CLASS 409 GEAR CUTTING, MILLING, OR PLANING

1. GEAR CUTTING
   .With regulation of operation by use of templet, card, or other replaceable information supply
   ..Including follower for templet
   .And burnishing simultaneously in drive means
   .With work or product advancing
   .Utilizing transfer arm
   ..Using relatively reciprocating or oscillating cutter
   .Gear tooth shape generating
   ....Hobbing
   ...Process
   ....Generating tooth for bevel gear
   ...Including means to shift hob between cutting passes
   ...With control means energized in response to activator stimulated by condition sensor
   ...Plural hobs
   ...Including infeed means
   ......To infeed along axis of work rotation
   ......Infeed of cutter
   ......And infeed radially of axis of work rotation
   ......Vertically
   ......To infeed radially of axis of work rotation
   ......Infeed of cutter
   ......And infeed tangentially of work axis
   ...Milling with radial faced tool
   ...Process
   ...Adapted to cut bevel gear
   ....With means to continuously rotate work and means to conform all teeth of gear
   ....Bevel gear having nonparallel opposing tooth flanks
   ....Including rotary cutter cradle
   ..By relative axial movement between synchronously indexing or rotating work and cutter
   ...Crowning
   ...Displacing cutter axially relative to work (e.g., gear shaving, etc.)

2. Thread or helix generating
   .Process
   ..With means to regulate operation by use of templet, card, or other replaceable information supply
   ..Complete cycle
   ..To regulate cutting depth (e.g., relief, taper, etc.)
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...To regulate rate of motion (e.g., stopping, etc.)
..With nonthread or nonhelix generating, milling cutter
..With means to advance work or product
..Plural cutters or work holders
..With planetary cutter
..Work means to move work axially and means to interrelate work movement with cutter rotation
..With means to rotate work and means to interrelatedly infeed the work relative to the cutter
...Means to infeed the cutter
..With means to circumferentially adjust the position of the cutter with respect to the work
..With regulation of operation by templet, card, or other replaceable information supply
..With sensing of numerical information and regulation without mechanical connection between sensing means and regulated means (i.e., numerical control)
...To cut lock key
...Using templet other than a key
...Complete cycle
..Process
..Reproducing means
...Including pantograph cutter-carrier
....And means to move work at work station
......About work axis
....Pivotingally supported for vertical movement
....And means to counterbalance carrier
....Including plural cutters
....By use of pivotally supported tracer
....Duplicating means
....With means for operation without manual intervention
......To make a double curvature foil
....Including means to sense optical or magnetic image

....With means to support templet above or under work
....Including tracer adapted to trigger electrical energy
....To actuate electrically driven work or tool moving means
....To actuate fluid driven work or tool moving means
....Including tracer adapted to trigger fluid energy
....To actuate fluid driven work or tool moving means
....Including cutter and tracer fixed to move laterally together
....And provision for circumferential relative movement of cutter and work
....Including plural cutters
....Including cross-slide tool carrier
....Including plural cutters
....Including cross-slide tool carrier
....With means to support templet above or under work
....With provision for circumferential relative movement of cutter and work
....Including plural cutters
....Including cross-slide tool carrier
....And means for operation without manual intervention
....Including tracer adapted to trigger electrical or fluid energy
....For using planar templet in cutting profile (e.g., contour map from planar map, etc.)
....Including means for operation without manual intervention
....Including means for operation without manual intervention
....Including simultaneously usable plural tracers or including tracer adapted to simultaneously use plural templets
....To make a double curvature foil
...To make a double curvature foil

...Including cutter and tracer fixed to move together

...With provision for circumferential relative movement of cutter and work

...And provision for circumferential relative movement of cutter and work

...Including cutter and tracer fixed to move together

...Templet, tracer, or cutter

...Tracer

...Adapted to trigger electrical energy

...Photocell

...Adapted to trigger fluid energy

...Templet

..Process

...Including infeeding

..With means to weigh or test work or product

..With means to protect operative or machine (e.g., guard, safety device, etc.)

..With means to control temperature or lubricate

..Cutter or work

..With means to remove chip

..Means to trim edge

..Means to remove scale or raised surface imperfection

..Means to remove flash or burr

..With means to dampen vibration

..Means to mill epitrochoidal shape

..Means for internal milling

..With detachable or auxiliary cutter support to convert cutting action

..Including means to infeed work to cutter

..With compensation for backlash in drive means

..With control means energized in response to activator stimulated by condition sensor

...In response to cutter or cutter carriage

...In response to work or work carriage

...To control rate of infeed or return

...To control limit of infeed

.....Adapted to hydraulically or pneumatically stimulate control

.....Adapted to electrically stimulate control

...To control rate of infeed or return

...To effect stopping of infeed

...With means to change rate of infeed

...Means to mill indeterminate length work

..Multiple work stations

..With means to advance work or product

...Vertically

...Endless or orbital work or product advancing means

..To reciprocate or oscillate work

..With work holder

...And means to selectively position work

...Including means to support work for rotation during operation

...And including means to infeed cutter toward work axis

...With linear movement of work

...With angular movement of work

..Including friction gearing drive

..Including fluid drive

..With means to effect stopping upon completion of operation

..With means to advance work or product

..Endless or orbital work or product advancing means

..With means to precisely reposition work

..Randomly manipulated, work supported, or work following device

..For machining commutator

..For cutting longitudinal groove in shaft (e.g., keyway, etc.)

...To guide tool to move in arcuate path

...With work follower

..Randomly manipulated

...End mill (e.g., router, etc.)
including means to infeed rotary cutter toward work

...with means to limit penetration into work

...axially

...with infeed control means energized in response to activator stimulated by condition sensor

...in response to cutter condition

...in response to work condition

...with work holder

...and laterally

...simultaneously

...plural cutters

...with infeed control means energized in response to activator stimulated by condition sensor

...in response to cutter condition

...in response to work condition

...with means to change rate of infeed

...with work holder

...indexable

...machining arcuate surface

...with means to move cutter eccentrically

...angularly adjustable cutter head

...including gantry-type cutter-carrier

...plural cutters

...including means to adjustably position cutter

...with work holder or guide

...linear adjustment

...with control for adjustment means responsive to activator stimulated by condition sensor

...responsive to position of cutter

...and means to clamp cutter support in adjusted position

...with position indicator or limit means

...and angular adjustment

...including gantry-type cutter-carrier

...plural cutters

...with position indicator or limit means

...with right angle cutter drive

compound angular adjustment

...plural cutters

...with limit means to aid in positioning of cutter bit or work (e.g., gauge, stop, etc.)

...work support

...with position indicator or stop

...indexable

...including dividing head

...multiple row dividing head

...with angular adjustment

...with work holder or guide

...including cutter limited to rotary motion

...with means to adjust work support vertically

...with means to adjust work support

...including means to compensate for deformation

...deflection of cutter spindle

...convertible from lathe

...including relatively movable components and means to relatively immobilize these components

...detachable or repositionable tool head

...cutter spindle or spindle support

...with cutter holder

...and draw bar

...with cutter holder

...machine frame

...overarm harness structure

...including counterbalancing means

...including means to compensate for deformation

...deflection of cutter spindle

...convertible from lathe

...including relatively movable components and means to relatively immobilize these components

.broaching

...process

...with control means energized in response to activator stimulated by condition sensor

...responsive to condition of work or product

...with means to distribute cutter infeed force

...with means to select cutter or to select or modify cutter drive

...with means to clean, lubricate, or modify temperature of work or cutter

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250 .With product handling means
251 ..Between plural broaching stations
252 ..Means to eject broached product
253 ..Chip removal means
254 ..With means to protect operative or machine (e.g., guard, safety device, etc.)
255 ..With safety means for overload or safety interlock
256 ..With work immobilizer and means to activate work immobilizer interrelated with cutter infeed, work infeed, or work advance
257 ..With work infeed or advancing means and means to clamp the work thereto, which clamping means is interrelated with work or cutter infeed
258 ..Means to remove flash or burr
259 ..Means for cutting groove
260 ..Arcuate groove in cylindrical surface
261 ...Rifling
262 ..Orbital carrier for cutter
263 ..Orbital carrier for work
264 ..With means to cyclically manipulate cutter or cutter support
265 ..To reorient, introduce, or remove cutter
266 ..Cutter released to interim support at termination of cutting stroke
267 ..To remove and return cutter to cutter support
268 ..With plural cutters
269 ..With means to advance, infeed, or manipulate work
270 ..Interrelated with cutter infeed
271 ...Including means supporting work and additional means opposing infeed force
272 ...Including work indexing means for sequential cutting of different surfaces of a single workpiece
273 ...Including work indexing means for sequential cutting of surfaces of different workpieces
274 ...With means to retract work from path of tool's idle return stroke
275 ..To infeed work past cutter
276 ..With means to hold work during cutting
277 ..Including work clamping means
278 ..With means to adjust or facilitate adjustment of work or work holder
279 ..With means on work or work holder to guide cutter during infeed
280 ..Cutter infeed means
281 ..Imparting rectilinear motion to cutter
282 ...And rotary motion to cutter
283 ...Fluid powered means
284 ...Rack means
285 ...Screw means
286 ..Machine frame
287 ..Cutter support or guide
288 PLANING
289 ..With regulation of operation by templet, card, or other replaceable information supply
290 ..Including use of tracer adapted to trigger electrical or fluid energy
291 ...Including provision for circumferential relative movement of cutter and work
292 ..Including provision for circumferential relative movement of cutter and work
293 ..Process
294 ..With means to lubricate
295 ..With product handling means
296 ..Randomly manipulated, work supported, or work following device
297 ..Means to remove flash or burr
298 ..Elongated work
299 ...Flash or burr inside hollow work
300 ...Transverse burr
301 ..Flat work
302 ..Of commutator
303 ..Means for trimming edge (e.g., chamfering, scarfing, etc.)
304 ..Means for cutting groove
305 ..Arcuate groove
306 ...For rifling
307 ..Inside hollow work
308 ..Means for shaving by blade spanning work surface

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309 ...Concave work surface (e.g., bearing, stereotype printing plate, etc.)
310 ...Circumferential surface
311 ...Including rack driven infeed means
312 ...Including roller infeed means
313 ...Means for cutting arcuate surface
314 ...Cycloidal surface
315 ...With work infeed and means to arcuately reposition the cutter
316 ...With work infeed and means to arcuately reposition the work
317 ...With means to relatively infeed cutter and work
318 ...And means to rotate work and cutter at same rate about converging axes
319 ...With plural sequentially acting cutters or with double acting cutter
320 ...And means to vary rate of infeed
321 ...Reciprocating work infeed means
322 ...With fluid-driven bed
323 ...With rack-driven bed
324 ...With screw-driven bed
325 ...And means to permit repositioning of cutter laterally
326 ...Reciprocating cutter infeed means
327 ...Reciprocating cutter horizontally
328 ...With work support and lead screw to reposition work support
329 ...With fluid-powered means to drive cutter
330 ...With pivoting link to drive cutter
331 .....Link driven by crank
332 .....With rack to drive cutter
333 .....With screw to drive cutter
334 .....With link or cam to drive cutter
335 .....With rack to drive cutter
336 .....Including means causing return stroke
337 .Machine frame
338 .....Means to permit repositioning of cutter
339 .....Laterally
340 ...Plural independently positioned cutters
341 ...Including clutch
342 ...Including repositioning means and means to effect stopping thereof
343 ...Including relatively movable components and means to relatively immobilize these components
344 ...Work table
345 ...Tool head
346 ...With selectively usable cutting edges
347 ...With means to permit repositioning of cutting for idle return stroke
348 ...Comprising pivotal cutter or cutter support

CROSS-REFERENCE ART COLLECTIONS

900.1 MACHINE BUTTON OR LOCATOR
900.2 MACHINE TOOL CARRIAGE CLAMP
901 STEREOTYPE PRINTING PLATE
902 TIRE MOLD
903 WORK HOLDER
904 WITH HYDROSTATIC BEARING

FOREIGN ART COLLECTIONS

FOR 000 CLASS-RELATED FOREIGN DOCUMENTS

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