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INDEXIBLE MODULE PROHOLD WORKHOLDING FIXTURE

This application claims the benefit of U.S. Provisional Application No. 60/066,250, filed November 20, 1997.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to an indexible fixture for securing parts that are to be machined. This invention relates to a fixture for use in machining applications, and more particularly to a positioning fixture block having moveable jaws for use with machining centers.

5 During machining operations downtime is a crucial problem that occurs daily at almost every manufacturing facility. Emphasis is placed on limiting the amount of time which the machining center sits idle due to the operator setting up the job and verifying the operation. The object is to reduce downtime thereby increasing productivity. The present invention reduces downtime for setup and re-verification while improving both the quality and quantity of the
10 output.

One advantage of the fixture block of the present invention is that it cuts the time and risk of error in setups and reverification. Large lot runs and reruns are possible with greater speed and accuracy. In one preferred embodiment of the present invention, twelve various parts may be run at the same time on the same fixture to save changeover time. Another advantage of the present
15 invention is that setup can usually be completed in just a few minutes and no reverification is needed on previous setups. The fixture of the present invention is available in any number of chucks and arrangement of chucking dimensions and/or chuck capacity diameter.

In addition to the novel features and advantages mentioned herein, other objects and advantages of the present invention will be readily apparent from the following descriptions of the drawings and preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1 is various views of a preferred embodiment of an indexible fixture of the present invention; and

 Figure 2 is various views of a preferred embodiment of an indexible fixture of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT(S)

10 The present invention is directed to an indexible fixture for securing parts that are to be machined. This invention relates to a fixture for use in machining applications, and more particularly to a positioning fixture block having moveable jaws for use with machining centers.

 In a preferred embodiment, each fixture is supplied with a plurality of complete sets of movable jaws which are built to hold close tolerances for years of accurate service. Three sets of
15 jaws are secured to each of four side walls of the fixture. Of course, the number of jaw sets may vary depending on the user's needs. Either hard or soft work jaws may be used. The work jaws may be arranged to sit in a standard ninety degree serrated face master jaw which enables different jaws to be incorporated that are available from most jaw manufacturers. The fixture features welded steel or cast construction and may be designed to permit through-the-cube
20 chucking of shafts. The use of soft jaws enables the user to custom machine the jaw locating faces to his own needs right on the machining center. Downtime is further reduced by using the

fixture of the present invention on each pallet of a machining center so that idle pallets can be setup while another pallet is running.

Referring now to the drawings, there is illustrated a positioning fixture that may be used with a horizontal machining center. Various parts which are to be machined are secured to the fixture then the fixture may be moved along an axis until it reaches the cutting tool. The machining center may be automated to enable a tool to be automatically exchanged for other tools. The fixture may be secured to a base. The base is secured to an indexing member which may rotate to expose each face of the fixture to the cutting tool.

The fixture may include a casing having four side walls. The fixture may then be secured to a base member which will be used to secure the fixture on the machining center. Along each face plate one or more sets of jaws may be provided for gripping parts to be machined. Through holes at the center of each set of jaws provide clearance for shaft type parts.

In one embodiment the jaws may be actuated by the operator through tool insert holes. One tool insert hole may be provided for each set of jaws. The actuation for the jaws will be described more thoroughly hereinafter. Lastly, eye bolts may be secured to the top portion of the fixture to assist in the lifting of the fixture on to the machine center.

Each set of jaws may be comprised of two or more master jaws. Positioned within the slots of the master jaws may be two or more T-nuts. Work jaws may be positioned on the serrated face of the master jaws and secured by bolts passing through the work jaw and down into the T-nuts. The T-nuts may be adapted to slide inside the slot so that the work jaw may be arranged on the master jaw in various distances from the through hole or center.

Before further describing the present invention, it is important to note that many variations of the invention may be incorporated. For example, more or less than two sets of jaws may be in place on each face plate. Secondly, the fixture block does not necessarily have to be a cube shape. Each set of jaws may include more than two master jaws. The side walls may be one
5 block of machined steel or welded plates assembled.

To actuate the master jaws a worm drive passageway may be provided which houses a worm gear. As a tool is inserted into the tool insert and engages the worm drive gear the worm drive gear will turn within the passageway. The worm drive gear may make contact with a worm track on a worm wheel. The worm wheel may be connected to a scroll plate by dowel pins
10 through dowel pin holes in the scroll plate and worm wheel.

Bolts passing through bolt holes in the scroll plate and the worm wheel will tightly secure the two together. Therefore, as the worm wheel turns, the scroll plate will turn with it.

The scroll plate may have three somewhat elliptical shaped slots formed in a side thereof. The exact number and shape of the slots may vary and still fall within the scope of this invention.
15 In one preferred embodiment there is an equal number of slots to go with jaws. Each slot may begin at one end, a particular distance from the perimeter of the scroll plate. The slots may descend toward the center of the scroll plate in such a manner that another end of the slots is a further distance away from the perimeter. In a preferred embodiment, the difference between the distances from one end to the perimeter, and the other end and the perimeter, may be one quarter
20 inch. Of course, this difference may be more or less than one quarter inch depending on how much jaw movement is preferred.

Inside each slot may be a roller bushing and one end of a pin which may be made of hardened steel. As the scroll plate turns, the pins and roller bushings will move within the slots. While one end of the pins resides in the slots of the scroll plate, the other end of the pins may be secured within a portion of the master jaws. As the scroll plate turns, the scroll pin will move in or out, with respect to the center of the through hole, depending upon the direction of rotation of the scroll plate. As the pin moves in or out with respect to the through hole, the pin will force the master jaw to move within a slot of the face plate. The work jaw may be secured to the master jaw and as the scroll plate is turned by the worm wheel the work jaws will either tighten around the part to be machined or the work jaws will loosen from the part so that it may be removed from the fixture.

The work jaws are commercially available from many sources known to those of ordinary skill in the art. In one embodiment described above, the master jaws are actuated manually by a tool to turn the worm gear drive. In another embodiment, the jaws may also be actuated by electrical or hydraulic means.

In another embodiment for the fixture of the present invention a hydraulic system works generally as described above except for the manner in which the scroll plate is turned. Instead of having a worm wheel, a spur gear may be secured to the scroll plate. And, instead of a worm gear a rack drive gear may be provided inside a hollowed out section of the side wall. Hydraulic fluid under pressure is used to actuate the components.

With reference to Figures 1 and 2, a preferred embodiment of an indexible fixture of the present invention preferably includes the following components: (1) central casing or main structural housing; (2) chuck module insert; (3) chuck jaws; (4) internal chuck actuation piston;

(5) hydraulic gear rack position; (6) ring gear on OD of chuck module; (7) rocker arms; (8) bearings; and (9) pivot pin.

The significance of this invention is that it preferably allows a workpiece to be machined complete on five sides in one holding or chucking of the part to be machined without removal or
5 unchucking from the fixture, eliminating commonly called "A" and "B" loads which are two separate holdings of a part to be machined because of the inability on conventional setups to present the top and bottom of the part to the spindle of the machine tool in the "A" load only.

It preferably works as follows: Central casing (1) may house any number of independent removable workholding modules (2) which may house any number of chuck jaws (3) that may be
10 driven inward and outward about a common centerline preferably by an actuation piston (4) preferably through the use of rocker arms (7) which may have a fixed pivot point preferably about a pin (9) inside the module insert (2). Module inserts (2) may be accurately located in the main structural housing (1) by precision roller bearings (8) or other conventional means. These module inserts (2) are preferably removable and interchangeable for different workholding
15 applications (example: 2-jaw, 3-jaw or pull-back-clamp type module inserts). These module inserts (2) may be rotated on their centerline axis by a hydraulic gear rack piston (5) which may engage a ring gear (6) which may rotate the independent workholding module (2). This rotation is preferably accomplished through hydraulic operation which may force oil to one side of the gear rack piston (5) to advance it through a bore in the central housing (1) while oil on the
20 opposite side of the gear rack piston is preferably drained to an internal tank within the central casing. Reverse rotation (5) may be accomplished by introducing hydraulic pressure to the opposite side of the piston preferably via an internal solenoid valve. Accurate rotational stop

positioning of the module may be accomplished through an hydraulic advanced shot-pin or other conventional mechanical positioning mechanisms when the module insert (2) is rotated into a desired position.

The preferred embodiments herein disclosed are not intended to be exhaustive or to
5 unnecessarily limit the scope of the invention. The preferred embodiments were chosen and described in order to explain the principles of the present invention so that others skilled in the art may practice the invention. Having shown and described preferred embodiments of the present invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention. Many of those variations and modifications will
10 provide the same result and fall within the spirit of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.

WHAT IS CLAIMED IS:

1. A fixture for securing parts that are to be machined, said fixture comprising:

a casing;

a chuck module insert housed substantially within said casing, said chuck module insert

5 having a plurality of jaws adapted to be driven inward and outward about a common center line;

an actuation piston mechanism in association with said chuck module insert, said
actuation piston mechanism adapted to drive said jaws inward and outward about said common
center line; and

a hydraulic gear rack piston mechanism adapted to rotate said chuck module insert about
10 a central axis by engaging a ring gear;

wherein rotation of said chuck module insert in a first direction is accomplished by
forcing oil to one side of said hydraulic gear rack piston mechanism to advance said hydraulic
gear rack piston mechanism through a bore in said casing while oil on an opposite side of said
hydraulic gear rack piston mechanism is drained; and

15 wherein rotation of said chuck module insert in a second direction opposite said first
direction is accomplished by applying hydraulic pressure to an opposite side of said hydraulic
gear rack piston mechanism via an internal solenoid valve.

2. The fixture of claim 1 wherein said actuation piston mechanism includes a plurality of
rocker arms, each rocker arm having a respective fixed pivot point about a respective pin inside
20 said chuck module insert.

3. The fixture of claim 1 wherein said chuck module insert is located in said casing by a
plurality of roller bearings.

4. The fixture of claim 1 wherein said chuck module insert is removable and interchangeable for different workholding applications.

5. The fixture of claim 1 wherein stop positioning of said chuck module insert is accomplished through a hydraulic advance shot-pin when said chuck module insert is rotated to a

5 desired position.

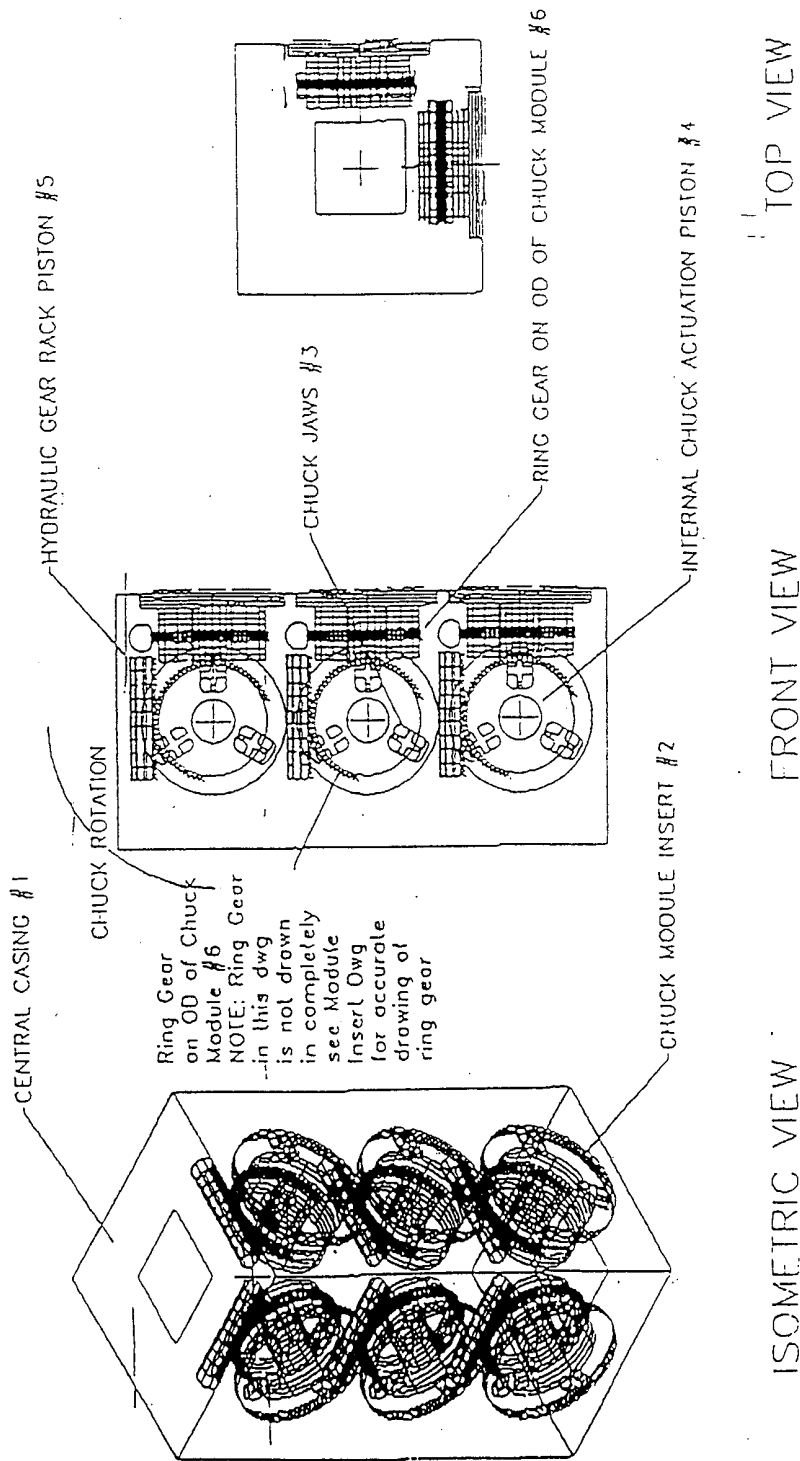


Figure 1

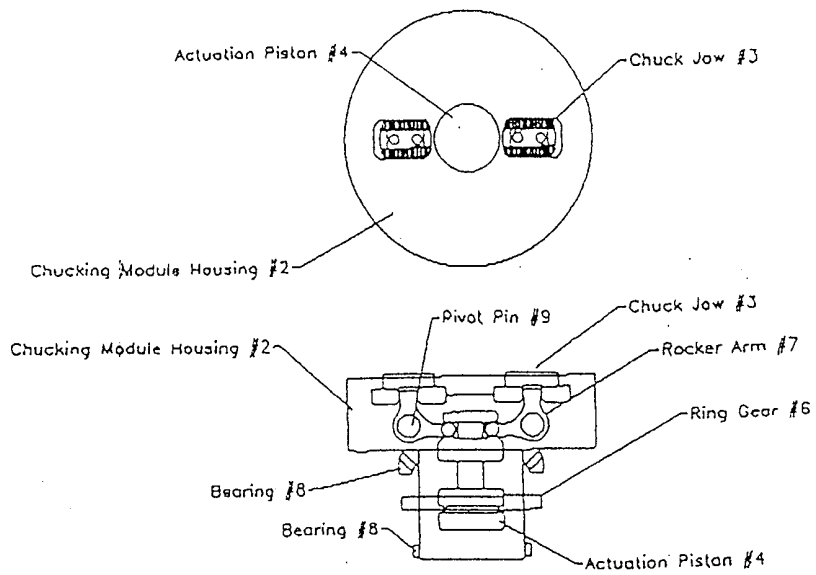


Figure 2