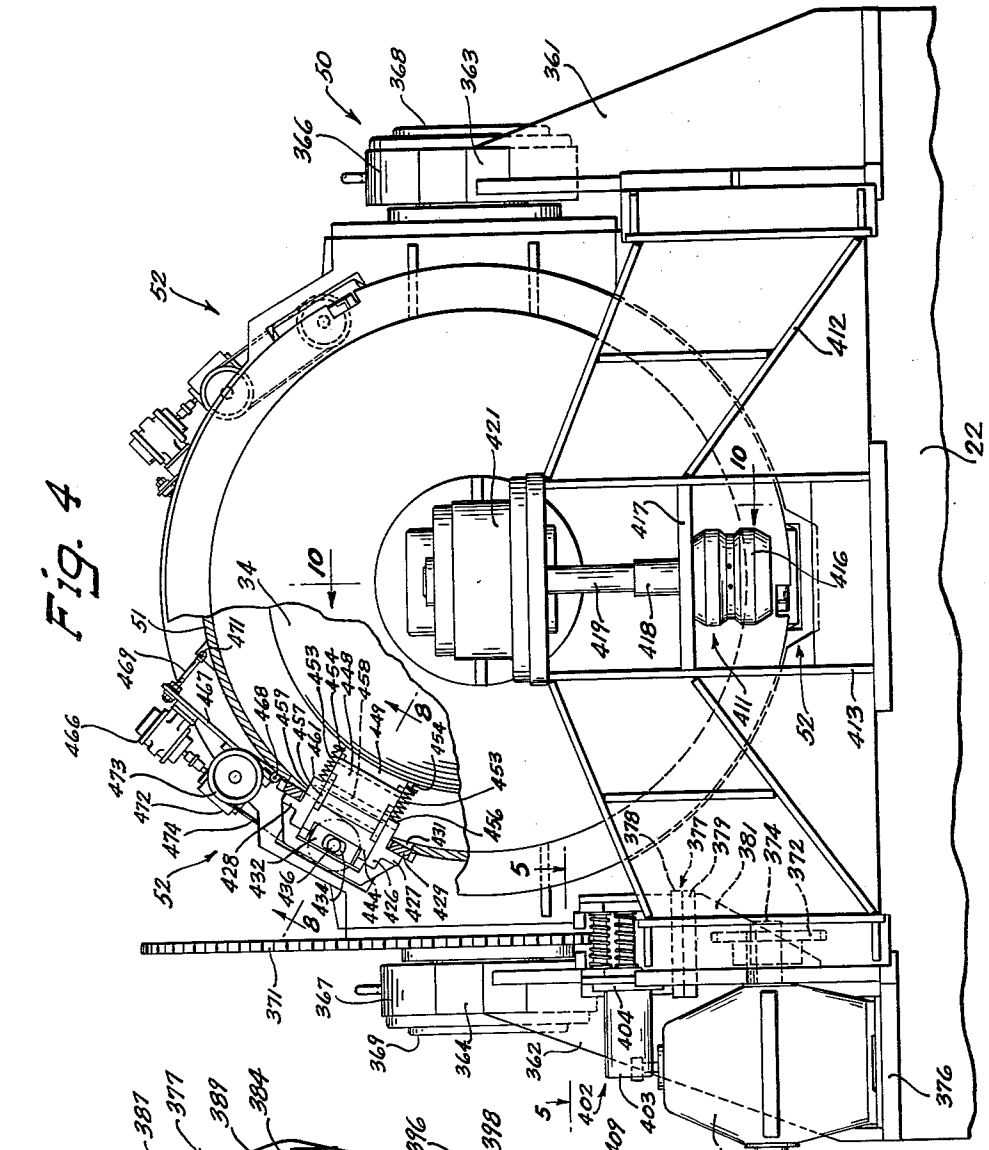


Fig. 4

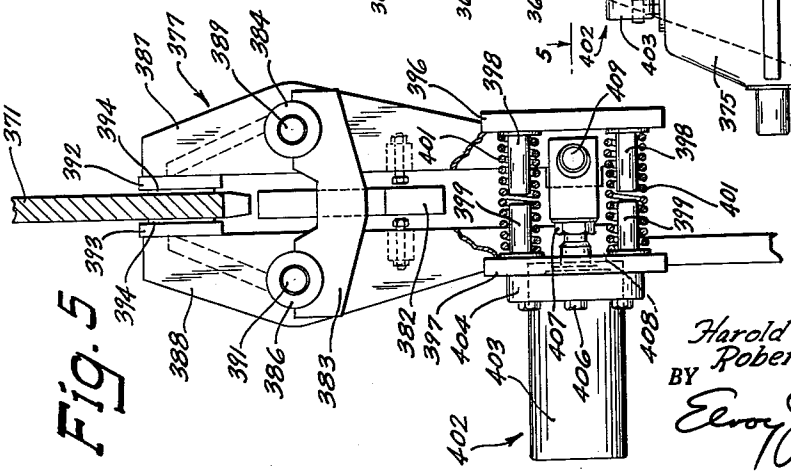


Fig. 5

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Sept. 24, 1963 R. K. SEDGWICK ET AL 3,104,989

MACHINE TOOL FOR REMOVING A MASS OF MATERIAL FROM A CONTAINER AND METHOD

Filed June 28, 1956 5 Sheets-Sheet 4

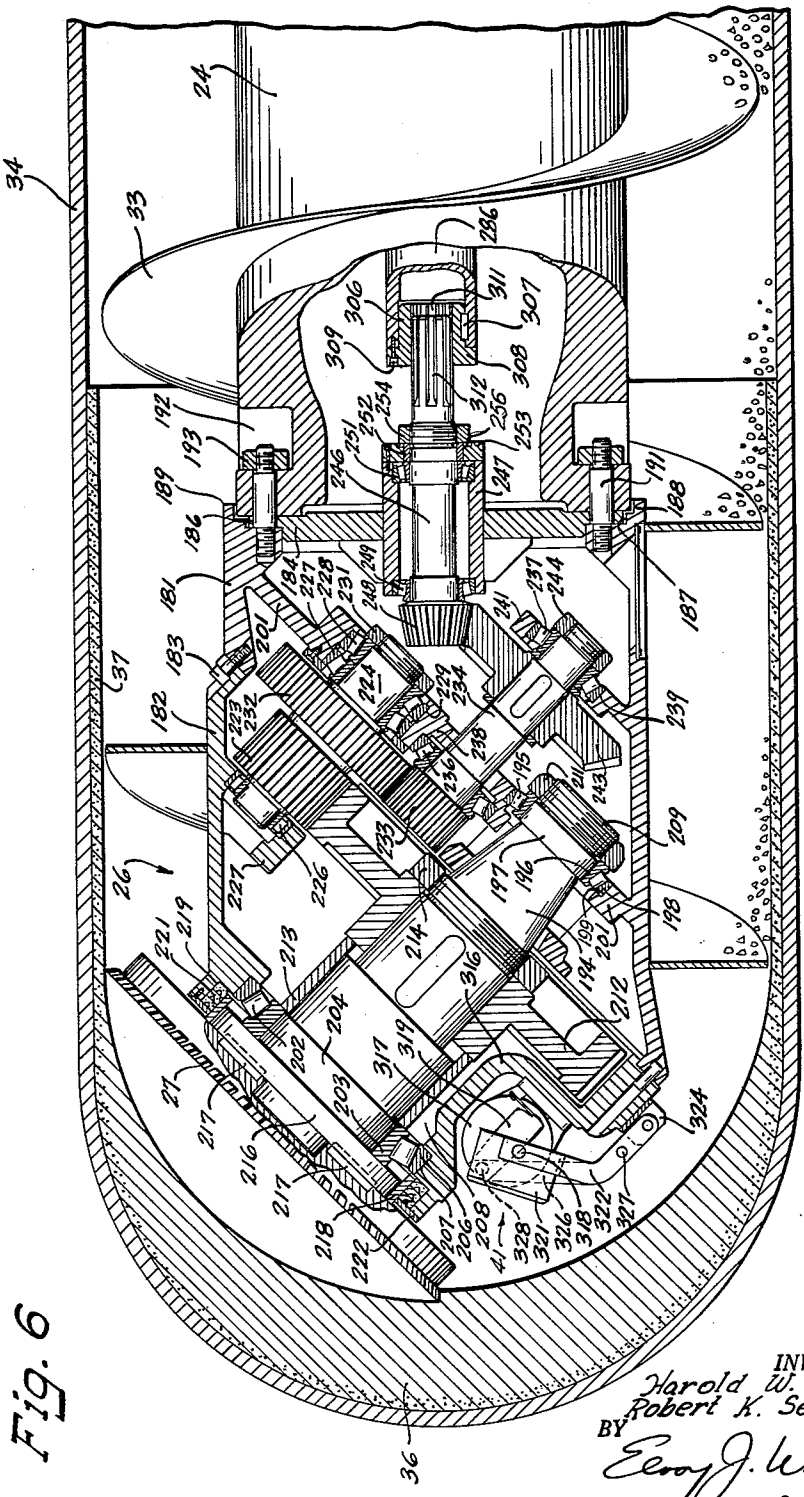


Fig. 6

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MACHINE TOOL FOR REMOVING A MASS OF MATERIAL FROM A CONTAINER AND METHOD

Filed June 28, 1956 5 Sheets-Sheet 5

Fig. 7

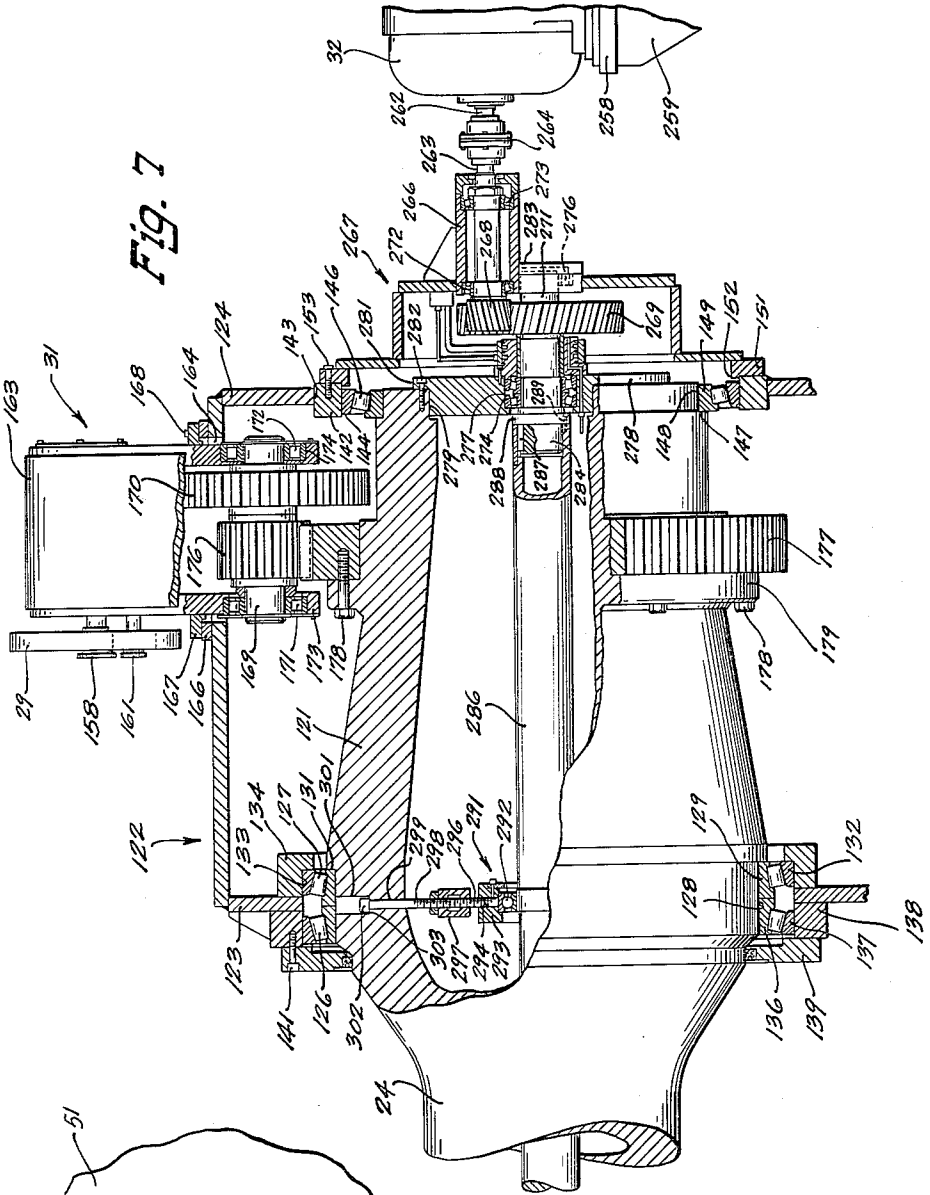
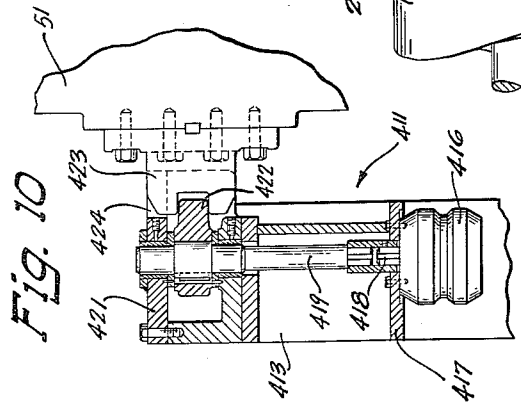


Fig. 10



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3,104,989

MACHINE TOOL FOR REMOVING A MASS OF MATERIAL FROM A CONTAINER AND METHOD

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24 Claims. (Cl. 134—8)

This invention relates to a machine tool and more particularly to a machine tool adapted to remove product from a container, for example, in removing titanium sponge from a crucible having a hemispherical bottom.

In processing titanium ore, one of the steps is the reduction of titanium tetrachloride which is accomplished by placing titanium tetrachloride in a crucible and heating it to a relatively high temperature. When the reduction has been completed the crucible with the titanium composition in it is allowed to cool and upon cooling solidifies into a solid mass of material called titanium sponge. The titanium sponge contains impurities in the form of undesirable salts which are removed by a leaching process. For this purpose the titanium sponge mass must be removed from the crucible in pieces. The crucibles used in the reduction process are relatively large both in diameter and length and have hemispherical bottoms. The sponge when cooled is contained in the bottom half of the crucible and the hemispherical bottom of the crucible makes it difficult to remove it therefrom. The wall of the upper half of the crucible has a dendritic growth of undesirable by-product material that forms during the heating and cooling period. This undesirable by-product material must be removed first before the sponge is removed.

Prior to this invention, the dendritic growth in the upper half of the crucible was removed from the wall by manually scraping it off. This, of course, was slow and expensive. After the upper portion of the crucible had been cleaned, a plurality of holes were drilled into the mass of titanium sponge and charged with an explosive. The open end of the crucible was then covered by a mat and the explosive charges detonated to shatter the mass. However, the resulting pieces were not uniform and the larger pieces of sponge would then have to be broken or crushed into smaller pieces. Also, the blasting operation, while effective in removing most of the sponge, was not capable of removing the sponge from the wall or bottom of the crucible. This was accomplished by manually chipping the adhering sponge from the wall and bottom. In general, the prior method of removing the titanium sponge from the crucible was generally unsatisfactory in that it was hazardous to personnel, very slow and expensive.

Accordingly, it is a general object of the present invention to provide a machine tool especially adapted to remove a product from a container and a method of removing a product from a container.

Another object of the present invention is to provide a machine tool capable of removing product from a container having a hemispherical bottom.

A further object of the present invention is to provide a machine tool capable of receiving a large crucible and to automatically position the crucible in a desired work position to be operated on.

A further object of the present invention is to provide a machine tool having a mobile tool unit for feeding a cutting tool into a container.

A further object of the present invention is to provide a machine tool having a mobile tool carrying unit which is self propelled.

A further object of the present invention is to provide a machine tool having mobile tool carrying unit wherein the mobile unit has a ram rotatable about its own axis and a cutter supported by the ram and independently rotatable about its own axis while it is bodily rotated about the axis of the ram.

A still further object of the present invention is to provide a machine tool for machining a mass of material out of a cylindrical container that is also capable of machining a concave contour conforming to the bottom configuration of the container.

Another object of the present invention is to provide a machine tool that is operable to scrape the wall of a cylindrical container prior to performing a cutting operation for removing material from the bottom portion of the container.

Still another object of the present invention is to provide a machine tool for removing a mass of material from a cylindrical container that is capable of reducing the material to particles and to remove them from the container without the necessity of withdrawing the cutting tool.

Still another object of the present invention is to provide novel securing means for locking a cylindrical container within a positioning member.

In accordance with the present invention a novel machine tool for removing a mass of material out of a cylindrical container or crucible having a concave bottom is provided wherein the machine includes a self propelled mobile tool unit mounted on a track. The tool unit rotatably supports a ram to which is secured a cutter carrying head having a cutter disposed thereon for independent rotation about an axis which intersects the axis of the ram. The arrangement is such that as the ram is rotated the cutter is bodily rotated in an orbital path about the axis of the ram while the cutter is rotated about its own axis. The novel arrangement of the cutter on the ram is such that the machine tool feeds the cutter into an elongated cylindrical container as it operates to remove material therein substantially to the wall of the container. The cutter is also capable of removing material from the concave bottom portion of the crucible to clean out the material contained therein. There is also provided a material removing auger which is secured to the outer periphery of the ram so that the particles produced by the cutter in operating upon the material in the container are conveyed out of the container into a suitable receptacle so that they do not clog or interfere with the action of the cutter. The various motors and gear transmissions for propelling the tool unit, rotating the ram and for rotating the cutter are all carried on the mobile unit. The machine tool also includes a crucible positioning unit which has a basket normally disposed in a vertical position and into which the crucible is placed. Means are provided for locking the crucible within the basket so that when the basket is moved by power means to a work position the crucible is axially aligned and securely locked therein.

The foregoing objects of the invention and others which will become apparent from the following detailed description, may be achieved by means of the exemplifying apparatus depicted in and set forth in this specification in connection with the accompanying drawings, in which:

FIG. 1 is a view in left side elevation of a machine tool embodying the features of the present invention with parts broken away to show the carriage drive means;

FIG. 2 is a view in rear elevation of the machine tool of FIG. 1, with parts of the carriage transmission housing broken away to show a portion of the carriage gear transmission;

FIG. 3 is an enlarged detail sectional view of the resilient mounting provided for a horizontally disposed

herringbone pinion gear of the carriage gear transmission taken along the plane represented by the line 3—3 in FIG. 2;

FIG. 4 is a view in front elevation of the machine tool of FIG. 1, showing the container positioning unit with parts broken away to illustrate one of the locking mechanisms for locking the container within the basket;

FIG. 5 is an enlarged detail view in horizontal section of the basket brake taken along the plane represented by the line 5—5 in FIG. 4;

FIG. 6 is an enlarged fragmentary view, substantially in vertical section taken through the container and cutter head, showing the cutter operating upon the titanium sponge in the semispherical bottom portion of the container and the gear transmission contained within the cutter head;

FIG. 7 is an enlarged fragmentary view of the rear end of the ram housing partially in elevation and partially in section, showing the ram journalled in the housing, the drive transmission for rotating the ram and the drive transmission for rotating the spindle drive shaft;

FIG. 8 is an enlarged detailed sectional view of a container locking mechanism taken in a plane represented by the lines 8—8 in FIG. 4;

FIG. 9 is an enlarged fragmentary sectional view of a central portion of the container showing the three types of material within the container and showing the cutter head within the container with the scraping tool extended into the work position; and,

FIG. 10 is an enlarged fragmentary view partly in section and partly in elevation taken on the plane of the line 10—10 in FIG. 4, showing the basket locking mechanism.

The particular machine tool shown in the accompanying drawings exemplifying a preferred embodiment of the present invention, is in the form of individual units, mounted on a floor or common base, which cooperate and function to accomplish the specific object of removing product from a container. It is to be understood that the invention may be embodied with equal advantage on a unitary structure. Referring more specifically to the drawings, and particularly to FIG. 1, thereof the illustrative apparatus there shown is embodied in a self-propelled mobile tool unit, generally denoted at 20, that is supported for movement on laterally-spaced longitudinally-extending parallel rails 21 secured to the floor or base 22. The mobile tool unit 20 is comprised of a carriage 23 on which a ram 24 is rotatably supported in a horizontal plane. On the extreme forward end of the ram 24 there is secured an angularly shaped cutter carrying head 26 which rotatably supports a circular cutter 27. The cutter 27 is disposed on the head 26 in such manner that the axis of the cutter intersects the axis of the ram 24 and it is arranged and constructed so that the cutting surfaces of the cutter are tangent to the axis of the ram 24. The arrangement is such that the ram 24 in rotating about its axis, bodily rotates the cutter 27 in an orbital path about the axis of the ram.

Power for rotating the ram 24 is obtained from an electric motor 28 mounted on the carriage 23. Power is transmitted from the motor 28 through a belt transmission 29 to a unitary gear transmission 31 carried on the top surface of the carriage 23 and which extends downwardly into operable engagement with the ram 24 to rotate it and its associated head 26 and cutter 27. The cutter 27 while being bodily rotated about the axis of the ram 24, is, also, operably connected to be independently rotated about its own axis, by power obtained from an electric motor 32 supported on the carriage 23. An auger 33 is fixed to the periphery of the ram 24 and extends forwardly about the cutter head 26 so that it rotates with the ram to move the material that has been cut from the mass within a crucible or container 34 for the purpose of transferring the material out of the crucible 34 to avoid an accumulation of chips within the crucible.

The crucible or container 34 in which the cutter 27 operates is an elongated cylindrical structure having a hemispherical bottom. The titanium sponge 36 which is contained therein occupies approximately the lower half of the container. The container 34 may be said to contain three types of material. In FIGS. 6 and 9, the cutter 27 is shown operating on the titanium sponge 36 to remove the pure titanium sponge while a relatively thin outer layer 37 adjacent the wall of the container is left in the container. Referring to FIG. 9, wherein the middle portion of the container 34 is illustrated and showing the cutter within the container prior to the actual operation on the titanium sponge mass 36, as can be seen, a dendritic growth layer 38 of an undesirable by-product material is shown adhering to the wall of the upper half of the container 34 adjacent the open end thereof. This by-product material must be removed before the cutter operates upon the pure titanium sponge 36 contained in the lower half portion of the crucible. For the removal of this by-product material the cutter head 26 is provided with a scraping mechanism 41 which is extendable from the head 26 into contact with the wall of the container 34.

Power for propelling the mobile tool unit 20, for feeding and retracting the cutter 27 into and out of the container 34, is obtained from an electric motor 42, also, carried on the carriage 23. The power is transmitted from the motor 42, through a belt transmission 43, to a variable gear transmission, partially shown in FIG. 2, operably connected to drive a pinion gear 44. The pinion 44 is in meshing engagement with an elongated gear rack 46 disposed below the carriage 23 between the rails 21.

For positioning and maintaining the crucible or container 34 in horizontal axial alignment with the ram 24 there is provided a positioning unit 50, also supported on the floor or base 22. The positioning unit 50 pivotally supports a crucible receiving basket 51, that is movable from a vertical load position to a horizontal work position. A plurality of clamping mechanisms 52 are mounted on the outer surface of the basket 51 and are adapted to engage the container 34 so as to lock the container in axial alignment within the basket 51.

Power to pivot the basket 51 from the vertical load position to the horizontal work position is obtained from a hydraulic motor 53 mounted on the right side of the positioning unit 50. The power is transmitted from the motor 53 through a chain drive transmission 54 to the basket 51.

A hood unit 58 is interposed between the mobile tool unit 20 and the positioning unit 50 to control and exhaust the dust from within the container 34, created by the action of the cutter 27 operating upon the titanium sponge 36. The hood unit 58 is movably supported on rollers or wheels 59 which ride in channels 61 disposed between the rails 21. A piston and cylinder mechanism 62 is provided for moving the hood unit 58 into or out of engagement with the container 34 to provide clearance for the container when it's being pivoted into or out of the work position. The hood unit 58 also acts as a chute to direct chips or pieces of titanium sponge from the container 34 into a suitable receptacle (not shown) located between the rails 21 below the positioning unit 50.

The carriage 23 of the tool unit 20 is a built-up member movably supported on flanged wheels 66 rotatably mounted on axles 67 carried by the carriage 23. Power to actuate the carriage 23, in its path of travel as defined by the rails 21, and as best shown in FIG. 2, is obtained from the reversible electric motor 42 secured in a vertical position on the rear portion of the carriage 23. To the extending end of the motor drive shaft 68 there is secured a pulley (not shown) around which the belt 43 engages. Power from the motor pulley is transmitted via the belt 43 to another pulley secured to the outwardly extending end of a vertical shaft 69 journalled in a gear transmission housing 71 disposed at the rear of the carriage 23. As best shown in FIG. 2, the shaft 69 has secured to its inner end a gear 72 which is operatively

connected to drive a variable gear transmission (partially shown), and generally denoted at 73, contained within the transmission housing 71.

The variable gear transmission ultimately drives a gear 74 carried by another vertically disposed short shaft 76 which is rotatably supported in the transmission housing 71. The gear 74 is keyed to the shaft 76 so that it will rotate the shaft 76 to drive a herringbone pinion gear 77 which is also keyed to the shaft 76. The herringbone gear 77, in turn, meshes with and drives a herringbone gear 78 secured to a vertically disposed pinion drive shaft 79. The vertical pinion drive shaft 79 is rotatably mounted in the housing 71 and extends outwardly thereof below the housing. To support the extending lower end of the shaft 79 there is provided a depending bracket 81 which is secured to the bottom plate 82 of the transmission housing 71 by any suitable method, such as welding. The bracket 81 has a horizontally disposed bearing plate 83 having a hub 84 which receives and supports an antifriction bearing 86, in which the lower end of the shaft 79 is journalled. The pinion drive gear 44 is keyed to the extending end of the pinion drive shaft 79 and is in meshing engagement with the elongated gear rack 46 secured to a longitudinally extending mounting bracket 87 supported and fixed to the floor or bed 22.

As can be seen in FIG. 2, the shaft 79 is rotatably supported in the vertical plane by means of the bottom bearing 86 and a top supporting bearing (not shown) mounted in a hub 87 provided in the top plate 88 of the transmission housing 71. The shaft 79 is also supported intermediate of its top and bottom supports by an intermediate bearing 89 mounted within a sleeve 91 provided in the lower plate 82 of the housing 71. This three point support for the vertical shaft 79 prevents any lateral movement of the shaft and insures a rigid positioning of the shaft in the vertical plane. As can be seen, the herringbone gear 78 is prevented from moving axially by means of a sleeve 92 which encircles the top portion of the shaft 79 and is in abutting engagement with the top hub 93 of the gear 78; and a bottom sleeve 94 which abuts the opposite side of the hub 93 of the gear 78. The bottom sleeve 94, at its lower end, bears against the shoulder of an enlarged portion 95 of the shaft 79 on which the intermediate bearing 89 is mounted and the inner race of the bearing 89.

To maintain the herringbone pinion gear 77 and the herringbone gear 78 in efficient driving engagement and to provide means whereby the gear 77 will be self adjusting to compensate for any downward thrust that may be exerted on it by the mating herringbone gear 78 and to minimize wear in the gears, the herringbone pinion gear 77, while keyed to the shaft 76 for rotation with it, is provided with a resilient mounting which allows the gear 77 to move axially on the shaft. As best shown in FIG. 3, the upper end of the shaft 76 is rotatably journalled in an antifriction bearing 96 confined in a cylindrical enclosure 97 provided in the upper plate 88 of the gear housing 71. The bearing 96 is maintained in place by a sleeve 98 loosely mounted on the shaft 76 and which abuts the inner race 99 of the bearing 96. The lower end of the sleeve 98 abuts the face of a hub 100 of the gear 74. A spacer 101 is mounted on the shaft 76 to space the gears 74 and 77 on an enlarged portion 102 of the shaft. The opposite or lower end of the shaft 76 is rotatably journalled in an antifriction bearing 103 which is confined within a cylindrical enclosure 104 provided in the lower plate 82 of the gear housing 71. A cup-retainer 105 is seated upon the top or inner surface of the hub 104 and serves to locate and support the lower end of a compression coil spring 106 disposed about the shaft 76. The axial opening in the retainer 105, through which the shaft 76 passes, is larger in diameter than the shaft 76 so that the washer does not contact it. The opposite or top end of the spring 106 abuts and is confined within another cup-retainer 107 mounted about the shaft 76 the axial opening of which is also larger in diameter than the diameter of the shaft 76.

The face of the cup-retainer 107 adjacent the gear 77 is provided with an enlarged flared radial rim 108 in which a plurality of stepped recesses 109, 110 and 111 are provided. The depth of the recess 109 is relatively slight but is sufficient to provide clearance between the bottom face of the inner race 112*a* of an antifriction bearing 112, confined within the intermediate recess 110, and the inwardly extending annular base 113 of the cup-retainer 107 against which the top portion of the spring 106 abuts. The depth of the intermediate recess 110 is such that the top surface of the bearing 112 will be disposed below the edge 114 of the rim 108. The base 115 of the recess 110 is of a dimension sufficient to provide a seat for the outer race 112*b* of the bearing 112. A spacer washer 116 is mounted on the shaft 76 and its top surface is in engagement with the bottom surface of the pinion gear 77. The lower surface of the washer 116 is such that the washer has contact only with the top surface of the inner race 112*a* of the bearing 112.

A depending annular collar or sleeve 117 is provided on the bottom surface of the washer 116 and it is disposed to snugly engage the bottom end of the enlarged portion 102 of the shaft 76 upon which the gear 74 is mounted. The sleeve 117 engages the inner periphery of the inner race 112*a* of the bearing 112 and serves to maintain the cup-retainer 107 in axial alignment with the shaft 76. The spacer washer 116 is also provided with a radially extending fin 118 the diameter of which is greater than the diameter of the gear 77 but is less than the diameter of the recess 111. It is therefore apparent that lubricant supplied to the gear 77 will drip therefrom and onto the fin 118. Any foreign matter such as particles of metal from the gear 77 will also fall onto the fin 118 and be washed by oil dripping thereon into a reservoir 119. The reservoir 119 is formed by the cooperating base of the recess 111, the portion of the outer race 112*b* of the bearing 112 extending above the base of the recess 111, and the edge 114 of the rim 108. Since the height of the outer race 112*b* of the bearing 112 is below the edge 114 of the rim 108 lubricant dripping into the reservoir 119 will accumulate therein until it rises to the height of the race 112*b*. Foreign material washed into the reservoir 119 will settle to the bottom of the reservoir while the lubricant will gradually overflow to lubricate the roller of the bearing 112 and thence to the bearing 103.

It is apparent that if the gear 78 tends to exert a downwardly acting force on the gear 77, the gear 77 will move downwardly on the shaft 76 to relieve the thrust force and still maintain a meshing engagement between the gears. The spring 106 will constantly urge the gear 77 upwardly and when the downwardly acting force has been relieved, the gear 77 will move upwardly to its normal position on the shaft 76. Any wobble that may develop in the gear 78 is constantly compensated for by the ability of the gear 77 to move axially on the shaft. Thus, undue wear on the teeth of the gears 77 and 78 is minimized and the gears are always in perfect meshing engagement while the bearings 112 and 103 are constantly supplied with clean lubricant.

The ram 24, as previously stated is rotatably supported on the carriage 23. To this end, the rear or right end 121 of the ram 24, as viewed in FIGS. 1 and 7, is enlarged and is rotatably supported in a housing 122 of the carriage 23. The front and rear walls 123 and 124 respectively of the housing 122 serve as supporting members for the ram 24. To rotatably support the ram on the housing 122 two antifriction thrust bearings 126 and 127 are mounted on a reduced peripheral bearing surface 128 provided on the forward end of the enlarged end portion 121 of the ram 24. The inner raceway 129 of the bearing 127 abuts a shoulder 131 that is created in forming the peripheral bearing surface 128. The outer raceway 132 of the bearing 127 is confined in a recess 133 of a retain-

ing ring 134 that is welded or otherwise secured to the inner surface of the front wall 123. The inner race 136 of the bearing 126 abuts the inner race 129 of the bearing 127. The outer race 137 of the bearing 126 is confined within a retaining ring 138 which is welded or otherwise secured ot the outer face of the front wall 123 of the housing 122. A cap ring 139 is secured to the retaining ring 138 by a plurality of screws 141, and effectively retains the bearings 126 and 127 in position.

The rear wall 124 of the housing 122 is provided with a hub or ring 142 suitably secured within an opening 143 provided in the wall and supports the outer race 144 of an antifriction bearing 146 which rotatably supports the rear or right end of the ram 24 in the wall. The bearing 146 is retained in position by means of a shoulder 147, formed on the ram 24, in establishing a peripheral seating surface 148 for receiving an inner race 149 of the bearing 146, and against which the inner race 149 of the bearing 146 abuts. A retainer ring 151 having an annular inwardly extending flange 152 is secured to the outer surface of the ring 142 by means of a plurality of screws 153. The flange 152 is disposed to engage the outer race 144 of the bearing 146.

The electric motor 28 for rotating the ram 24, as best shown in FIG. 2, is secured to the top surface of the housing 122 by bolts 156 and is operatively connected to drive the gear transmission 31 by means of the transmission belt 29. The belt 29 is engaged on a sheave 157 secured to a drive shaft 158 of the motor 28. The belt 29 is engaged around a larger sheave 159 secured to an input shaft 161 of the gear transmission 31.

As best shown in FIG. 7, the gear transmission 31 is unitarily contained in a casing 163 which is adapted to be inserted within an opening 164 provided in the top of the housing 122. A supporting ring 166 is provided on the housing 122 around the opening 164 and supports a locating and securing ring 167. The ring 167 is secured to the outer surface of the casing 163 and locates the bottom of the transmission to a predetermined desired position relative to the ram 24. The unitary gear transmission is secured in place by means of screws 168 which are inserted through suitable openings in the casing locating ring 167 and threadedly engaged in the supporting ring 166. Thus, by disengaging the belt 29 from the sheave 159 and by removing the screws 168, the gear transmission 31 may be unitarily removed from the housing 122 for maintenance or inspection purposes.

As is shown in FIG. 7, the input shaft 161 of the gear transmission 31 ultimately drives a gear 170 keyed on a cross shaft 169. The shaft 169 is journalled in bearings 171 and 172 mounted in the lower ends of the front and rear walls 173 and 174, respectively, of the casing 163. The shaft 169 also supports a pinion 176 which is keyed thereon for rotation with it. The pinion 176 is in constant meshing engagement with a large spur gear 177 mounted on the ram 24. The gear 177 is secured to the ram 24 by screws 178 which are inserted through suitable openings, in an annular flange 179 provided on the ram 24, into threaded engagement with the gear 177. Thus, power from the electric motor 28 is transmitted by the belt 29 to the input shaft 161 of the unitary gear transmission 31 and transmitted through the gear transmission to the gear 177 to effect rotation of the ram 24.

The spindle supporting head 26 and the associated gear transmission for driving the spindle is best shown in FIG. 6. As there shown the head 26 comprises a two-piece assembly of a hollow base section 181 and a hollow cap section 182 which are secured together by screws 183. The base 181 is provided with a cap plate 184 having an extending annular flange 186 which seats within a recess 187 provided in the end of the base 181. The extreme outer end of the base 181 is provided with another recess 188 which receives the end of the ram 24 so that the outer peripheral rim 189 of the base encompasses the peripheral surface of the ram to establish

a tight sealed engagement therebetween. The base 181 is secured to the end of the ram 24 by a plurality of studs 191 which are threaded into the end of the base section 181 and extend into the end of the ram into recesses 192 provided in the peripheral surface of the ram. Nuts 193 are threadedly engaged on the extending ends of the studs 191 to rigidly unite the head 26 to the ram 24.

A spindle 194 is rotatably supported within the head 26 with its longitudinal axis obliquely disposed therein so that it intersects the axis of the ram 24. To this end, the relatively smaller inner end of the spindle 194 is supported in an antifriction thrust bearing 195. The inner race 196 of the bearing 195 is fitted on a peripheral seat 197 provided on the inner end of the spindle 194. The outer race 198 is confined in a recess 199 formed in an angularly disposed web 201 provided in the base 181 of the head 26. The relatively large outer end of the spindle 194 is rotatably supported in an antifriction thrust bearing 202, the inner race 203 of which is arranged on a suitable seat 204 provided at the top end of the spindle 194. The outer race 206 of the bearing 202 is confined in a recess 207 formed within the spindle throat 208 of the cap section 182. The extreme inner end of the spindle 194 is threaded as at 209 to accommodate an adjusting nut 211 by which means the bearings 195 and 202 are preloaded.

A spindle driving gear 212 is mounted on the spindle 194 and keyed thereto for a driving connection to effect rotation of the cutter 27. The gear 212 is maintained in position on the spindle by means of a sleeve 213 which is mounted on an enlarged portion of the spindle just below the upper bearing seat 204. The sleeve 213 at one end engages the inner race 203 of the bearing 202 and at its opposite end abuts the end of the hub of the gear 212. A nut 214 is threadedly engaged on the spindle 194 and engages against the opposite side of the hub of the gear 212, to maintain the gear in the desired position. The top portion of the spindle 194 is provided with a circular face plate 216 to which the cutter 27 is secured. The face plate 216 is provided with keys 217 which engage suitable key slots in the body of the cutter 27, to prevent relative motion between the cutter 27 and spindle 194. To prevent dust and dirt from entering into the interior of the head 26 a ring 218 is secured to the periphery of the face plate 216 and extends inwardly into a recess 219 provided in the spindle throat portion 208 of the cap 182. A plurality of sealer rings 221 are inserted in the recess 219 between the outer peripheral surface of the ring 218 and the wall of the recess 219 to effectively seal the interior of the head 26 from dust and dirt. A retainer ring 222 is secured to the outer end of the throat portion 208 in a well known manner to retain the sealer rings 221 in place.

The spindle gear 212 is driven by a pinion 223 which is keyed to a stub shaft 224, the axis of which is parallel to the axis of the spindle 194. The upper or top end of the shaft 224, as seen in FIG. 6, is rotatably supported by an antifriction bearing 226 confined in an angularly inwardly extending web portion 227 of the cap section 182. The lower or opposite end of the shaft 224 is journalled in two antifriction thrust bearings 227 and 228 mounted in a recess 229 provided in the web 201. The lower extending end of the shaft 224 is threaded to receive an adjusting nut 231 to maintain the shaft in a desired operative position. A shaft driving gear 232 is keyed on the shaft 224 and is in meshing engagement with a pinion 233 keyed on the end of a shaft 234 disposed within the head 26 so that its axis is parallel to the axis of the spindle 194. The shaft 234 is rotatably mounted in a pair of antifriction thrust bearings 236 and 237. The bearing 236 is confined in a recess 238 provided in the angular web 201. The bearing 237 is mounted in a recess 239 provided in another angularly inwardly extending web section 241 provided in the base 181 of the head 26. A bevel gear 243 is keyed to the shaft 234 for

an operative driving connection therewith. An adjusting nut 244 is threadedly engaged on the end of the shaft 234 to pre-load the bearings 236 and 237 and to maintain the shaft 234 in position.

The gear transmission within the head 26, is driven by a gear transmission power shaft 246 that is rotatably supported within a bearing retainer sleeve 247 provided in the cap plate 184. The sleeve 247 is disposed in the cap plate 184 so that its axis coincides with the axis of the ram 24. The head end of the power shaft 246 has an integrally formed bevel gear 248 thereon which is in constant meshing engagement with the bevel gear 243. The shaft 246 is rotatably supported within the sleeve 247 by a pair of antifriction thrust bearings 249 and 251 which are supported in the ends of the sleeve 247. A thrust ring 252 is mounted on the shaft 246 to abut the inner race of the bearing 251 and extends outwardly beyond the outer surface of a retainer ring plate 253 secured to the end of the sleeve 247. A lock-nut 254 is threadedly engaged on the shaft 246 and engages with the extending end of the thrust ring 252. Thus, by tightening the nut 254 against the thrust ring 252 the bearings 249 and 251 may be pre-loaded to insure accurate rotation of the shaft 246. A sealing ring 256 surrounds the thrust ring 252 and is recessed in the outer face of the retainer ring plate 253.

As previously stated, power for rotating the spindle 194 is obtained from the electric motor 32 carried on the carriage 23. As best shown in FIGS. 2 and 7, the motor 32 is secured, to a supporting plate 258 of a motor supporting bracket 259 provided on the top surface of the gear transmission housing 71, by bolts 261 in the conventional manner. The outwardly extending end of the drive shaft 262 of the motor 32 is operatively connected to the outwardly extending end of a power-input shaft 263 by means of a suitable coupling 264. The shaft 263 is rotatably supported within a shaft housing or sleeve 266 secured in a gear case 267 that is attached to the rear wall 124 of the housing 122. The casing 267 is suitably secured as by welding, to the retaining ring 151 on the rear wall 124 of the housing 122. The inwardly extending end of the shaft 263 has an integrally formed pinion 268 thereon which is in constant meshing engagement with a gear 269 that is keyed to a stub power shaft 271. The shaft 263 is rotatably supported in a pair of antifriction bearings 272 and 273 which are confined in the ends of the shaft housing 266, in a well known manner.

The shaft 271 is journalled in antifriction bearings 274 and 276 of which the bearings 274 is a double thrust bearing confined within an opening 277 provided in a ram cap plate 278. The cap plate 278 is seated within a circular recess 279 provided in the end of the ram 24 and has an annular flange 281 which seats upon the end of the ram 24 and is secured thereto by means of screws 282. The bearing 276 which supports the outer end of the shaft 271 is confined in a bearing bracket 283 provided in the rear wall of the gear casing 267.

The inwardly extending end 284 of the shaft 271 is engaged in the end of an elongated tubular drive shaft 286 and is operatively connected to impart rotative drive thereto by means of a key 287. The key 287 is retained in operative position by means of a retaining ring 288 secured to the end of the drive shaft 286 by means of screws 289.

The elongated tubular drive shaft 286 which extends through substantially the entire length of the ram 24 is rotatably supported within the hollow ram 24, by a spider support 291. To this end, the shaft 286 is journalled in a roller bearing 292 which is confined within a supporting ring 293. The supporting ring 293 is provided with a plurality of threaded openings 294 which are at equally spaced intervals and the axes of which radiate outwardly from the axis of the ring 293. Each of the openings 294 are provided with a threaded stud 296 which at their outer ends have a turn buckle 297 engaged thereon. Bolts 298 are inserted through radially disposed openings 299 provided in the ram 24. The openings 299 have an enlarged outer portion 301 in which the heads 302 of the bolts 298 are confined so that the heads 302 of the bolts rest or seat upon the base 303 of the enlarged portion 301. The threaded inner extending end of the bolts 298 are engaged in the opposite ends of the turn buckles 297. It is therefore apparent that by properly adjusting the several turn buckles the longitudinal axis of the drive shaft 286 may be maintained in coaxial relationship with the ram 24.

The left end of the drive shaft 286, as best shown in FIG. 6, is provided with a bushing 306, which is snugly fitted within the end of the shaft 286. A key 307 is provided to prevent relative rotation between the bushing 306 and the shaft 286. The bushing 306 is provided with an annular flange 308 which seats against the end of the shaft 286 and through which screws 309 are inserted into threaded engagement with the end of the shaft 286 to maintain the bushing 306 in position. The bushing 306 is provided with a splined axial opening 311 which receives the splined end 312 of the shaft 246 for an operative driving connection therebetween. Thus, power from the motor 32 is transmitted by means of the drive shaft 286 through the ram 24 into the head 26, and by means of the spindle gear transmission is imparted to the spindle 194 to rotate the cutter 27, independently of the rotation of the ram.

With the arrangement, so far described, it is apparent that a novel and efficient mobile tool unit has been provided which is capable of milling a mass of material out of a cylindrical container having a hemispherical bottom. This result is made possible through the combined actions of feeding the cutter 27 into the container 34, rotating the cutter 27 bodily about the axis of the ram 24, and rotating the cutter 27 about its own axis while it is being fed into the container and rotated bodily; plus the novel arrangement of the cutter 27 on the head 26 with its axis disposed to intersect the axis of the ram 24 at an angle of 45°, and providing a cutter 27 of a size resulting from the formula: Diameter of cutter=radius of hemisphere to be generated multiplied by the $\sqrt{2}$; and of arranging the cutter on the spindle 194 so that its cutting surface will be tangent to the axis of the ram about which it is bodily rotated. This combination of features combine to produce the desired results of generating a hemispherical cavity in the mass of material 36 in the container 34.

It is of course apparent that from the concepts as described, that for various other containers having different ellipsoidal bottoms, the angular inclination of the axis of the spindle relative to the axis of the ram and the size of the cutter 27 may be varied so that the cutter will be made to generate the desired concave cavity. That is, by arranging the spindle 194 in the head 26 so that its axis will intersect the axial line of the ram 24 at an angle which is less than 45° and providing a cutter 27 of a size so that its cutting surface will be tangent to the axial line of the ram, the cutter 27 can be made to generate a pattern of an oblate spheroid. Likewise by inclining the axis of the spindle at an angle that is greater than 45° to the axis of the ram and maintaining the cutting surface of the circular cutter 27 tangent to the axial line of the ram the cutter will generate a pattern of a prolate spheroid.

As mentioned previously and as best shown in FIG. 9, the upper half of the container 34 adjacent to its open end, has a dendritic growth of an undesirable by-product material 38 which forms on the wall of the container during the reduction process. This dendritic growth 38 must be removed prior to the removal of the mass of titanium sponge 36 and the scraping mechanism 41 is employed for this purpose. The head 26 has a cavity or hollow portion 316 in which is secured a motor 317,

which we prefer to be air-operated. To the extending end of the motor shaft 318 of the motor 317 there is an actuating arm 319 which is suitably secured to the shaft 318 for rotation therewith, in a well known manner. A scraping blade or tool 321 is rigidly secured to the end of an angular shaped scraper arm 322 which has its opposite end pivotally secured as at 323 to a bracket 324. The bracket 324 is welded or otherwise securely mounted on the head 26. An angular pivot arm 326, one end of which is pivotably secured to the scraper arm 322, as at 327, with its opposite end pivotally secured, as at 328, to the end of the actuating arm 319, is operable to extend or retract the scraper 321 as desired. As viewed in FIG. 9, the motor 317 when actuated in a counterclockwise direction will rotate the actuating arm 319 in a counterclockwise direction. This will move the pivot arm 326 downwardly and lower the scraper arm 322 to place the scraping tool 321 in contact with the dendritic growth 38 on the wall of the container 34. With the scraper thus extended the ram 24 is rotated and the scraper 321 scrapes the by-product material 38 from the interior wall of the container 34. The carriage is actuated to feed the scraper inwardly into the container to remove all of the dendritic growth material 38 from the wall of the upper half of the container 34.

The container positioning unit 50 of the machine tool comprises a pair of spaced upright members or trunnion stands 361 and 362 provided with bearings 363 and 364, respectively, having bearing caps 366 and 367. Pivotally mounted between the trunnion stands 361 and 362 is the container basket 51 having a pair of diametrical outwardly extending stub shafts 368 and 369 which are journalled in the bearings 363 and 364, respectively.

For pivoting the basket 51 from a vertical load position to a horizontal work position, as shown in FIGS. 1 and 4, there is provided a large sprocket gear 371 which is keyed or otherwise secured to the stub shaft 369. The sprocket gear 371 is operatively connected to be rotated by a smaller sprocket gear 372 through a chain belt 373 engaged about the gears. The sprocket gear 372 is secured to the extending end of an output shaft 374 of a suitable gear reduction unit 375 which is supported and secured to a lateral extending base plate 376 of the upright 362. The gear reducer unit 375 is connected to be driven in a well known manner, by the hydraulic motor 53 supplied with fluid pressure from a source (not shown).

As a safety feature in the event that the motor 53 fails when operating to pivot the basket 51 or in the event of a hydraulic failure, a braking mechanism 377 is provided which is engageable with the large sprocket gear 371 and when so engaged is operable to maintain the basket 51 with the container 34 therein in any position. As best shown in FIGS. 4 and 5, the brake mechanism 377 comprises a base 378 which is secured in a conventional manner to a plate 379 of a supporting bracket 381 provided on the upright member 362. The base 378 has a centrally located vertical web 382, which is provided at its top with a transverse bar 383. The bar 383 extends equidistant on either side of the web 382 with each side having bored bosses 384 and 386. A pair of brake arms 387 and 388 are pivotally mounted on either side of the web 382 between the base plate 378 and the extending ends of the bar 383 by pins 389 and 391. The top portion of the pins 389 and 391 are loosely confined within the bosses 384 and 386, respectively, and have their opposite ends loosely confined within suitable bosses (not shown) provided on the plate 378. The arms 387 and 388 are therefore pivotally movable in a horizontal plane about the axes of the pins 389 and 391. The nose portions of the arms 387 and 388 extend forwardly on either side of the sprocket gear 371 and have vertical nose plates 392 and 393, respectively. The vertical nose plates 392 and 393 are each provided with a suitable friction lining 394 on their inner surfaces which is disposed to engage the side of the sprocket gear 371.

The opposite or rear ends of the brake arms 387 and 388 have secured to them vertical side plates 396 and 397, respectively. The plate 396 has a plurality of inwardly extending projections or pins 398 which are in axial alignment with corresponding oppositely disposed inwardly extending pins 399 provided on the plate 397. The pins 398 and 399 serve to locate and hold compression springs 401 in position between the plates 396 and 397. The springs 401 are of such length, that when placed on the pins 398 and 399 between the plates 396 and 397, they are operable to exert substantially maximum force on the rear end portion of the brake arms 387 and 388 to frictionally engage the nose portions 392 and 393 of the brake arms against the sides of the sprocket gear 371.

A fluid actuator mechanism 402 is provided for the purpose of overcoming the force exerted by the springs 401 to release the braking action on the sprocket gear 371. The actuator comprises a cylinder 403 having an annular flange 404 through which bolts 406 are inserted to threadedly engage the plate 397 to secure the cylinder to the plate. A piston (not shown) which is reciprocally contained within the cylinder 403 has a rod 407 secured to it. The rod 407 extends outwardly of the cylinder 403 and extends through an opening 408, provided in the plate 397, towards the plate 396 of the arm 387. The inwardly extending end of the rod 407 is loosely secured to the brake arm 387 as by a pin 409.

The actuator 402 is adapted to receive hydraulic fluid through a port (not shown) located in the cylinder 403 at the rod side of the piston (not shown). When hydraulic fluid under pressure is supplied to the actuator 402, the force of the fluid tends to move the piston (not shown) leftwardly within the cylinder 403, as viewed in FIG. 5, pivoting the brake arm 387 about the pin 389 in a clockwise direction. At the same time, the hydraulic fluid also exerts a force on the face of the cylinder 403. Since the cylinder 403 is secured to the brake arm 388, the force of the hydraulic fluid will tend to pivot the brake arm 388 in a counterclockwise direction about the pin 391. Therefore, the plates 396 and 397 on the brake arms 387 and 388, respectively, compress the springs 401 to release the frictional pressure exerted by the nose portions 392 and 393 on the sprocket gear 371. Hydraulic pressure is supplied to the actuator 402, to the rod side of the piston thereof when hydraulic pressure is supplied to the motor 53 to actuate it either to raise the basket from the work position to the load positions or to return it to the load position. Thus, in the event of a hydraulic failure, during either of the two movements, the supply of hydraulic pressure to the actuator 402 will be immediately discontinued and the brake mechanism under the force of the springs 401 will react instantaneously to frictionally engage the sprocket gear 371 to prevent the basket 51 from dropping to the horizontal position.

To insure that the basket 51 will be maintained in axial alignment with the ram 24 when in the horizontal work position a lock mechanism 411 is provided which is operable to engage the bottom of the basket 51. To this end, between the upright basket supports 361 and 362 at the left end thereof, as viewed in FIG. 1, and as best shown in FIGS. 4 and 10, there is provided a transverse supporting frame 412. The frame 412 has a vertical column 413 the bottom end of which rests upon the floor or base 22, upon which the machine tool is supported. A reversible hydraulic motor 416 is suitably secured to a horizontally disposed transverse web 417 of the column 413. The drive shaft 418, of the motor 416 extends upwardly and is operably connected, in a well known manner, to rotate a shaft 419 journalled in the head 421 of the lock mechanism 411. Within the head 421 and secured to the shaft 419, for rotation with it is a semi-circular wedge plate 422 disposed in the horizontal plane. The wedge plate 422, upon operation of the motor 416 in one direction will engage between the extending lower and upper arms of a

U-shaped bracket 423 secured to the bottom of the basket 51. The U-shaped bracket 423 of the basket 51, when the basket is pivoted to the work position, is disposed to enter a vertical slot 424 provided in the side of the head 421 adjacent the basket. Thus, when the basket 51 has been pivoted to the horizontal work position, as shown in FIGS. 1 and 10, the motor 416 of the lock mechanism 411 is actuated to engage the wedge plate 422 in the U-shaped basket bracket 423 to lock the basket in the work position and in axial alignment with the ram 24.

As previously stated the container 34 is locked in the basket 51 in axial alignment therein, for movement with the basket. The plurality of locking mechanisms 52 for adjustably locking the container in the basket are deployed on the basket in two annular rows with the locking mechanism 52 in each annular row being spaced equidistant apart, as best shown in FIGS. 1 and 4. All of the locking mechanisms 52 are similar in construction, so that description of one will be illustrative of all of them. The locking mechanism 52, as best shown in FIGS. 4 and 8, comprises a U-shaped elongated housing or body 426 having longitudinally extending side flanges 427 and 428 by which means the body 426 is supported and secured to a rectangular supporting collar 429. The collar 429 is welded into an opening 431 provided in the side of the basket 51. Within the lock body 426 there is a clamp wedge 432 having a longitudinal bore 433. The left end of the longitudinal bore 433, as viewed in FIG. 8, is enlarged to accommodate an internally threaded nut 434 which is press fitted therein. A screw 436 is threadedly engaged in the nut 434 and has its outwardly extending end rotatably supported in a pair of antifriction bearings 437 and 438. The bearings 437 and 438 are supported in a bearing collar 439 secured, in a well known manner, to the end of the lock body 426. The extreme outer end of the screw 436 is provided with a sprocket 441 and is operably connected thereto to rotate it by means of a key 442. The bearings 437 and 438 and the sprocket gear 441 are maintained in position by a lock-nut 425 threadedly engaged on the end of the screw 436. The top surface of the clamp wedge 432 is adapted to bear against a wear plate 443 secured to the inner surface of the top portion of the lock body 426.

The clamp wedge 432 is adapted to slidably engage a clamp block 444 having a tapered or sloping top surface 446 which engages a complementary sloping under surface 447 of the clamp wedge 432. The clamp block 444 is supported and keyed to a spacer block 448. The spacer block 448 engages and is keyed to a clamp jaw 449 which is provided with an arcuate concave bottom surface 451 that is adapted to engage the outer surface of the container 34. The clamp block 444, the spacer block 448 and the clamp jaw 449 are secured together by means of screws 452, one of which is shown, provided in each of the four corners of the assembly.

As best shown in FIG. 4, the assembled unit of the clamp block, spacer block and clamp jaw is maintained in engagement with the clamp wedge 432 by means of four tension springs 453, two of which are shown. The springs 453 are secured to the four corners of the jaw 449 as at 454 and have their opposite end secured to the bottom of the lock body 426 as at 456. Thus, movement of the clamp wedge 432 to the left, as viewed in FIG. 8, will permit the clamp jaw assembly to move inwardly into the lock body 426 away from the container, under the influence of the springs 453. To prevent the jaw assembly for moving longitudinally with the clamp wedge 432 there is provided a pair of L-shaped arms 457, one of which is shown in FIG. 8. The arms 457 have one end pivotally secured as at 458 to the spacer block 448 and have their opposite ends pivotally secured as at 461 to depending lugs 459, provided for this purpose, on the under edges of the sides of the lock body 426. A scale 462, bearing appropriate indicia is secured to the clamp wedge 432 and extends outwardly through a guide block 463. A pointer or indicator 464 is fastened in the lock body 426 and cooperates with the scale 462 to indicate the amount of extension of the jaw assembly.

For driving the screw 436 to move the clamp wedge 432 in either direction as desired, there is provided a reversible hydraulic motor 466. The motor 466 is mounted on an adjustable platform or base plate 467 which is pivotally secured at one end to the basket 51, as at 468. The opposite end of the base plate 467 is adjustably secured to the extending end of a threaded stud 469 which at its opposite end is pivotally connected to the basket 51, as at 471. The motor 466 is operably connected in a well known manner to drive a gear reducer unit 472, also, mounted on the base plate 467. The output shaft of the gear reducer unit 472 has secured to its extending end a sprocket driving gear 473. A chain belt 474 is entrained on the sprocket gear 473 and the sprocket gear 441 to impart a rotational drive to the screw 436 to actuate the clamp wedge 432 to the right or left, as viewed in FIG. 8, as desired. Proper adjustment of the chain belt 474 can be maintained by adjusting the platform 467 on the stud 469 either upwardly or downwardly as the condition may warrant. It is apparent, that through individual actuation of the various lock mechanisms 52, the container 34 may be axially aligned in the basket 51 and securely locked therein.

The hood unit 58 serves to control and exhaust the dust from within the container 34 into an exhaust system (not shown) located below the machine tool. The unit also serves to collect and conduct the pieces of titanium sponge, produced by the cutter in operating upon the titanium sponge mass and which are conveyed outwardly of the container by the auger 33, into a suitable receptacle (not shown). The hood 58 is moved into and out of the position, shown in FIG. 1, by the fluid actuator 62. The fluid actuator 62 comprises a cylinder 476 having a reciprocating piston (not shown) provided with a piston rod 477 which extends outwardly of the cylinder 476. The extending end of the piston rod 477 is secured to the hood 58 while the cylinder is anchored to the supporting base 22. Fluid pressure applied to the rod side of the piston serves to move the hood 58 rightwardly out of container engagement. The hood is provided with an axial opening (not shown) to allow the head 26 and ram 24 to enter into the container 34.

The several operating mechanisms of the positioning unit 50 are under the control of an electrical circuit (not shown) which is actuated selectively by manipulating a plurality of switches mounted in a switch box 481. The switch box 481 is secured to the side of the upright or trunnion stand 361. Also, the several operating mechanisms of the mobile tool unit 20 and the hood unit 58 are under the control of another electrical circuit (not shown) which is actuated selectively by manipulating a plurality of switches mounted in a switch box 482. The switch box 482 is mounted on a panel stand 483 that is supported on an operator's platform 484. The platform is secured to the side of the carriage 23 and has a plurality of steps 486 for gaining access to the platform to control the various movements of the mobile tool unit. An operator's seat 487 is provided on the platform 484 for the convenience of the operator, since he must ride with the carriage during a cycle of operation.

In operation, assuming that the basket 51 is in a vertical load position, the container 34 is loaded into the basket 51 by any suitable means, such as a crane. The operator then manipulates the several switches on the control box 481 to selectively actuate the various clamping mechanisms 52 to align and lock the container within the basket. After the container is locked within the basket the operator manipulates another switch on the control box 481 which actuates the motor 53 to pivot the basket to the horizontal work position. At this time the brake mechanism 377 is actuated to move the nose

portions 392 and 393 out of braking engagement with the large sprocket gear 371. After the basket 53 has been positioned in the horizontal work position the motor 53 is stopped and the operator then manipulates another switch on the control box 481 to actuate the basket locking mechanism 411 to lock the basket in horizontal axial alignment with the ram 24. When in this position another switch on the control box 481 is manipulated to effect movement of the hood 58 into engagement with the open end of the container 34.

The operator then moves to the platform 484 and manipulates a switch on the control box 482 to energize the motor 42 to advance the carriage 23, at a rapid rate, towards the container 34. When the cutter head 26 reaches the hood 58 the advancing speed of the carriage 23 is reduced to a feed rate to enter the head 26 into the hood 58 and container 34. When the head 26 is just within the container 34 the operator manipulates another switch to actuate the motor 317 of the scraper mechanism 41 to extend the scraping tool 32 into engagement with the side of the container 34. At this time another switch is manipulated to energize the motor 28 to rotate the ram 24, while the carriage is moving to advance the ram at a feed rate. In this manner the dendritic by-product which is present on the inner surface of upper portion of the container, adjacent the opening, is removed.

When all of the dendritic by-product has been removed the operator stops the forward motion of the carriage, and the rotation of the ram, and retracts the scraping tool. He then retracts the carriage 23 at a rapid rate. The by-product material lying loose in the container 34 is then removed either manually or by pivoting the basket so that the open end of the container is lowered to dump the loose material out. In either case after the by-product material has been removed the operator again advances the carriage 23 at a rapid rate up to the point where the head 26 is about to enter the hood 58 and then reduces the advancing rate of movement of the carriage to a feed rate. When the cutter 27 nears the mass of titanium sponge, which is to be removed, the operator through proper switches on the control box 482 energizes the motor 28 to rotate the ram 24 and energizes the motor 32 to effect rotation of the cutter 27. At this time the advancing movement of the carriage is further reduced to a fine feed rate. The cutter then operates upon the sponge mass 36 to reduce it to chips leaving only a relatively thin layer 37 of impure titanium on the wall of the container.

The pieces or chips of titanium are removed from within the container to the chip chute in the hood 58 by the action of the spiral auger 33 which encircles the ram 24 and head 26. After the titanium sponge 36 has been removed from the container, the operator stops the rotation of the cutter 27 and the ram 24 and stops the forward motion of the carriage 23. The carriage is then retracted at a rapid rate to its extreme rightwardly position, as shown in FIG. 1. The hood 58 is then retracted, the basket lock 411 released and the motor 53 actuated in the opposite direction to pivot the basket to the unload or vertical position. As the motor 53 is actuated to pivot the basket to the unload position hydraulic pressure is supplied to the cylinder 403 of the brake mechanism 402 to compress the springs 401 to release the braking action on the large sprocket gear 371. When the basket is in the unload position the driving action of the motor 53 is stopped and as this occurs, the supply of fluid pressure to the cylinder 403 is stopped and the springs 401 again react to re-engage the braking mechanism with the sprocket gear 371. The container clamps 52 are then released and the container 34 may be removed from the basket 51 and another container inserted therein for another operation.

From the foregoing detailed description of an explanation of the operation of the exemplifying machine tool herein set forth as a practical embodiment of the present invention, it will be apparent that there has been provided an improved machine tool especially adapted for machining a mass of material out of a container and especially out of a container having a semispherical bottom, and capable of positioning the container from a load position to a work position in axial alignment with the cutter carrying ram.

Although the illustrative embodiment of the invention has been described in considerable detail for the purpose of disclosing a practical operative structure whereby the invention may be practiced advantageously, it is to be understood that the particular apparatus described is intended to be illustrative only, and the various novel characteristics of the invention may be incorporated in other structural forms without departing from the spirit and scope of the invention as defined in the subjoined claims.

The principles of this invention having now been fully explained in connection with the foregoing description, we hereby claim as our invention:

1. In a machine tool for removing as mass of material from a cylindrical container having a concave bottom: a mobile carriage; a ram rotatably supported on and disposed parallel to the line of motion of said carriage; a spindle head secured to one end of said ram for rotation therewith; a cutter spindle rotatably mounted in said head, the axis of said spindle being disposed to intersect the axis of said ram; a cutter secured to said spindle for rotation therewith; a frame member; a container receiving basket pivotally supported on said frame member, said basket being pivotable from a load position to a work position and back to the load position; operable means carried by said basket to adjust and lock said container therein; power means operably connected to pivot said basket from the load position to the work position, said work position being in a plane wherein the axis of said basket coincides with the axis of said ram; power means carried by said mobile carriage and operably connected to propel said carriage to move said ram into said container; second power means carried by said carriage operably connected to rotate said ram; third power means carried by said carriage operably connected to rotate said spindle; whereby said container may be positioned to receive said cutter and said carriage will move said cutter into said container while said ram is rotating to rotate said cutter bodily about its axis and said spindle is rotating to rotate said cutter about its axis.

2. In a machine tool for removing a mass of material out of a container, the combination of: a mobile tool unit comprising a movable carriage; power operated means adapted to reciprocate said carriage; a ram rotatably supported on and disposed parallel to the line of motion of said carriage in a horizontal plane having one end extending beyond said carriage; a second power operated means carried on said carriage operably connected to rotate said ram; a cutter head secured to the extending end of said ram for rotation therewith; a circular cutter rotatably supported on said head for independent rotation about its own axis, the axis of said cutter being disposed at an angle to intersect the axis of said ram; a third power operated means carried by said carriage operably connected to rotate said cutter; all of said power operated means being operable selectively or simultaneously; a container positioning unit comprising a supporting member; a basket pivotally supported on said supporting member; power operated means operably connected to pivot said basket from a load position to a horizontal work position and to return it to said load position, said basket when pivoted to the horizontal work position being in axial alignment with the axis of said ram; and a plurality of locking mechanisms carried by said basket operably disposed to lock said container in axial alignment within said basket; whereby said container may be positioned in a horizontal work position in axial alignment with said ram, and said cutter may be fed into said container and

be made to generate a concave cavity in the material within the container.

3. In a machine tool for machining a mass of material out of a cylindrical container having a concave bottom, the combination of: a movable carriage; power operated means carried by said carriage and operably connected to move said carriage in its path of travel; a ram rotatably supported on said carriage and being disposed parallel to the path of travel of said carriage; second power-operated means carried by said carriage and operably connected to rotate said ram; a spindle rotatably supported on said ram with its axis disposed at an angle to intersect the axis of said ram; third power-operated means carried by said carriage and operably connected to rotate said spindle; a circular cutter secured to one end of said spindle for rotation therewith, the cutting surface of said cutter being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; a support; a container basket pivotally mounted on said support for movement from a load position to a work position, said basket when in the work position being in axial alignment with the axis of said ram; and power operated means carried by said basket support and operably connected to pivot said basket from a load position to the work position and to return it; whereby said container may be positioned in axial alignment with said ram and said carriage will be moved to feed said cutter into said container and said ram will be rotated to rotate said cutter in an orbital path around the axis of said ram and said cutter will be rotated about its own axis as it is being fed into the container and rotated in an orbital path around the axis of the ram to generate a concave cavity in the mass of material contained in said container.

4. In a machine tool for removing product from a container, the combination of: a container positioning unit comprising a frame; a container receiving basket pivotally supported on said frame; a motor on said frame operably connected to pivot said basket from a load position to a work position and to return it to the load position; a lock mechanism carried on said frame and operable to lock said basket in a work position; a plurality of container locks on said basket disposed to be engageable with said container to lock said container within said basket; a brake mechanism carried by said frame and operably connected to prevent movement of said basket; means operably connected to disengage said brake mechanism from braking engagement with said basket when said motor is actuated; a hood unit comprising a movable frame having an opening therethrough, the axis of the opening in said frame coinciding with the axis of said container when in a work position; a piston and cylinder mechanism operably connected to move said hood unit into engagement with the open end of said container when said container is in a work position to receive material from the container; a tool unit comprising a movable carriage; means to guide said carriage in its path of travel; a ram rotatably supported on and disposed parallel to the line of motion of said carriage, the axis of said ram being disposed to coincide with the axis of said container when in a work position; a motor on said carriage operably connected to rotate said ram; a spindle head secured to one end of said ram for rotation therewith; a spindle supported in said head for independent rotation therein, the axis of said spindle being disposed at an angle to intersect the axis of the ram; a circular cutter removably secured to said spindle and constructed and arranged so that the cutting surface thereof meets the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; a second motor on said carriage operably connected to rotate said spindle; a scraping tool carried on said tool head; a motor on said tool head operably connected to extend said scraping tool outwardly of said head into contact with the wall of said container; a spiral auger secured to the peripheral surface of said ram and extend on to said head; a third motor on said carriage operably connected to propel said carriage on said guide means to move said cutter into said container and to retract it therefrom; and means on said carriage operably connected to actuate said motors selectively.

5. In a machine tool for removing a mass of material out of a cylindrical container; a movable carriage; an electric motor carried on said carriage and operably connected to move said carriage in its path of travel; a ram rotatably supported in said carriage parallel to the path of travel of said carriage, said ram having one end extending beyond said carriage; a gear transmission carried by said carriage and operably connected to rotate said ram; a second electric motor carried by said carriage and operably connected to drive said gear transmission; a cutter head secured to the extending end of said ram for rotation with it; a spindle rotatably supported in said head, the axis of said spindle being disposed at an angle of 45° to the axis of said ram; a spindle gear transmission carried in said head and operably connected to rotate said spindle; a drive shaft rotatably supported in said ram and operably connected to drive said spindle gear transmission; a third electric motor carried by said carriage and operably connected to drive said drive shaft; a circular cutter secured to one end of said spindle for rotation therewith, the cutting surface of said cutter being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is bodily rotated in an orbital path about the axis of said ram; a container positioning member operable to position said container from a load position to a work position and to return it to the load position, said container when positioned in the work position being in axial alignment with the axis of said ram; power means carried by said positioning member operably connected to actuate said member; and locking means carried by said positioning member and operable to adjustably position said container in axial alignment therein and to lock said container in said positioning member.

6. In a machine tool for removing a mass of material out of a cylindrical container having a concave bottom, the combination of: a mobile tool unit comprising a carriage guided for reciprocation along a fixed path, said carriage being self-reciprocating at a plurality of rates selectively; a ram rotatably supported on and disposed parallel to the line of movement of said carriage and having one end extending beyond said carriage; a unitary gear transmission carried by said carriage and operably connected to rotate said ram; an electric motor carried by said carriage operably connected to drive said unitary gear transmission; a cutter head secured to the extending end of said ram for rotation with it; a spindle rotatably supported in said head, the axis of said spindle being disposed at an angle to intersect the axis of said ram; a gear transmission within said head and operably connected to rotate said spindle; power operated means carried on said carriage operably connected to drive said gear transmission in said head; a circular cutter secured to said spindle for rotation therewith, the cutting surface of said cutter being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; a spiral auger secured to the periphery of the ram and extending substantially the extending length of the ram and terminating at a point short of said cutter; an extendable scraper mechanism secured to the exterior of said head in position to be engageable with the wall of said container, said scraper mechanism being disposed on said head in a position to be non-interfering with the cutting action of said cutter when retracted; a container positioning unit

comprising a supporting member; a basket pivotally supported on said supporting member coaxial with the ram axis; power operated means operably connected to pivot said basket from a vertical load position to a horizontal work position; a brake mechanism carried by said supporting member and operably disposed to be normally in braking engagement with said basket to maintain said basket in any position when said power operated means for pivoting said basket is inoperative; operable means connected to effect a release of the brake action of said brake mechanism when said power operating means for pivoting said basket is operative; a basket locking mechanism carried by said supporting member and operable to lock said basket in a horizontal work position; and a plurality of container adjusting and locking mechanisms secured to said basket and operably disposed to engage the exterior of said container within said basket, said locking mechanism being operable selectively to adjustably position said container in axial alignment with said basket and to lock said container therein.

7. In a machine tool for removing a mass of material out of a cylindrical container having a hemispherical bottom, the combination of: a mobile tool unit comprising a self-propelled carriage adapted to be reciprocated in a fixed path of travel; a variable speed transmission carried within said carriage and operably connected to reciprocate said carriage at a selected rate within the limits of said transmission; a motor carried by said carriage and operably connected to drive said variable speed transmission; a ram rotatably supported in and disposed parallel to the line of movement of said carriage and having one end extending beyond said carriage; a unitary gear transmission supported in said carriage and operably connected to rotate said ram, said unitary gear transmission constructed and arranged so as to be removable as a unit from said carriage; a second motor carried by said carriage and operably connected to drive said unitary gear transmission; a cutter supporting head secured to the extending end of said ram for rotation with it; a spindle rotatably supported in said head and having its axis disposed at an angle of 45° to the axis of said ram; a spindle gear transmission carried within said head and operably connected to rotate said spindle; a third motor carried by said carriage and operably connected to drive said spindle gear transmission; a circular cutter secured to said spindle for rotation therewith, the cutting surface of said cutter being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; a spiral auger secured to the periphery of said ram and extending substantially over the length of the extending portion of said ram to a point short of said cutter; an extendible scraper mechanism including power means for actuating said scraper mechanism secured to the exterior of said head, said scraper mechanism constructed and arranged so as to be engageable with the wall of said container when extended to scrape said wall and when retracted to be disposed in a non-interfering position relative to said cutter; a container positioning unit comprising a supporting member; a container basket pivotally supported on said supporting member coaxial with the ram axis; power means carried by said supporting member and operably connected to pivot said basket from a load position to a work position and to return it to the load position; a brake mechanism carried by said supporting member and operably connected to maintain said basket in any position, said brake mechanism constructed and arranged so as to normally exert a braking action on said basket when said power means for pivoting said basket is inoperative; a plurality of container locking mechanisms secured to said basket and adapted to be engageable with said container therein to axially align said container within said basket and to lock said basket therein; individual power actuating means operably connected to each of said locking mechanism to engage or disengage said locking mechanisms with said container selectively; a movable hood engageable with the open end of said container when in a work position to receive chips of the material produced by said cutter and propelled outwardly of said container by said auger; and power means operably connected to move said hood into and out of container engaging position.

8. In a machine tool for machining a mass of material out of a cylindrical container having a concave bottom, the combination of: a movable carriage; power-operated means carried by said carriage operably connected to move said carriage in its path of travel; a ram rotatably supported on said carriage and being disposed parallel to the path of travel of said carriage; a second power operated means carried by said carriage operably connected to rotate said ram; a cutter carrying head secured to one end of said ram for rotation therewith; a circular cutter mounted on said head for bodily rotation with it and for independent rotation about its own axis, the axis of said cutter being disposed at an angle so that it intersects the axis of said ram, said cutter having cutting elements located to meet the axis of said ram as said cutter is being rotated about its own axis and while it is being bodily rotated in an orbital path about the axis of said ram; a third power-operated means carried by said carriage operably connected to rotate said cutter; an extendible scraper mechanism including power means for actuating said scraper mechanism secured to the exterior of said head and adapted to be engageable with the wall of said container when extended and when retracted to be disposed in a non-interfering position relative to said cutter; a support; a container receiving basket pivotally mounted on said support for movement from a load position to a work position, said basket when in the work position being disposed in axial alignment with the axis of said ram; and power-operated means carried by said support operably connected to pivot said basket with said container from a load position to a work position and to return it.

9. In a machine tool for removing a mass of material out of a cylindrical container having a concave bottom, the combination of: a work positioning unit comprising a supporting member; a container receiving basket pivotally supported on said supporting member; power-operated means operably connected to pivot said basket from a load position to a work position and to return it; a plurality of locking mechanisms carried by said basket and operably disposed to engage said container to lock said container within said basket in axial alignment therein; a brake mechanism on said supporting member operably disposed to be normally in braking engagement with said basket; power means on said brake mechanism and operably connected to effect a release of the braking action of said brake mechanism whenever said basket is being pivoted; locking means carried by said supporting member and operably connected to lock said basket in the work position; a tool unit comprising a wheeled carriage; a trackway disposed to movably support said carriage in its path of travel; an elongated stationary gear rack disposed in parallel relationship with said trackway; a variable speed transmission carried on said carriage and operably engaged with said gear rack to actuate said carriage in its path of travel; power means carried by said carriage and operably connected to said transmission to drive it; a ram rotatably supported on and disposed parallel to the line of movement of said carriage and having its axis disposed so as to coincide with the axis of said basket when said basket is in a work position; a second transmission carried by said carriage and operably connected to rotate said ram; a second motor carried by said carriage and operably connected to drive said second transmission; a tool head secured to one end of said ram for rotation with it; a spindle rotatably supported in said tool head in a manner that its axis intersects the axis of said ram; a spindle transmis-

sion carried in said tool head and operably connected to rotate said spindle; a third motor carried on said carriage and operably connected to drive said spindle transmission; a circular cutter secured to said spindle for rotation therewith, the cutting surface thereon being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodlly rotated in an orbital path about the axis of said ram; and a scraper mechanism secured to said tool head and operable to engage the interior surface of said container when actuated, said scraper mechanism including power means for actuating said scraper mechanism; whereby said container may be moved to a work position and said tool head fed into said container while said scraper mechanism is actuated into engagement with the interior of said container and rotated in an orbital path about the axis of said ram and said cutter may be rotated on its axis while moving in an orbital path about the axis of said ram to thereby generate a concave cavity in the material within the container.

10. In a machine tool for removing a mass of material out of a cylindrical container having a concave bottom: a wheeled carriage; a pair of tracks supporting said carriage thereon and defining its path of travel; a gear rack mounted between said rails and parallel thereto; power-operated means carried by said carriage operably connected to said gear rack to reciprocally propel said carriage on said tracks; a ram rotatably supported on said carriage parallel to said tracks; second power-operated means carried on said carriage and operably connected to rotate said ram; a spindle rotatably supported on one end of said ram with its axis disposed at an angle so that it intersects the axis of said ram; a flat circular cutter secured to said spindle for rotation with it and so constructed and arranged that the cutting surface thereof will meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; third power-operated means carried on said carriage and operably connected to rotate said spindle; whereby said carriage will feed said cutter into said container while said cutter is moving in an orbital path about the axis of said ram and said spindle is operable to rotate said cutter on its axis so that said cutter will generate a concave cavity in the material in the container.

11. In a machine tool for machining product out of a cylindrical container having a concave bottom, the combination of: a mobile tool unit comprising a movable supporting carriage; a ram rotatably supported on said carriage in a horizontal plane and having one end extending beyond said carriage; a cutter head secured to the extending end of said ram for rotation with it; a spindle rotatably supported in said head the axis of which is disposed at an angle to intersect the axial line of said ram; a flat circular cutter secured to said spindle for rotation therewith, said cutter being of a size and located so that its cutting surface will meet the axis of said ram as it is being rotated about the axis of said spindle and it is being bodily rotated in an orbital path about the axis of said ram; power-operated means operably connected to move said carriage at a plurality of rates in either direction selectively; a gear transmission operably disposed within said head to rotate said spindle; power-operated means carried by said carriage and operably connected to drive said gear transmission independently of the movement of said carriage; and power-operated means carried by said carriage and operably connected to rotate said ram independently of the rotation of said spindle and the movement of said carriage; whereby said cutter may be fed into said container and said cutter will generate a concave cavity in the material within the container.

12. In a machine tool for removing a mass of material from a container having a concave bottom, the combination of: a wheeled carriage; a pair of tracks supporting said carriage and defining its path of travel; a gear rack mounted between said rails and parallel thereto; power-operated means carried by said carriage and operably connected to said gear rack to move said carriage in its path of travel; a ram rotatably supported on said carriage parallel to said tracks; a cutter head secured to one end of said ram for rotation with it; a spindle rotatably supported in said head on an axis disposed at an angle so that the axis of the spindle intersects the axis of the ram; a circular cutter secured to said spindle for rotation therewith, the cutting surface of said cutter being located to meet the axis of said ram as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said ram; a transmission carried in said head and operably connected to rotate said spindle; second power-operated means carried by said carriage and operably connected to drive said transmission independently of the movement of said carriage; third power-operated means carried by said carriage and operably connected to rotate said ram independently of the rotation of said spindle and the movement of said carriage; and a scraper mechanism secured to the exterior of said head and operably connected to be engageable with the interior of the wall of said container and to be retractible to a non-interfering position relative to said cutter, said scraper mechanism including power means operably connected to actuate said scraper mechanism; whereby said cutter may be fed into said container and will generate a concave cavity in the material within the container.

13. In a container positioning unit for a machine tool for removing product from a container and having a movable tool unit: a frame; a container receiving basket pivotally supported in said frame, said basket being pivotable from a load position to a work position and return; power means on said frame operably connected to pivot said basket from the load position to the work position and to return it to the load position; a brake carried by said frame and being operably connected to hold said basket in any position upon failure of said power means; a plurality of container locking means carried by said basket and disposed thereon to be engageable with said container and operable to adjust said container in axial alignment with said basket and to lock said container in said basket; and basket locking means carried by said frame and operable to engage said basket to lock said basket in a work position.

14. In a container positioning unit for a machine tool for removing product from a container: a frame; a basket pivotally supported on said frame and adapted to receive said container; operable means connected to pivot said basket from a load position to a work position and to return it to the load position; a brake mechanism carried on said frame and operably disposed to be normally in braking engagement with said basket to maintain said basket in any position, said brake mechanism having resilient means operable to normally maintain said brake mechanism in braking engagement; a fluid motor on said brake mechanism operably connected to disengage said brake mechanism from braking engagement with said basket when said basket is being pivoted; a lock mechanism mounted on said frame and operably disposed to be engageable with said basket to lock said basket in the work position; and a plurality of container locks mounted on said basket and adapted to be engageable with said container to lock said container in axial alignment within said basket.

15. In a container positioning unit for a machine tool for removing product from a container: a frame; a basket adapted to receive said container pivotally supported on said frame; a sprocket wheel secured to said basket; a motor carried on said frame and operably connected to said sprocket wheel to pivot said basket from a load position to a work position and to return it to the load position; a brake mechanism carried on said frame and oper-

ably disposed to normally engage said sprocket wheel to maintain said basket in any position; a fluid motor on said brake mechanism operably connected to disengage said brake mechanism from engagement with said sprocket wheel when said basket is being pivoted; a lock mounted on said frame and operably disposed to be engageable with said basket to lock said basket in the work position; and a plurality of container locks mounted on said basket and adapted to be engageable with said container to lock said container in axial alignment within said basket.

16. In a tool head for rotatable and axially movable member of a machine tool: a housing; a spindle rotatably supported in said housing, the axis of said spindle being obliquely disposed in said housing in a manner so that it intersects the axis of said movable member when the housing is mounted on such member; a transmission carried within said housing and operably connected to rotate said spindle; a circular cutting tool removably secured to said spindle for rotation therewith, the cutting surface of said cutting tool being located to meet the axis of said movable member as said cutting tool is rotated about the axis of said spindle; a scraper tool movably secured to the exterior of said housing; and power-operated means secured to the exterior of said housing and operably connected to extend said scraper tool to a position beyond the effective cutting range of said circular cutting tool and to retract said scraper tool to a non-interfering position relative to said circular cutting tool.

17. In a tool head for a machine tool having a member which is rotatably and axially movable: a casing secured to said movable member and having its major axis coinciding with the axis of said movable member; a spindle rotatably supported in said casing the axis of which is obliquely disposed relative to the axis of said movable member; a gear secured to said spindle to rotate it; a first shaft rotatably supported in said casing on an axis which is parallel to the axis of said spindle but off-set therefrom; a pinion gear secured to said first shaft for rotation therewith and adapted to be in meshing engagement with said gear on said spindle; a driving gear secured to said first shaft to rotate it; a second shaft rotatably supported in said casing on an axis parallel to the axes of said spindle and said first shaft but off-set therefrom; a pinion gear secured to said second shaft for rotation with it and adapted to be in meshing engagement with said driving gear on said first shaft; a beveled gear secured to said second shaft to rotate it; a power input shaft rotatably supported in said casing on an axis which coincides with the major axis of said casing and with the axis of said movable member; a beveled pinion secured to said power input shaft adapted to be in meshing engagement with said beveled gear on said second shaft; and a circular cutter secured to said spindle to rotate with it, said cutter being of a size so that its cutting surface is located to meet the axial line of said movable member as said cutter is being rotated about the axis of said spindle and while it is being bodily rotated in an orbital path about the axis of said movable member.

18. In a container positioning unit for a machine tool for removing product from a container, the combination of; a frame; a container receiving basket pivotally supported on said frame, said basket being pivotable from a load position to a work position and return; power means on said frame operably connected to pivot said basket from the load position to the work position and to return it to the load position; a plurality of individually actuatable container adjusting and clamping means carried by said basket and operable to engage a container therein to adjust the container into axial alignment with said basket and to clamp the container in said basket for movement with it, each of said adjusting and clamping means comprising; a body having in cross section a U-shaped configuration; a clamp wedge slidably housed within said body; a clamp block movably contained within said body for movement in a plane perpendicular to the path of movement of said clamp wedge; a clamp jaw removably secured to said clamp block; resilient means operably connected to said clamp jaw and said body to urge said clamp block and said clamp jaw inwardly into said body; a screw member threadedly engaged in said clamp wedge and having one end rotatably supported by said body; and power means carried by said basket and operably connected to rotate said screw in either direction selectively to thereby effect a movement of said clamp wedge in one direction to move said clamp jaw outwardly of said body when said screw is driven by said power means in one direction or said clamp wedge may be moved in the opposite direction to permit said clamp jaw to move inwardly into said body under the urging of said resilient means when said screw is driven by said power means in the opposite direction; whereby a container in said basket may be adjusted into axial alignment with the axis of said basket through individual actuation of said adjusting and clamping means and the container when adjusted within said basket may be clamped therein by actuating all of said adjusting and clamping means to effect a tight engagement of their clamp jaws with the container to thereby lock the container within said basket.

19. In a container positioning unit for a machine tool for removing product from a container, the combination of; a frame; a container receiving basket pivotally supported on said frame, said basket being pivotable from a load position to a work position and return; power means on said frame operably connected to pivot said basket from the load position to the work position and to return it to the load position; a plurality of individually operable container adjusting and clamping means carried by said basket and operable to engage a container therein to adjust the container into axial alignment with said basket and to clamp the container therein for movement with said basket, each of said adjusting and clamping means comprising; a hollow elongated housing which in cross section is of U-shaped configuration, a movable clamp wedge contained within said housing, said clamp wedge being provided with a longitudinal bore and having its bottom surface inclined; a threaded nut tightly fitted within the bore provided in said clamp wedge in non-rotating relationship with said clamp wedge; a screw threadedly engaged in said nut and having one end rotatably supported by said housing; a clamp block having an inclined top surface which is complementary to the inclined surface of said clamp wedge and adapted to be in engagement therewith, said clamp block being movable inwardly or outwardly of said housing in a direction perpendicular to the direction in which said clamp wedge is movable and under the influence of said clamp wedge; a clamp jaw removably secured to the bottom surface of said clamp block to form a unit assembly; resilient means secured to said unit assembly and to said housing to resiliently urge said unit assembly inwardly of said housing; means pivotally connected to said housing and to said unit assembly to prevent movement of said unit assembly in the direction of movement of said clamp wedge; and power means operably connected to rotate said screw in either direction selectively to thereby effect movement of said clamp wedge in one direction to move said unit assembly outwardly of said housing when said screw is rotated in one direction by said power means or said clamp wedge may be moved in the opposite direction to permit said unit assembly to retract inwardly into said housing under the influence of said resilient means when said power means is actuated to rotate said screw in the opposite direction; whereby a container in said basket may be adjusted into axial alignment with the axis of said basket through individual operation of said adjusting and clamping means and the container when adjusted within said basket may be clamped therein by operating all of said adjusting and clamping means to effect a tight engagement of their

clamp jaws with the container to thereby lock the container within said basket so that it will move with it.

20. In a container positioning unit for a machine tool for removing product from a container, the combination of; a frame; a basket pivotally supported on said frame and adapted to receive the container; means operably connected to pivot said basket from a load position to a work position and to return it to the load position; a brake mechanism carried on said frame and operably disposed to be normally in braking engagement with said basket to maintain said basket in any position, said brake mechanism having resilient means operable to normally maintain said brake mechanism in braking engagement with said basket; a fluid motor on said brake mechanism operably connected to disengage said brake mechanism from braking engagement with said basket when said basket is being pivoted; a lock mechanism mounted on said frame and operably disposed to be engageable with said basket to lock it in the work position; a plurality of individually operable container adjusting and clamping means carried by said basket and operable to engage a container in said basket to adjust the container into axial alignment with the axis of said basket and to clamp the container therein so that the container and said basket will move as a unit, each of said adjusting and clamping means comprising; a hollow elongated housing which in cross section is of U-shaped configuration; a movable clamp wedge provided with a longitudinal bore and having an inclined bottom surface contained within said housing; a threaded nut tightly fitted within the bore provided in said clamp wedge in non-rotating relationship with said clamp wedge; a screw member threadedly engaged in said nut and having one end rotatably supported by said housing; a clamp block having an inclined top surface which is complementary to the inclined bottom surface of said clamp wedge and adapted to be in engagement therewith, said clamp block being movable inwardly or outwardly of said housing under the influence of said clamp wedge and in a direction perpendicular to the direction in which said clamp wedge is movable; a clamp jaw removably secured to the bottom surface of said clamp block to form a unit assembly; resilient means secured to said unit assembly and said housing and operable to urge said unit assembly inwardly of said housing; holding means pivotally connected to said housing and to said unit assembly to prevent movement of said unit assembly in the direction of the movement of said clamp wedge; and power means carried on said basket and operably connected to rotate said screw in either direction selectively to thereby effect movement of said clamp wedge in one direction to move said unit assembly outwardly of said housing when said screw is rotated by said power means in one direction or when said power means is operated to rotate said screw in the opposite direction said clamp wedge will be moved in the opposite direction to permit said unit assembly to move inwardly into said housing under the influence of said resilient means; whereby a container within said basket may be adjusted into axial alignment with the axis of said basket by the operation of said individual adjusting and clamping means and the container when adjusted within said basket may be clamped therein by operating all of said adjusting and clamping means to effect a tight engagement of their clamp jaws with the container to thereby lock the container within said basket so that it will move with said basket.

21. In a container positioning unit for a machine tool for removing product from a container, the combination of; a frame; a basket pivotally supported on said frame and adapted to receive the container; a sprocket wheel secured to said basket; a motor carried on said frame and operably connected to said sprocket wheel to pivot said basket from a load position to a work position and to return it to the load position; a brake mechanism carried by said frame and operably disposed to

normally engage said sprocket wheel to maintain said basket in any pivoted position; a fluid motor on said brake mechanism operably connected to effect a disengagement of said brake mechanism from engagement with said sprocket wheel when said basket is being pivoted; a lock mechanism on said frame and operably disposed to be engageable with said basket to lock said basket in the work position; a plurality of individually operable container adjusting and clamping means carried by said basket and operable to engage a container within said basket to adjust it into axial alignment with the axis of said basket and to clamp the container therein so that the container and said basket will move as a unit, each of said adjusting and clamping means comprising; a hollow elongated housing which in cross section is of U-shaped configuration; a movable clamp wedge provided with a longitudinal bore and having an inclined bottom surface contained within said housing; a threaded nut tightly fitted within the bore provided in said clamp wedge in non-rotating relationship with said clamp wedge; a screw threadedly engaged in said nut and having one end rotatably supported by said housing; a clamp block having an inclined top surface which is complementary to the inclined bottom surface of said clamp wedge and adapted to be in engagement therewith, said clamp block being movable inwardly or outwardly of said housing under the influence of said clamp wedge in a direction perpendicular to the direction in which said clamp wedge is movable; a clamp jaw removably secured to the bottom surface of said clamp block to form a unit assembly; resilient means secured to said unit assembly and to said housing to resiliently urge said unit assembly inwardly of said housing when said clamp wedge is moved to permit of such movement; holding means pivotally connected to said housing and to said unit assembly to prevent movement of said unit assembly with said clamp wedge; and power means carried on said basket and operably connected to rotate said screw in either direction selectively to thereby effect movement of said clamp wedge in one direction to move said unit assembly outwardly of said housing when said power means is operated in one direction or when said power means is operated to rotate said screw in the opposite direction said clamp wedge will be moved in the opposite direction to permit said unit assembly to move inwardly into said housing under the influence of said resilient means; whereby a container within said basket may be adjusted into axial alignment with the axis of said basket by the operation of said individual adjusting and clamping means and the container when adjusted within said basket may be clamped therein by operating all of said adjusting and clamping means to effect a tight engagement of their clamp jaws within the container to lock the container in said basket so that the container will move with said basket.

22. The method of removing a mass of material from a cylindrical container having a concave bottom comprising; locating a flat circular cutter with its axis disposed at an angle to the axis of the container and with its periphery intersecting the axis of the container; rotating said cutter about its axis; revolving said cutter bodily about the axis of the container while said cutter is rotating about its own axis; and feeding the rotating cutter into the container for operating on the mass of material therein; whereby said cutter will form a concavity in the material to conform to the configuration of the bottom of the container.

23. The method of removing a mass of material from a cylindrical container having a concave bottom comprising; supporting a spindle for axial movement with its axis coinciding with the axis of the container; mounting a flat circular cutter on the end of said spindle adjacent to the container; tilting said cutter so that its axis is located at an angle to the axis of said spindle with the periphery of said cutter intersecting the axis of said spindle;

rotating said cutter about its axis; rotating said spindle about its axis to rotate said cutter bodily in an orbit while it is rotating about its axis; and feeding said spindle axially to move said rotating cutter into said container; whereby said rotating cutter will form a concavity in the material to conform to the configuration of the bottom of the container.

24. In a machine tool for machining a mass of material out of a container; a carriage; a ram rotatably supported by said carriage and having its axis operationally coinciding with the axis of the container; a spindle rotatably supported by said ram for rotation independent of said ram, the axis of said spindle being disposed at an angle to the axis of said ram; a circular cutter supported by said spindle for rotation therewith in position with its periphery intersecting the axis of said ram so that said cutter is rotatable about its axis with said spindle while rotating bodily with said ram about the axis of said ram; guide means operative to guide said carriage in a path of travel to effect a feeding movement of said rotating cutter toward the mass of material in the container for machining the material out of the container; a scraper supported by said ram for rotation therewith and movable from an inoperative to an operative position to scrape the interior wall of the container while it is rotating with said ram; and means operative with the rotation of said ram to extract chips of the material from the container as they are formed by said cutter and said scraper.

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