CAM WEDGE SWIVEL GRIPPER HEAD


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References Cited

UNITED STATES PATENTS

2,251,323 8/1941 Burke 92/30 X
2,335,743 11/1943 Cross 269/32
3,147,004 9/1964 Blatt 269/233
3,170,322 2/1965 Cavanaugh 269/218

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ABSTRACT

A cam wedge work piece gripper head has a body receiving a power reciprocated plunger and pivotally mounted on the body opposed pairs of normally spaced apart work piece gripping arms. Opposed rollers carried by said plunger nest within angularly related cam slots in the respective pairs of arms so that forward and retracting movements of said plunger effect corresponding closing and opening movements of said pair of arms. A spring resists initial longitudinal forward movement of said plunger. Resilient detents are mounted within the gripper head body and are normally biased against said plunger yieldably resisting initial forward movement thereof and adapted on such forward movement to retainingly engage said plunger against retraction.

4 Claims, 3 Drawing Figures
CAM WEDGE SWIVEL GRIPPER HEAD

BACKGROUND OF THE INVENTION

Heretofore, gripper heads have been employed which include within a body upon which are mounted opposed pairs of work piece engaging arms, a reciprocating power actuated plunger together with a cam mechanism between the plunger and arms for causing opening and closing movements thereof.

BRIEF DESCRIPTION OF THE INVENTION

It is an object of the present invention to incorporate in such gripper head construction an adjustable spring means within the body and yieldably resisting initial forward movements of the plunger and to assist in return movements thereof.

It is another object to incorporate within the gripper body resilient detent means which bear against the plunger normally but yieldably resisting forward movements thereof, but which are adapted on such forward movement to further yieldably but retainingly engage said plunger.

It is another object of the present invention to incorporate with said gripper head an actuating unit in conjunction with a power operated piston rod providing a mechanism by which the gripper head body is so mounted upon the actuating unit as to be capable of rotative adjustment on a common axis throughout a range of 360 degrees without disconnecting the gripper head from the actuating unit, merely by loosening the fastening screws.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings.

THE DRAWINGS

FIG. 1 is a fragmentary partially broken away side elevational view of the present work piece gripper head and actuating unit;
FIG. 2 is a right end elevational view thereof;
FIG. 3 is a fragmentary plan view of the gripper head.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, the present cam wedge swivel work piece piece gripper head is generally indicated at 11, FIG. 1, and includes an elongated body 13 having a rearwardly extending transverse mounting flange 15 of circular shape.

An actuating unit is fragmentarily shown and designated at 17 and is adapted to receive therethrough the power reciprocated piston rod 19 fragmentarily shown whose T-end 21 is adapted for interlocking axial registry with the corresponding T-slot 45 in plunger 37, FIG. 1.

Upon the exterior of the actuating unit there are shown fragmentarily the forward ends of a pair of opposed guide stop bars 23 secured to the actuating unit at 25 and which are adapted to extend rearwardly for sliding and mounting engagement upon a suitable hydraulic cylinder of a conventional construction from which projects piston rod 19.

The actuating unit includes at its end an upright transverse mounting flange 27. Loosely applied on the forward face thereof are a pair of opposed coplanar collars 29 which include each a semi-circular undercut recess 31 adapted to supportably and adjustably receive gripper head mounting flange 15. Suitable collar screws 33 extend through the actuating unit flange 27 for threaded securing engagement with the opposed collars 29 drawing up the same and for fixedly securing flange 15 therein in any desired axial position between 0 and 360 degrees.

Referring in detail to the cam wedge gripper head, there is provided within body 13 an elongated bore 35 which terminates in a counterbore 39.

Reciprocating plunger 37 is nested within bore 35 and extends rearwardly as shown in FIG. 1 terminating in the T-slot formation 45 adapted for securing to the forward T end 21 of the piston rod.

Coiled compression spring 41 is nested within said counterbore and is adjustably anchored and positioned by set screw 43.

A first pair of upper jaw arms 47 bear against opposite sides of body 13 and are pivotally mounted thereon by the pivot bolt 53.

It is contemplated that the interior portions at the inner ends of the respective jaw arms are spanned by work piece gripping adapters which for clarity have been omitted from the illustration.

A second pair of opposed lower jaw arms 49 bear against the inner jaw arms respectively and are pivotally mounted upon said body by a second pivot bolt 53, FIG. 2.

The upright parallel spaced side plates 51 are arranged outwardly of and engaging the lower jaw arms 49 and are secured to the body 13 by the respective corresponding vertically spaced parallel bolts 53 and their associated fasteners.

A first pair of spacers 55 are arranged upon the upper bolt 53 and interposed between the respective upper jaw arms 47 and the corresponding side plate 51.

Additional spacers 55 are mounted upon the lower pivot bolt 53 and are interposed between body 13 and the outer or second pair of lower jaw arms 49 to complete the assembly shown in FIG. 2.

Transversely extending roller shaft 57 extends through plunger 37 and projects from its opposite sides and mounts adjacent its outer ends the respective outer rollers 59, FIG. 2, which are movably positioned within the acute angularly disposed slot 61 formed in the respective lower jaw arms 49.

An additional pair of rollers 63; namely, inner rollers are also mounted upon roller shaft 57 and are nested within the corresponding pair of acute angularly extending slots 65 formed within the upper jaw arms 47.

In this construction, it is noted that the outer ends of the roller shaft 57 are in registry with the respective side plates 51.

It is noted furthermore from FIG. 2 that respective rollers 59 and 63 on opposite sides are in engagement with each other with the inner rollers in engagement with plunger 37 and, thus, in the assembly shown, retained against accidental displacement.

Inner forward movement of the plunger 37 under the control of the power operated piston rod 19 will be against the yielding but compressive action of the coil spring 41. Furthermore, return movement of said plunger will be assisted by said coil spring.

Resilient detent means are mounted upon body 13, FIG. 1, and normally extend at right angles to the plunger axis for the purpose of resisting initial forward
movement of the plunger, but primarily for the purpose of yieldably anchoring the plunger in a forwardly moved position against retraction to provide for medium holding pressure of the arms with respect to a work piece gripped therebetween.

It is contemplated as a part of the present invention that the said resilient detent means may be provided by an opposed pair of bores which extend through said body transverse to the plunger axis and within which a spring plunger is mounted and adjustably positioned so that their inner ends bear against opposite side portions of said plunger and upon forward movement of said plunger adapted to seat within corresponding detent notches 71 in said plunger.

It is contemplated that the resilient detent means may be in the form of an opposed pair of steel balls 75, a resilient member such as a block of rubber or equivalent material as at 77 and an adjustable set screw 83.

As shown in FIG. 1, the balls 75 normally bear against the forward cam surfaces 87 on said plunger yieldably resisting initial forward movement thereof but which upon such forward movement, are adapted to retainingly nest within the opposed detent notches 71 in said plunger to provide a medium holding pressure.

The resilient members 77 may be coil springs if desired.

It is contemplated that in order to provide for maximum holding pressure that there be an additional set of resilient detent means which include the steel balls 81, additional resilient members 79 and corresponding set screws 83. In this case, under normal retracted position of the plunger, the balls 81 are yieldably and retainingly nested within the opposed plunger notches 71. Upon inward projection of said plunger, balls 81 are nestled within a second opposed pair of detent notches 69 in said plunger and the first set of balls 75 are nestled within plunger detent notches 71 for maximum holding pressure of said plunger when in forward work piece securing position.

It is contemplated as a part of the present invention that under some circumstances, one pair of jaw arms may be held stationary against movement. For this purpose, there is provided a transverse pin which extends through the body and apertures 85 in one pair of said jaw arms such as the arms 47, FIG. 1. In that case, the corresponding roller 63 would be omitted and jaw apertures 85 in registry with corresponding body aperture 87.

Under some conditions spring 41 may be omitted.

In operation with plunger 37 projected forwardly and the jaws closed upon a workpiece, the balls 75 and 81 effectively lock the plunger and the jaws against separation.

**OPERATION**

Though not shown in the drawing, there is employed a hydraulic or air cylinder with a reciprocating piston connected to the piston rod 19 fragmentarily shown.

The guide stop bars 23 fragmentarily shown, being anchored to the actuating unit 17 at 25, are at their other ends guidably and slidably mounted upon said hydraulic cylinder. Thus, when the hydraulic cylinder is energized, the initial forward movement of the piston rod 19 translates the actuating unit and the jaws while in the open position shown until the rear ends of the said guide stop bars 23 engage a stop on the cylinder.

This limits the forward movement of the actuating unit 17 and the jaws, to a position, for example, adjacent a work piece in a machine tool that has just been finished or treated. Despite the fact that the actuating unit has now been stopped by the functioning of the guide bars 23, there will, nevertheless, be an additional forward movement of the piston rod 19 approximately one inch in the same direction. It is this forward movement of the piston rod 19 relative to the actuating unit and the attached jaw assembly which causes the jaws 47-49 to close upon the work piece. It was this final longitudinal forward movement of the piston rod which moved the plunger 37 to a position forward of that shown in FIG. 1. Thus, with the jaws closed upon the work piece, the balls 75 and 81 effectively lock the plunger in such forward position and at the same time, lock the jaws against separation.

Now upon reversal of the pressure connections to the hydraulic cylinder, the piston rod 19 begins its retracting movement. The jaws, however, remain closed so that the work piece is transported by the closed jaws to an unloading position. At that point, actuating unit 17 is again stopped mechanically. There is override again for approximately 1 inch in the same direction of the piston rod 19 now relative to the actuating unit and jaw body which overcomes the pressure of the balls with respect to the plunger so that the plunger again returns to the position shown in FIG. 1 and the jaws open, permitting the dropping of the work piece at such unloading station.

Having described my invention, reference should now be had to the following claims.

I claim:

1. A cam wedge work piece gripper head comprising a body having a longitudinal bore at one end; a plunger reciprocally mounted in said bore and projecting from said body adapted for connection to a reciprocal piston rod; a first pair of jaw arms bearing against opposite sides of the body at their one ends pivotally mounted on said body; a second pair of jaw arms outwardly of and bearing against said first pair of jaw arms, at their one ends pivotally mounted on said body; opposed parallel side plates bearing against said second pair of arms; the pivotal mounting of said arms including a pair of spaced pivot bolts which extend through said side plates, said respective arms and said body; said bolts anchoring the side plates to said body; the other ends of said pair of arms projecting forwardly of said body and spaced apart adapted on closing to grip a work piece therewith; resilient detent means on said body yieldably engaging said plunger against initial inward movement relative to said body; there being a detent notch on said plunger normally spaced from said detent means and adapted to operate and retainingly receive said detent means on inward projection of said plunger; and cam means on said plunger registerable with angularly related slot means in said arms whereby inward and outward movements of said plunger effect relative closing and opening movements of said arms; said body rearwardly of the side plates terminating in a transverse annular flange;
an actuating unit having a body, a bore receiving said piston rod and a mounting flange;
a pair of opposed co-planar collars, each having an undercut semi-circular recess bearing against said
mounting flange and positioned over a rearward portion of said gripper head body with its annular
flange nested in said recesses;
fasteners between said mounting flange and collars retainingly supporting said gripper head flange in
axial alignment with said actuating unit; whereby, on loosening of said fasteners, said gripper head
may be rotated relative to said actuating unit in the range of 0 to 360 degrees.
2. A cam wedge work piece gripper head comprising
a body having a longitudinal bore at one end;
a plunger reciprocally mounted in said bore and projecting from said body adapted for connection to a
reciprocal piston rod;
a first pair of jaw arms bearing against opposite sides of the body at their one ends pivotally mounted on
said body;
a second pair of jaw arms outwardly of and bearing against said first pair of jaw arms, at their one ends
pivotally mounted on said body;
opposed parallel side plates bearing against said second pair of arms;
the pivotal mounting of said arms including a pair of spaced pivot bolts which extend through said side
plates, said respective arms and said body; said bolts anchoring the side plates to said body;
the other ends of said pairs of arms projecting forwardly of said body and spaced apart adapted on
closing to grip a work piece therebetween;
resilient detent means on said body yieldably engaging said plunger against initial inward movement
relative to said body;
there being a pair of opposed detent notches on said plunger normally spaced from said detent means
and adapted to operatively and retainingly receive said detent means on inward projection of said
plunger;
control means on said plunger operatively registerable with said arms whereby inward and outward
movements of said plunger effect relative closing and opening movements of said arms;
and a tapered cam surface on the forward end of said plunger;
said resilient detent means including a pair of opposed spaced bores in said body;
and nested in each bore a ball, a resilient member and an adjustable set screw;
said opposed balls retainingly engaging said cam surface normally holding said plunger against forward
movement and maintaining said jaw arms open;
whereby on forward movement of said plunger, said balls are retracted and successively nest within
said detent notches to operatively and retainingly engage said plunger for securing said jaws in a
closed position.
3. A cam wedge work piece gripper head comprising
a body having a longitudinal bore at one end;
a plunger reciprocally mounted in said bore and projecting from said body adapted for connection to a
reciprocal piston rod;
a first pair of jaw arms bearing against opposite sides of the body at their one ends pivotally mounted on
said body;
a second pair of jaw arms outwardly of and bearing against said first pair of jaw arms, at their one ends
pivotally mounted on said body;
a tapered cam surface on the forward end of said plunger;
said resilient detent means including longitudinally
spaced pairs of opposed spaced bores in said body;
and nested in each bore, a ball, a resilient member
and an adjustable set screw, one opposed pair of
balls being normally nested in one opposed pair of
plunger notches and the other pair of balls retain-
ingly bearing against said cam surface normally
holding said plunger against forward movement
and maintaining said jaws open; and whereby, on
forward movement of said plunger, said sets of
balls are retracted and successively nest within said
detent notches on said plunger to operatively and
retainingly engage said plunger at a plurality of
points for securing said jaws in a closed position.

* * * * *
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,817,510 Dated June 18, 1974

Inventor(s) Joseph M. Jatcko

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [76] "Bloomfield Hills, Mich." should read Roseville, Mich. --..

Signed and sealed this 29th day of October 1974.

(SEAL)

Attest:

McCoy M. Gibson Jr. C. Marshall Dann
Attesting Officer Commissioner of Patents