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(54) ADJUSTABLE CLAMPING DEVICE IN A MECHANICAL PRESS

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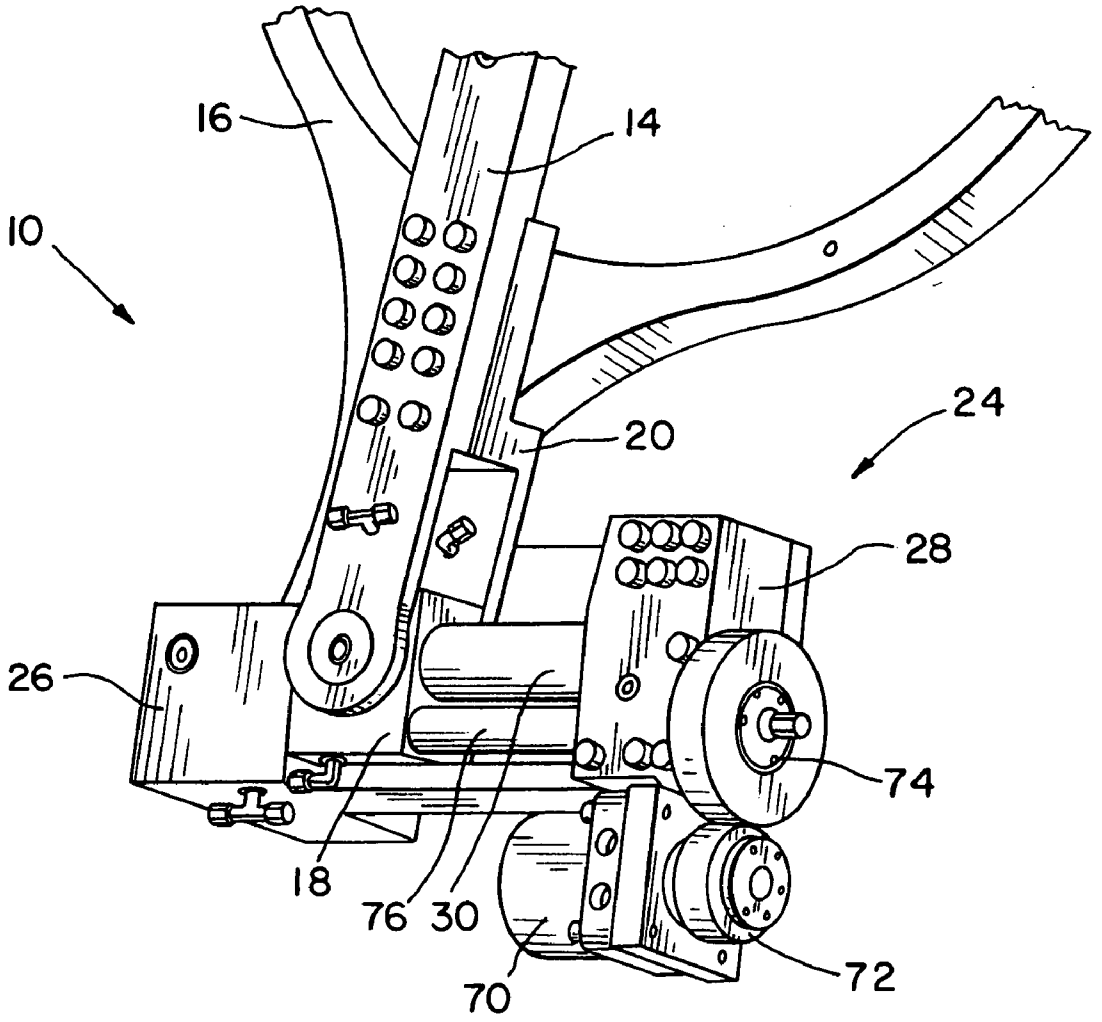
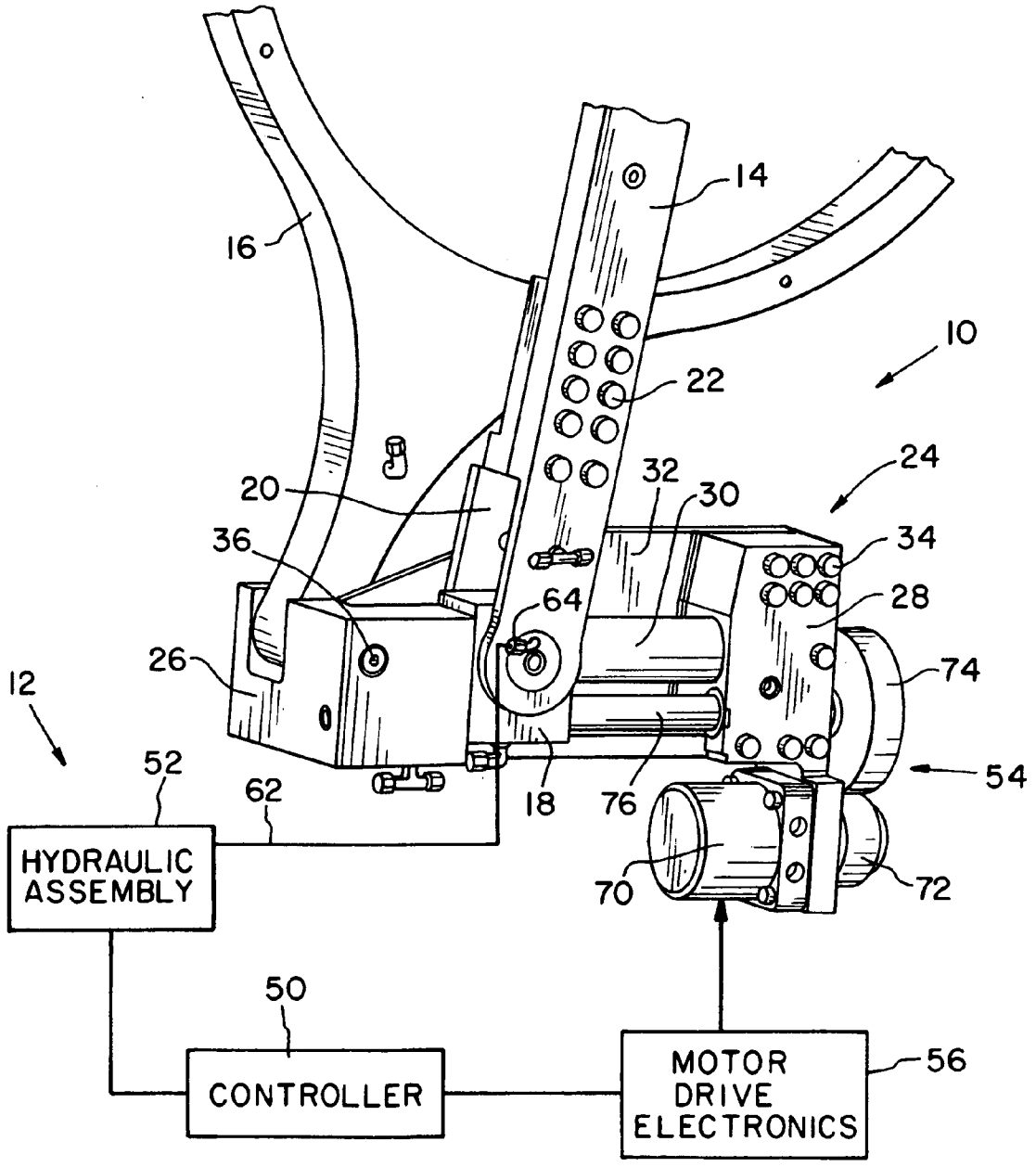
(57) **ABSTRACT**

An adjustable clamping mechanism includes a slider block annularly disposed about a rod device within a mechanical press. The mechanism utilizes a press or interference fit connection between the components. During operation, high-pressure oil is injected into the location between the slider block and rod, thereby relieving the press fit and making it possible to have relative movement therebetween. An actuator causes selective linear displacement of the slider block along the longitudinal axis of the stationary rod during the release condition. Once the slider block is repositioned, the high-pressure oil is removed, which reactivates the press fit connection and causes the slider block to once again lock up against the rod and prevent movement therebetween.

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CONTROLLER
MOTOR DRIVE ELECTRONICS
56

Fig. 1

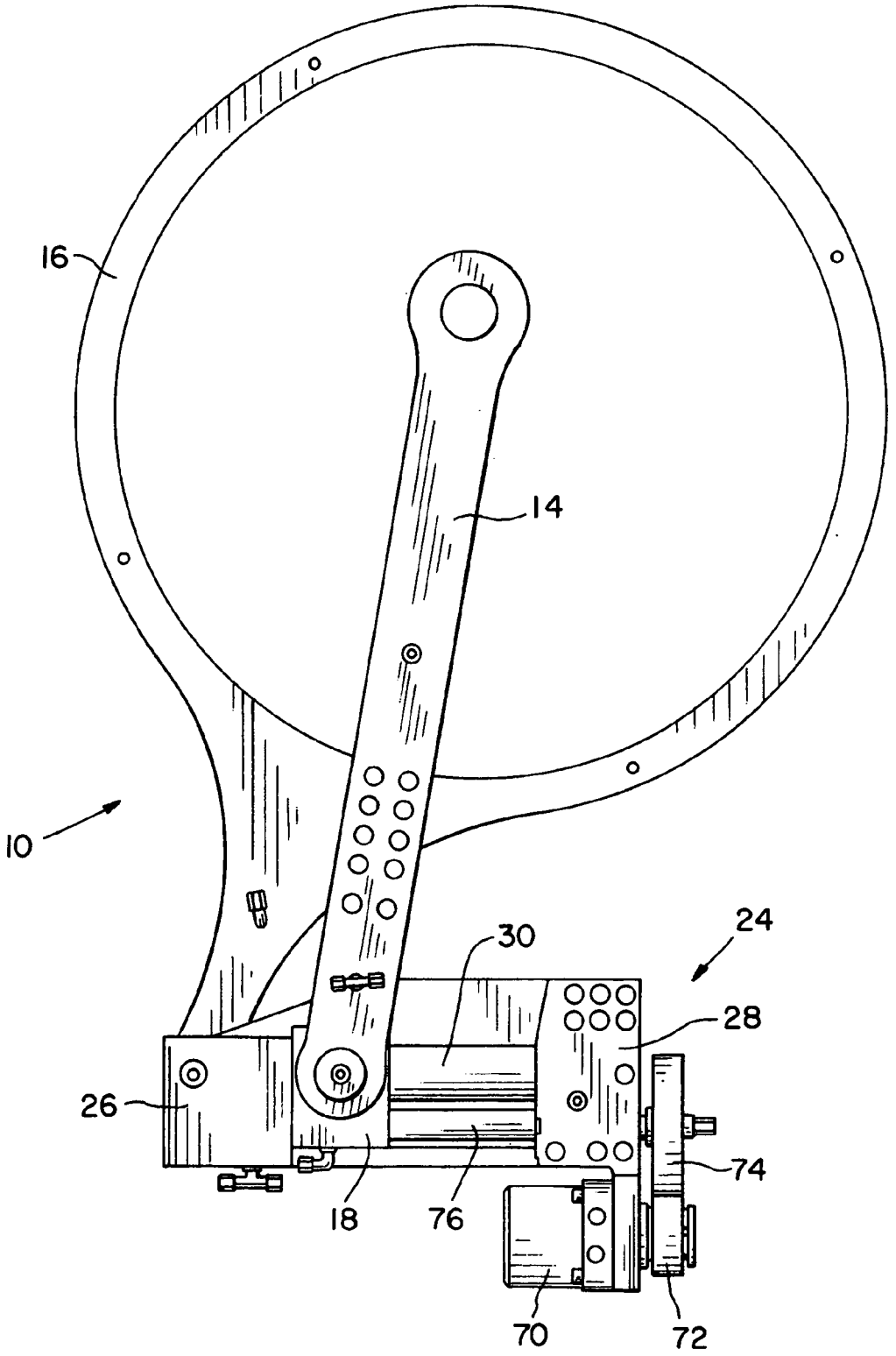

Fig. 2

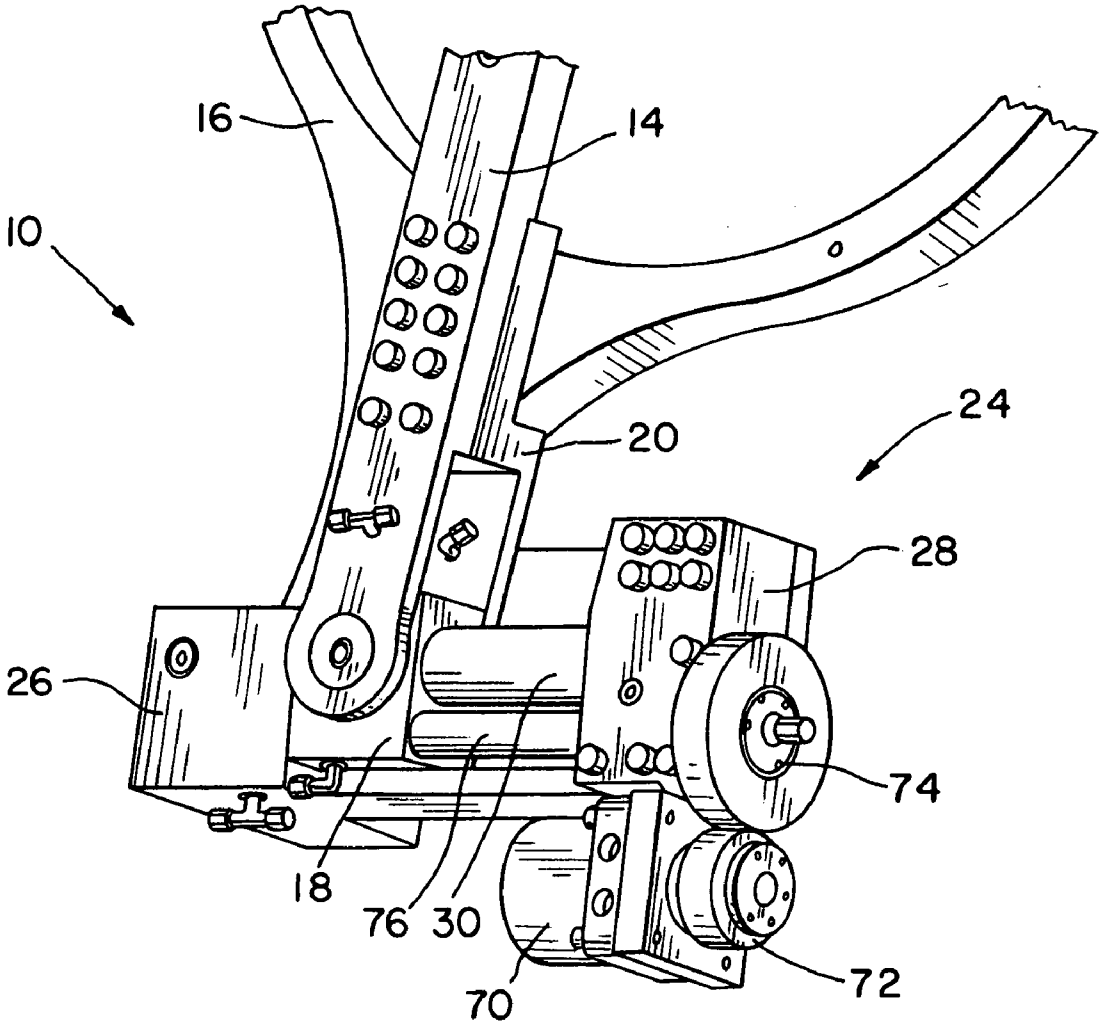

Fig. 3

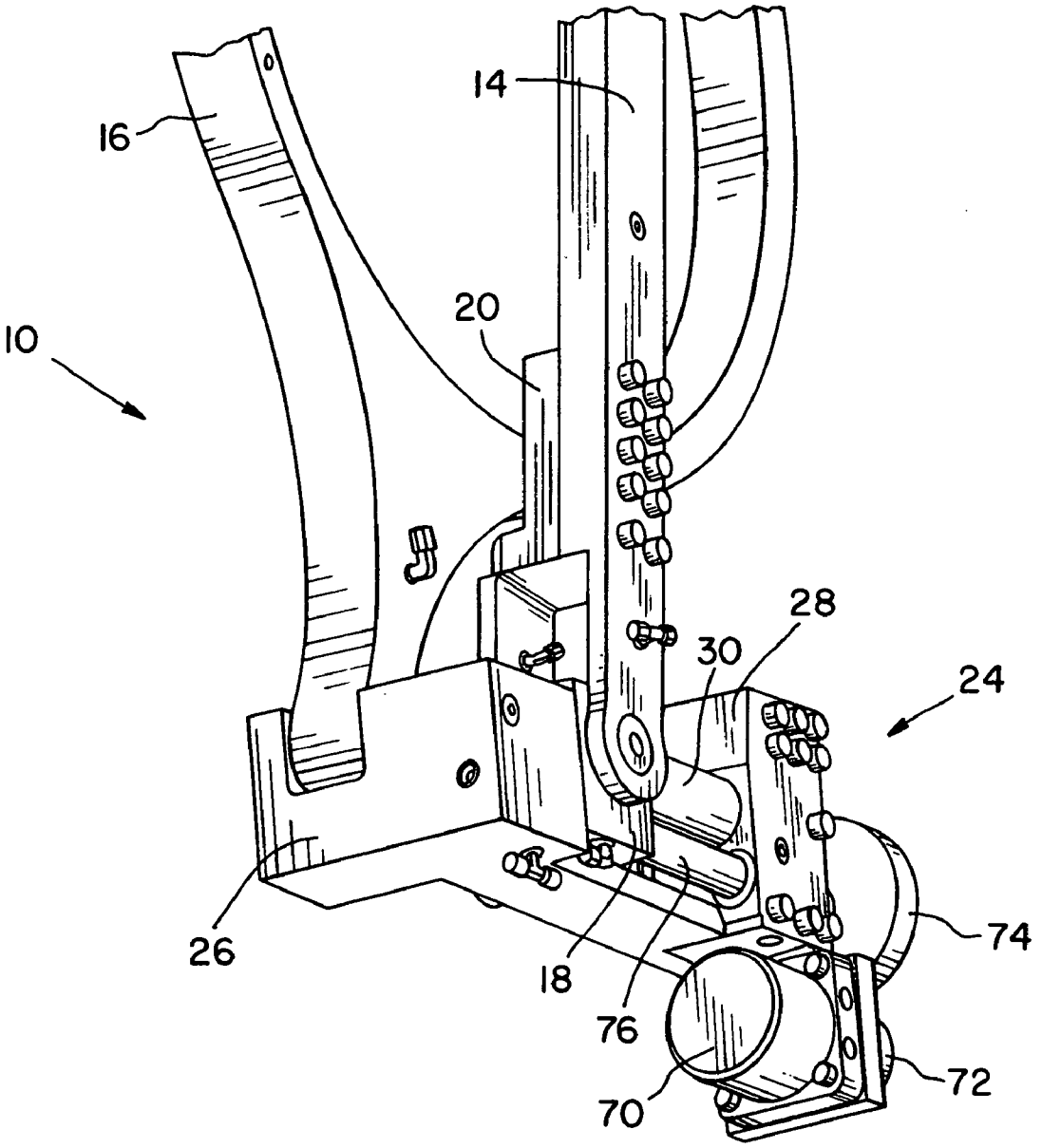

Fig. 4

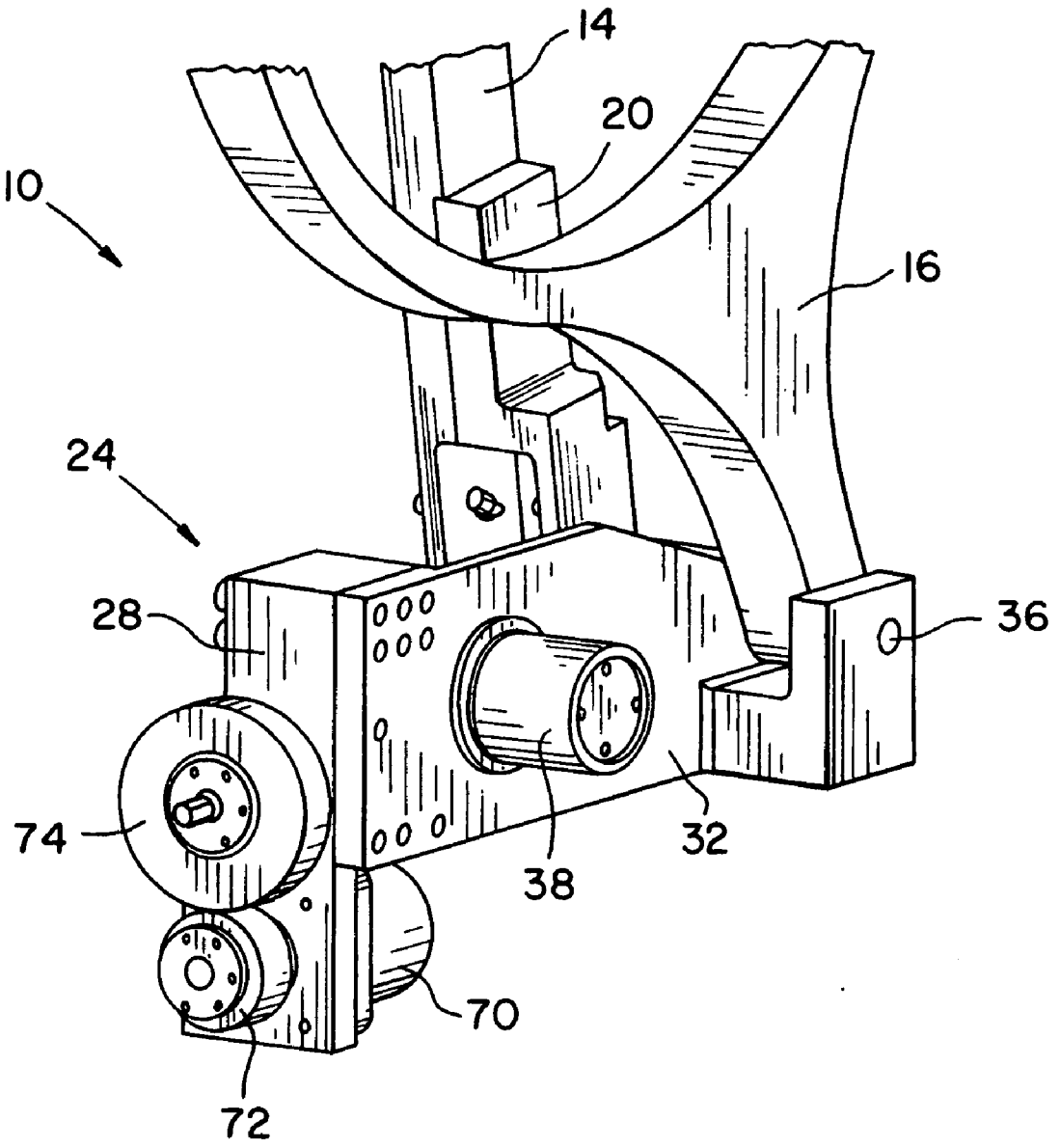

Fig. 5

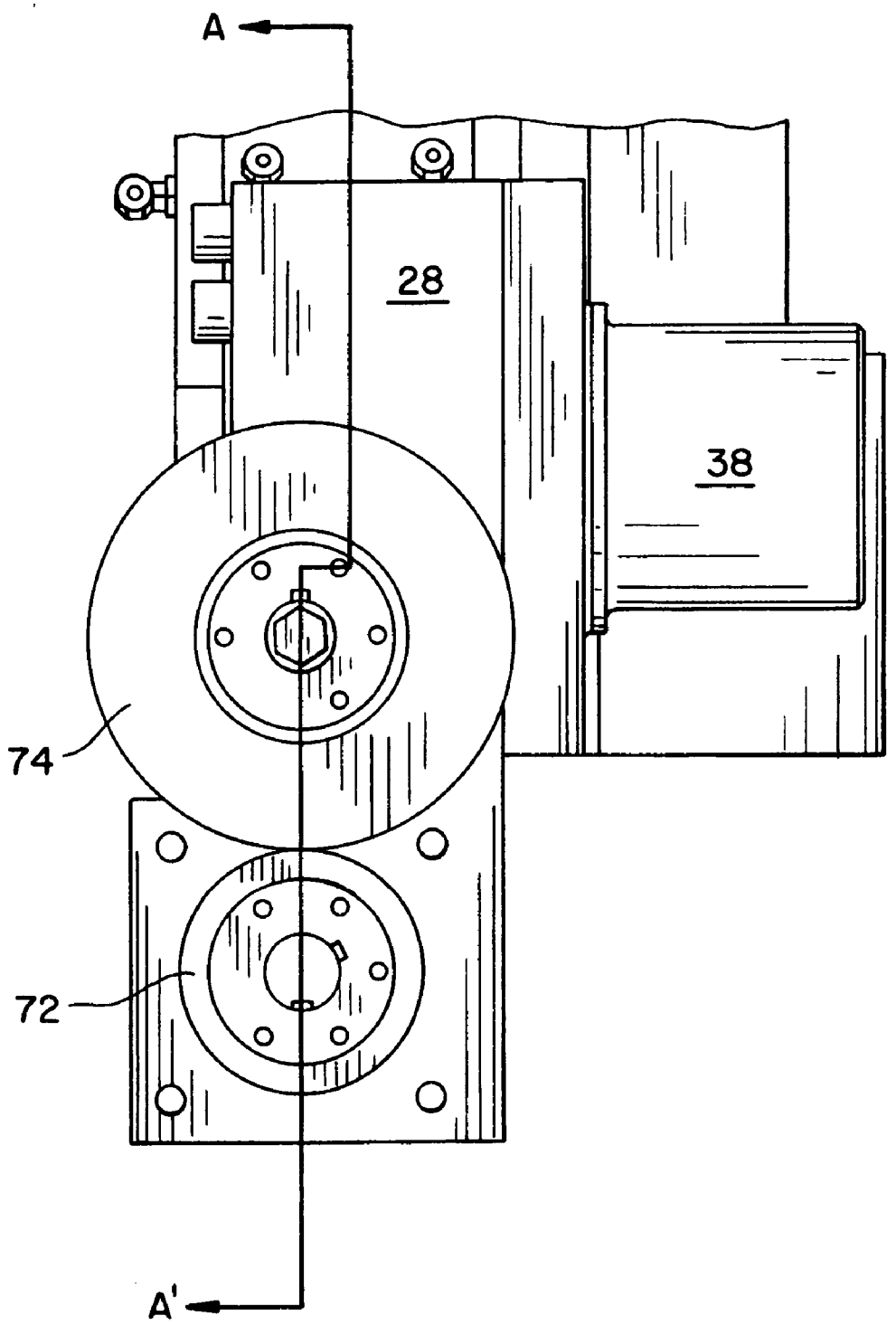

Fig. 6

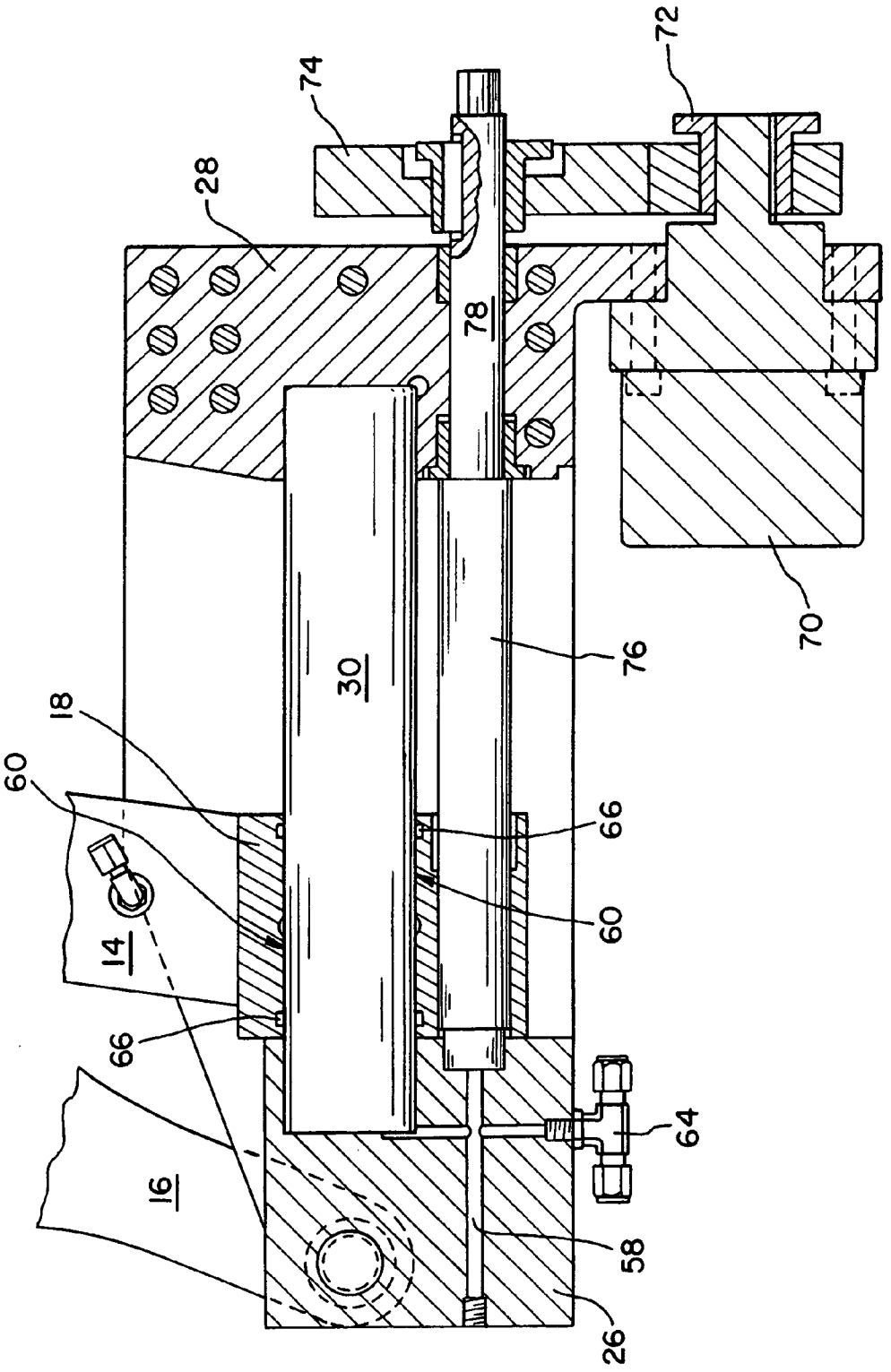

Fig. 7

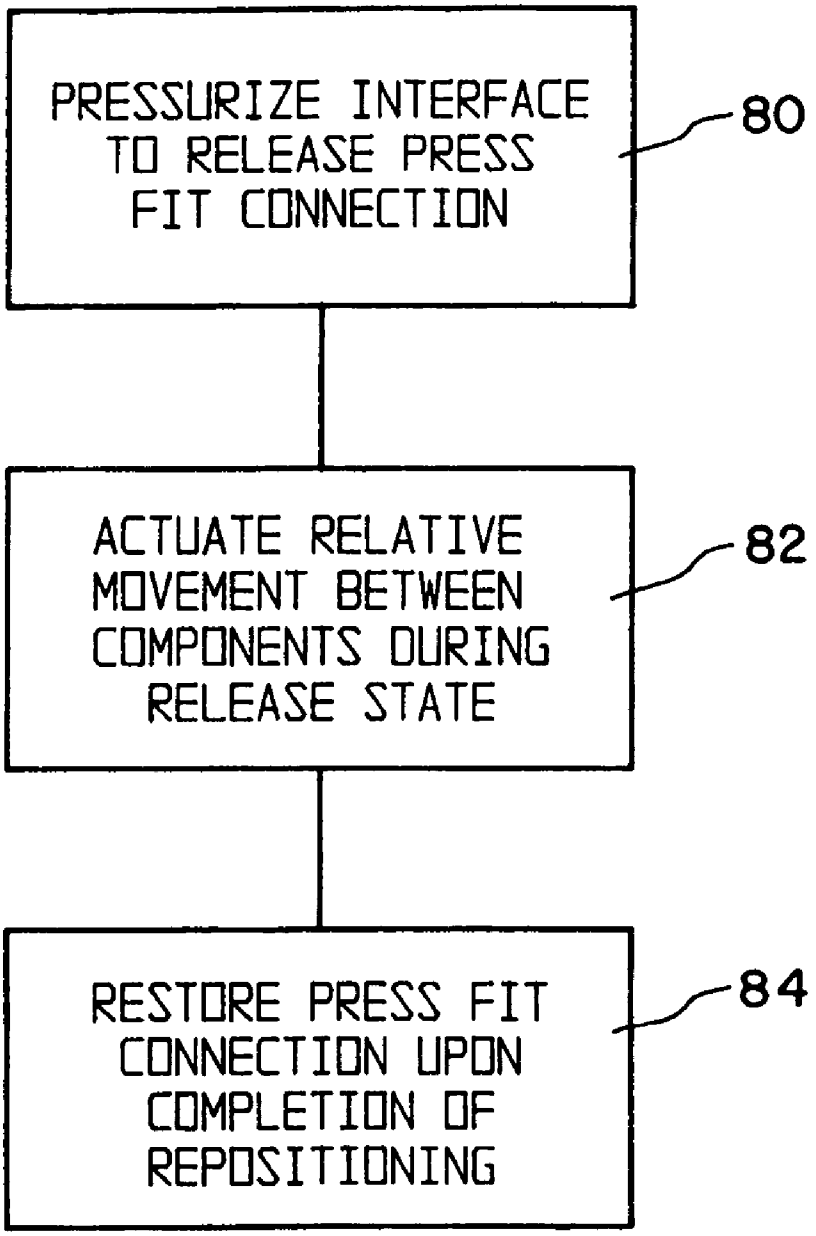
PRESSURIZE INTERFACE TO RELEASE PRESS FIT CONNECTION
80
ACTUATE RELATIVE MOVEMENT BETWEEN COMPONENTS DURING RELEASE STATE
82
RESTORE PRESS FIT CONNECTION UPON COMPLETION OF REPOSITIONING
84

Fig. 8

ADJUSTABLE CLAMPING DEVICE IN A MECHANICAL PRESS

[0001] This application is a divisional of co-pending U.S. application Ser. No. 09/750,751 filed on Dec. 29, 2000, filed under the same named inventor, and claims a priority benefit under 35 U.S.C. § 120.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a mechanical press, and, more particularly, to a method and apparatus useful in adjusting press components associated with press fit couplings, such as support structures for rocker arm mechanisms provided in machine drive apparatus.

[0004] 2. Description of the Related Art

[0005] Mechanical presses and other such power delivery machines utilize a drive apparatus to transmit torque between components. Depending upon the press application, it is possible that the drive apparatus may need to be reconfigured to accommodate a different press process or for other suitable reasons. For this reason, it is important that the press machine have the capability to allow adjustments to be made to the drive apparatus. For example, it may be necessary to alter or modify the mechanical relationship of the rocker arm so as to change its effective arm length and hence the torque transmission characteristics.

[0006] However, conventional adjustment mechanisms deploy a manual procedure involving movement of the rocker arm support between a limited number of discrete locations. The support element typically is secured using a removable key that is inserted into the support element and then received within a stationary fastening insert or hole to lock it in place. To effect movement, the key is removed and the support element is repositioned, but only to another keying location where the key channel of the support element is in alignment or registration with another stationary fastening insert.

[0007] What is therefore needed is an adjustment mechanism capable of executing continuously variable dynamic adjustments.

SUMMARY OF THE INVENTION

[0008] In one form of the invention, a combination includes an adjustable clamping device normally clamped to a support member in a press fit or interference fit connection. The combination is adapted to enable the press fit connection to be selectively releasable. In one form of the combination, the clamping device includes a slider block annularly disposed about a bar or rod apparatus. During a normal state, the slider block is clamped circumferentially about the rod in a press fit or interference engagement that defines a locking condition for preventing relative movement between the slider block and rod.

[0009] A hydraulic release mechanism injects a high pressure fluid into the interface (e.g., interstitial spacing) between the slider block and rod to effectuate a radially outward displacement of the slider block relative to the rod. This hydraulically-actuated displacement is sufficient to temporarily relieve the normal press fit or interference fit connection and thereby allow the slider block to be moved linearly with respect to the relatively stationary rod. In particular, the slider block undergoes a displacement along the longitudinal axis of the rod.

[0010] After the slider block reaches its new position, the pressurization is removed in order to reestablish and otherwise restore the previous press fit connection and once again lock the slider block against the rod.

[0011] The adjustable clamping device finds particular use in environments such as mechanical presses where the slider block functions as a support structure that serves as the pivot attachment point for carrying a rocker arm. In such a configuration, any linear adjustment of the slider block relative to the rod will likewise change the absolute positioning of the rocker arm within the press drive apparatus and thereby adjust its effective driving length, which in turn varies the torque communicating relationship between the rocker arm and the press driven component. Various other mechanical couplings or machine linkages can be similarly adjusted.

[0012] The invention, in one form thereof, is directed to an assembly comprising, in combination, a first member and a second member releasably connectable with one another. A mechanism is provided to selectively release the connection between the first member and the second member. An actuator selectively causes relative linear movement between the first member and the second member, when release of the connection exists. The releasable connection between the first member and the second member is defined in one form by a press fit connection therebetween.

[0013] The mechanism is operative further to selectively restore the releasable connection between the first member and the second member, following relative movement therebetween.

[0014] The mechanism is operative to selectively pressurize an interface defined between the first member and the second member. In particular, the mechanism is operative to perform at least one of selectively applying hydraulic pressure to the interface to enable release of the connection between the first member and the second member, and selectively withdrawing hydraulic pressure from the interface to enable restoration of the releasable connection between the first member and the second member.

[0015] The mechanism, in one form, includes at least one fluid passageway formed in the first member, at least one fluid passageway formed in the second member, or a combination thereof, wherein each fluid passageway is suitably arranged to enable hydraulic communication with the interface.

[0016] In one form of the assembly, the first member includes a rod element and second member includes a slidable element annularly disposed at least in part about the rod element. The slidable element is displaced axially along the rod element upon activation of the actuator.

[0017] The invention, in another form thereof, is directed to a combination comprising a first device and a second device arranged in releasable press fit engagement with one another. The combination further includes a first means to selectively release, at least in part, the press fit engagement between the first device and the second device; and a second means to selectively cause relative linear movement

between the first device and the second device, when release of the press fit engagement exists.

[0018] The first means is operative further to restore the releasable press fit engagement between the first device and the second device, following relative movement between the first device and the second device.

[0019] The first means, in one form, further includes a pressure means to selectively pressurize an interface defined between the first device and the second device. In particular, the pressure means is operative to perform at least one of selectively applying hydraulic pressure to the interface to enable release of the press fit engagement, and selectively withdrawing hydraulic pressure from the interface to enable restoration of the releasable press fit engagement.

[0020] In one form, the pressure means includes a source of selectively variable hydraulic pressure. The pressure means also includes at least one fluid passageway formed in at least one of the first device and the second device, wherein each fluid passageway is suitably arranged to enable fluid communication with the interface.

[0021] The second means further includes, in one form, a control apparatus to automatically adjust the relative position of the first device and the second device, in response to release of the press fit engagement.

[0022] In one form of the combination, the first device includes a rod member and the second device includes a slidable member annularly disposed at least in part about the rod member. The slidable member moves axially along the rod member upon activation of the second means.

[0023] The invention, in another form thereof, is directed to an assembly comprising, in combination, a support member, a movable member releasably connected to the support member, a mechanism to selectively release the connection between the movable member and the support member, and an actuator to selectively linearly move the movable member relative to the support member, while the movable member is operatively released from the support member.

[0024] The releasable connection between the support member and the movable member is preferably defined by a press fit engagement therebetween.

[0025] The mechanism is operative further to selectively restore the releasable connection between the movable member and the support member, following movement of the movable member relative to the support member.

[0026] The mechanism, in one form, is operative to selectively pressurize an interface defined between the support member and the movable member. In particular, the mechanism is operative to admit pressurized fluid into the interface to enable release of the connection between the movable member and the support member, and to remove pressurized fluid from the interface to enable restoration of the releasable connection between the movable member and the support member.

[0027] The actuator, in one form, includes a threaded member operatively associated with the movable member, such threaded member being arranged in adjustable threading engagement with a threaded surface formed in the movable member. A device is provided to activate the threaded member.

[0028] The device, in one form, includes a controllable motor-gear combination operatively coupled to the threaded member.

[0029] The invention, in another form thereof, is directed to an assembly comprising, in combination, a carriage member and a slidable clamping device arranged in releasable clamping relationship to the carriage member, with an interface defined therebetween. A mechanism selectively releases the clamping relationship between the clamping device and the carriage member. A means is provided to selectively move the clamping device relative to the carriage member, while the clamping device is released from the carriage member.

[0030] The releasable clamping relationship between the carriage member and the clamping device is preferably defined by a press fit connection therebetween.

[0031] The mechanism is operative further to selectively restore the releasable clamping relationship between the clamping device and the carriage member, following movement of the clamping device relative to the carriage member.

[0032] The mechanism, in one form, is operative to selectively pressurize the interface. In particular, the mechanism is operative to perform at least one of selectively applying hydraulic pressure to the interface to enable release of the clamping device from the carriage member, and selectively withdrawing hydraulic pressure from the interface to enable restoration of the releasable clamping relationship between the clamping device and the carriage member.

[0033] The movement means, in one form, further includes an actuator to displace the clamping device along an axis of the carriage member.

[0034] The invention, in yet another form thereof, is directed to an assembly comprising, in combination, a rod member and a slidable member annularly disposed at least in part about the rod member and defining an interface therewith. The slidable member is arranged in releasable press fit connection with the rod member. A mechanism is provided to selectively release, at least in part, the press fit connection between the slidable member and the rod member. A controller is provided to selectively move the slidable member relative to the rod member, following release of the slidable member from the rod member.

[0035] The mechanism is operative further to selectively restore the releasable press fit connection between the slidable member and the rod member, following movement of the slidable member relative to the rod member.

[0036] In one form, the mechanism is operative to selectively pressurize the interface. In particular, the mechanism is operative to perform at least one of selectively applying hydraulic pressure to the interface to enable release of the press fit connection between the slidable member and the rod member, and selectively withdrawing hydraulic pressure from the interface to enable restoration of the releasable press fit connection between the slidable member and the rod member.

[0037] The controller, in one form, is operative to axially displace the slidable member along the rod member.

[0038] The invention, in yet another form thereof, is directed to a method for use with a combination comprising

a support member and a movable device arranged in releasable press fit connection with the support member. The method includes the steps of releasing the press fit connection between the movable device and the support member, and linearly moving the movable device relative to the support member, during release of the press fit connection.

[0039] The releasing step further includes the step of pressurizing an interface defined between the support member and the movable device, such as by selectively applying a hydraulic pressure to the interface. The method further includes the step of restoring the releasable press fit connection between the support member and the movable device, following movement of the movable device, such as by selectively withdrawing hydraulic pressure from the interface.

[0040] The invention, in still yet another form thereof, is directed to a method to control a machine combination, wherein such machine combination includes a support member and a movable device arranged in releasable press fit connection with the support member and defining an interface therewith.

[0041] The control method includes the steps of pressurizing the interface to release the press fit connection between the movable device and the support member, and linearly moving the movable device relative to the support member, during release of the press fit connection. The pressurizing step further includes, in one form, the step of selectively applying a hydraulic pressure to the interface.

[0042] The method further includes the step of restoring the releasable press fit connection between the support member and the movable device, following movement of the movable device, such as by reducing the pressurization of the interface.

[0043] The invention, in still yet another form thereof, is directed to a method for use with a combination comprising a first member and a second member arranged in releasable press fit connection with one another. The method includes the steps of releasing the press fit connection between the first member and the second member, and actuating relative linear movement between the first member and the second member, during release of the press fit connection.

[0044] The releasing step further includes in one form the step of pressurizing an interface defined between the first member and the second member, such as by selectively applying a hydraulic pressure to the interface. The method further includes in one form the step of restoring the releasable press fit connection between the first member and the second member, following the relative movement therebetween, such as by selectively withdrawing hydraulic pressure from the interface.

[0045] One advantage of the invention is that dynamic, in-process adjustments can be made to the slider block throughout the entire press running cycle without any need to suspend the press operation.

[0046] Another advantage of the invention is that such on-the-fly adjustments to the slider block location enable the rapid execution of changes to the drive apparatus in response to new press conditions or parameters, such as varying the effective drive length of the rocker arm.

[0047] Another advantage of the invention is that an infinite number of continuously variable adjustment positions can be obtained for the slider block, unlike conventional arrangements where only a finite set of discrete block locations are possible.

[0048] Another advantage of the invention is that the adjustment mechanism may be operated at any time before, during, and after press operation.

[0049] Another advantage of the invention is that the adjustment process may be executed automatically, namely, the actuator is automatically activated to displace the slider block in response to an indication that the press fit connection has been released.

BRIEF DESCRIPTION OF THE DRAWINGS

[0050] The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

[0051] **FIG. 1** is a partial block diagram/schematic showing a front-side, forward-end, elevational perspective view of a machine combination employing the adjustment mechanism of the present invention;

[0052] **FIG. 2** is a schematic showing a front-side, planar view of the machine combination illustrated in **FIG. 1**;

[0053] **FIG. 3** is a partial schematic showing a front-side, rearward-end, elevational perspective view of the machine combination illustrated in **FIG. 1**;

[0054] **FIG. 4** is a partial schematic showing a front-side, forward-end, bottom elevational perspective view of the machine combination illustrated in **FIG. 1**;

[0055] **FIG. 5** is a partial schematic showing a back-side, rearward-end, elevational perspective view of the machine combination illustrated in **FIG. 1**;

[0056] **FIG. 6** is a partial schematic showing a rearward-end, axial plane view of the machine combination illustrated in **FIG. 1**;

[0057] **FIG. 7** is a partial schematic showing a front-side, cross-sectional, plane view taken along lines A-A' of **FIG. 6**, illustrating further a fluid channel configuration for conveying fluid to the press-fit interface, according to another embodiment of the present invention; and

[0058] **FIG. 8** is a flow diagram illustrating an operating sequence for the adjustment mechanism of **FIG. 1**, according to the present invention.

[0059] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates one preferred embodiment of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

[0060] Referring now to the drawings and particularly to **FIG. 1**, there is shown a partial block diagram, schematic

perspective view of a machine combination (illustrated generally at **10**) employing an adjustment mechanism (illustrated generally at **12**), in accordance with one embodiment of the present invention.

[**0061**] Referring to **FIG. 1** in conjunction with **FIG. 2**, the illustrated machine combination **10** preferably forms part of a mechanical press and includes a drive arm or linkage **14** (e.g., press rocker arm). Drive arm **14** is coupled at an upper drive end to a press driven component **16** (e.g., eccentric gear)in the indicated eccentric driving relationship, for example. Drive arm **14** is pivotally coupled at a lower support end to an adjustable slider block or movable device **18**. The pivoting connection between drive arm **14** and slider block **18** is facilitated with an attachment link **20** fixedly secured at an upper end to drive arm **14** using screws **22** and pivotingly coupled at a lower end to slider block **18**.

[**0062**] Press component **16** and rocker arm **14** are supported by a housing assembly generally illustrated at **24**, which includes a forward-end housing unit **26** and a rearward-end housing unit **28** arranged in spaced-apart relationship. Housing units **26** and **28** are coupled to one other using a shaft or rod apparatus **30** extending between them. The rod apparatus **30** is rigidly, fixedly secured at opposite ends to housing units **26** and **28** and therefore is stationary with respect thereto. Press component **16** is pivotally mounted to forward housing unit **26** using pivot pin **36**. Housing assembly **24** further includes a backing plate **32** secured to rearward housing unit **28** using screws **34**.

[**0063**] The mounting support provided by housing assembly **24** to drive arm **14** and press component **16** is further exemplified in the various views shown in **FIGS. 2-5**. Referring specifically to the backside view of **FIG. 5**, the entire machine combination **10** is assembled to the press frame upright using attachment member **38**.

[**0064**] Slider block **18** is mounted upon rod **30** in a well-known press fit connection or interference-type engagement. Slider block **18** may similarly be considered to be arranged in a clamping relationship to rod **30**. In one form, slider block **18** is annularly disposed about rod **30** to define an interface therebetween at which the press fit connection is established. As known, this press fit or interference fit is defined at the circumferential, peripheral, and/or bearing surfaces of slider block **18** and rod **30**.

[**0065**] According to one aspect of the invention, discussed in more detail below, the combination of slider block **18** and support rod **30** is adapted to provide a releasable press fit connection therebetween. In particular, the normal press fit connection may be selectively released such that the inner bearing surface of slider block **18** and the outer bearing surface of support rod **30** become sufficiently disengaged to enable relative motion between slider block **18** and rod **30**. In one form, release of the press fit connection may be characterized by the formation of a small radial clearance between the components.

[**0066**] As used herein, this release action is preferably complete (i.e., occurs throughout the entire press fit connection interface), although it should be understood that any degree of disconnection may be accomplished which is sufficient to allow relative movement between slider block **18** and rod **30**. For example, some degree of press fit engagement may remain provided that it does not compromise the ability to effectuate relative movement of the components.

[**0067**] According to another aspect of the invention, once the slider block **18** is released from rod **30** and while such release condition is being maintained, slider block **18** is caused to move relative to rod **30**. Preferably, the actuated movement involves selective and reversible axial displacement of slider block **18** relative to support rod **30**. In particular, slider block **18** is displaced axially along a longitudinal dimension of rod **30**. For this purpose, rod **30** remains substantially immovable with respect to slider block **18**.

[**0068**] Although the preceding discussion has involved the illustrated machine combination **10**, this implementation should not be considered in limitation of the present invention as it should be apparent that the present invention may be used in conjunction with various other assemblies or device arrangements, and deployed in machine environments other than mechanical presses.

[**0069**] Referring now to adjustment mechanism **12** of the present invention shown diagrammatically in **FIG. 1**, the illustrated adjustment mechanism **12** includes, in combination, a controller **50**, a hydraulic assembly **52**, an actuator assembly (generally illustrated at **54**), and motor drive electronics **56**. Controller **50** generally provides operational control of the indicated components to accomplish the main features of the present invention, namely, release of the press fit connection between slider block **18** and support rod **30** (using hydraulic assembly **52**) and movement of slider block **18** relative to support rod **30** (using actuator assembly **54** in conjunction with drive electronics **56**).

[**0070**] According to one aspect of the present invention, the combination of slider block **18** and rod **30** is adapted to enable the normally static, press fit connection established therebetween to be made selectively releasable. For this purpose, in one implementation, the illustrated hydraulics assembly **52** is used to selectively pressurize the interface defined at the press fit connection between slider block **18** and support rod **30**.

[**0071**] Hydraulics assembly **52** preferably includes, in one form thereof, a source of selectively variable high-pressure hydraulic fluid in combination with a controllable valve assembly. These components are adapted to deliver a controllable high-pressure fluid flow sufficient to induce release of the press fit connection, upon admittance into and distribution through the press fit interface. The high pressure fluid is typically in the range, but not limited to, between 7000 p.s.i. and 10,000 p.s.i., and may include oil or any other suitable medium.

[**0072**] For purposes of transporting fluid from hydraulic assembly **52** to the interface between slider block **18** and rod **30**, any suitable means may be used to convey the fluid, without limitation. Referring to **FIG. 7** in conjunction with **FIG. 1**, in one preferred form, a fluid channel arrangement is formed as by fluid supply output line **62** to provide fluid communication between the press fit interface region (depicted generally at **60**) and hydraulic assembly **52**. This fluid communication is facilitated with an intermediate coupling arrangement comprising fluid supply output line **62** and fluid valve/fitting combination **64** attached to slider block **18**.

[**0073**] Seals **66** (**FIG. 7**) are annularly disposed about rod **30** and interfit within slider block **18** in the indicated manner

to define a sealed, fluid tight location or interface **60** capable of being pressurized and then maintaining the pressurization. Any seal arrangement or other suitable means may be used to facilitate the formation of a pressurizable interface between the components.

[**0074**] As shown further in **FIG. 7**, the illustrated radial fluid channels open into interface **60** to enable the delivery of high-pressure fluid thereto, followed by its circumferential distribution about rod **30** to effectuate release of the press fit connection. As known, this pressurization causes circular expansion (i.e., radially outward elastic displacement) of the inner circumferential bearing surface of slider block **18** to thereby define a small radial clearance with rod **30**.

[**0075**] The indicated means for delivering fluid to interface **60** should not be considered in limitation of the present invention as it should be apparent that any other suitable means may be used to provide access to interface **60**. For example, the fluid channels may be formed in rod **30**. Additionally, any number, arrangement, or configuration of fluid channels may be used.

[**0076**] The illustrated actuator assembly **54** includes, in combination, motor unit **70**, pinion **72**, gear **74**, and adjustable threaded drive screw **76** arranged in cooperating relationship to one another. In a conventional manner, motor **70** is arranged in rotary driving relationship to pinion **72**, which is provided in intermeshing gear-driving relationship to gear **74**. Gear **74** is arranged in driving connection to screw **76** via intermediate coupling member **78**, which may be separate from or integrally formed with screw **76**. The combination of components **70**, **72**, **74**, **76**, and **78** are attached and otherwise mounted to housing unit **28**. The illustrated drive screw **76** extends from housing unit **28** at one end thereof and is received into a suitable bore formed in slider block **18** at another end thereof. In a preferred form, drive screw **76** is provided with an outer threaded surface that is arranged in threading engagement with a complementary threaded surface formed in the receiving bore of slider block **18**. The threading engagement between drive screw **76** and slider block **18** is sufficient to enable rotary motion of screw **76** to induce axial displacement of slider block **18** relative to screw **76**, under conditions where slider block **18** is free to move and not otherwise prevented from moving, i.e., during release of the press fit connection with rod **30**.

[**0077**] In a conventional manner, the rotary motion generated in motor **70** produces simultaneous rotation of pinion **72**, which concurrently drives gear **74** via their intermeshing gear arrangement. The driven rotary motion of gear **74** imparts a driving rotation to screw **76**, which turns within slider block **18** and imparts a linear displacing force thereto via the threading engagement. The motion of slider block **18** is reversible since a controlled counter-rotation of motor **70** will cause screw **76** to turn in the opposite direction.

[**0078**] Although the illustrated form of actuator assembly **54** includes a cooperating motor-gear combination, this implementation should not be considered in limitation of the present invention as it should be apparent that any means may be used to displace or otherwise actuate movement of slider block **18**. Additionally, the screw **76** is supported at the end opposite the actuator assembly **54** by housing unit **26**.

[**0079**] The illustrated motor drive electronics **56** conventionally provide the electronic signals suitable for activating motor **70**. Any means well known to those skilled in the art may be used to activate and control motor **70**.

[**0080**] The illustrated controller **50** may be implemented in any form suitable to provide operational control of hydraulic assembly **52** and actuator **54** via motor drive electronics **56**. For example, controller **50** may include, but is not limited to, a programmable or dedicated computer or microprocessor, logic control circuitry, firmware, software processes, or any combination thereof.

[**0081**] Referring now to **FIG. 8**, during operation, controller **50** receives an instruction or other such command to execute a controllable adjustment to the location of slider block **18**. This command may be obtained from any source, such as a manual input from the operator or a signal from a machine monitoring system that detects a condition requiring a new position for the slider block (e.g., a new drive configuration).

[**0082**] The adjustment command will preferably embody or otherwise have a, representation of the new location of the slider block. In one alternate form, a database may be provided that maps and otherwise correlates various press conditions or processes to a respective slider block location. In this manner, the controller **50** can simply retrieve from the database the new slider block position using an input press parameter as a key for accessing and searching the database. For example, certain press operating processes may demand certain drive configurations for the rocker arm, which correlate to specific positions for slider block **18** along rod **30**.

[**0083**] Controller **50** formulates the control signals sufficient to activate hydraulic assembly **52** and effectively cause release of the press fit connection between slider block **18** and rod **30**. As indicated previously, hydraulic assembly **52** in combination with the fluid supply output line **62** (**FIG. 1**) and fluid channels **58** (**FIG. 7**) cooperatively function to pressurize the press fit interface or location between slider block **18** and rod **30**. (Step **80**).

[**0084**] This pressurization, in a preferred form, induces a reversible, radially-outward displacement of slider block **18**, at least at its inner bearing surface disposed in opposition to rod **30** where the press fit connection occurs. For this purpose, slider block **18** is made (at least in part) of a material having sufficient resiliency and rigidity to form a tight press fit connection, but also having an elasticity that allows the slider block to expand during pressurization and then eventually return to its original press fit engagement following removal of the pressurization.

[**0085**] As a result of the pressurization, a small radial clearance is established between slider block **18** and rod **30** that allows relative movement between the components. At this point, controller **50** formulates the appropriate control signals for activating actuator assembly **54** in a manner sufficient to move slider block **18** relative to rod **30** in the desired manner. For this purpose, controller **50** may include a processor to assist in performing such signal formulation. Actuator assembly **54** is activated via motor drive electronics **56**, which receive the control signals issued from controller **50**. (Step **82**).

[**0086**] Slider block **18**, in its released condition, is then moved linearly with respect to rod **30**. In particular, slider block **18** moves axially along the longitudinal dimension of rod **30**.

[0087] Following activation of the actuator assembly **54**, and upon completion of the repositioning of slider block **18**, controller **50** issues another set of control signals to hydraulic assembly **52** that are sufficient to appropriately reduce the pressurization being maintained at the interface between slider block **18** and rod **30**, thereby restoring the original press fit connection therebetween. As known, this pressure reduction involves withdrawing the hydraulic pressure in a fluid evacuation or exhaustion process, for example. (Step **84**).

[0088] The control feature of adjustment mechanism **12** is particularly advantageous because it allows continuously variable, dynamic adjustments to be made to the relative position of slider block **18** and rod **30** throughout the entire press running cycle. Notably, the adjustments are executed on an in-process basis characterized by on-the-fly repositioning as the press operation is occurring. Additionally, any linear displacements to slider block **18** are selectively reversible using the appropriate control commands from controller **50**. In particular, slider block **18** can be selectively moved along rod **30** in either axial direction at any time. The mechanism also allows a highly precise maneuvering or relocation of slider block **18** due to the operational precision and stability afforded by controller **50** and actuator assembly **54**, especially with computer-based or microprocessor-based implementations.

[0089] What has been shown and described herein, in one preferred form, is an adjustable clamping mechanism that includes a slider block annularly disposed about a rod device or round bar member within a mechanical press. The mechanism utilizes a press fit connection between the components. During operation, high-pressure oil is injected into the location between the slider block and rod, thereby relieving the press fit and making it possible to have relative movement therebetween. An actuator causes selective linear displacement of the slider block along the longitudinal axis of the stationary rod during the release condition. Once the slider block is repositioned, the high-pressure oil is removed, which reactivates the press fit connection and causes the slider block to once again lock up against the rod and prevent movement therebetween.

[0090] It should be understood that the present invention may be used in combinations, arrangements, or systems where the type of interaction or engagement between respective components, devices, or members includes, but is not limited to, a press fit, interference fit, retentive action, grasping action, clamping action, or holding action, whether established in full or in part over the relevant interface.

[0091] Furthermore, although the preferred implementation involves movement of slider block **18** relative to stationary rod **30**, this should not be considered in limitation of the present invention. Rather, the present invention should be understood as encompassing any relative movement between slider block **18** and stationary rod **30**, whether by movement of slider block **18** relative to rod **30**, movement of rod **30** relative to slider block **18**, or a combination thereof.

[0092] Additionally, while linear displacement of slider block **18** along rod **30** is contemplated (i.e., movement of slider block **18** is actuated axially along the longitudinal dimension of rod **30**), it is also possible within the scope of the invention that motion may be actuated in a curvilinear or rectilinear fashion, such as in configurations where the element represented by rod **30** has other than a right-cylindrical or shaft-like geometry.

[0093] Moreover, although the preferred implementation involves release of the press fit connection via a radially outward elastic displacement of the bearing surface of slider block **18** (accompanied by substantially no radial displacement of rod **30**), it should be understood that the release condition may also be accomplished with a radially inward elastic displacement of the bearing surface of support rod **30** occurring alone or in combination with a radially outward elastic displacement of the bearing surface of slider block **18**. For this purpose, the fabrication materials, geometry, and construction of rod **30** and slider block **18** will be selected to accommodate the type of release action.

[0094] While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

1-38. (canceled)

39. A method for use with a combination comprising a support member and a movable device arranged in releasable press fit connection with said support member, said method comprising the steps of:

releasing the press fit connection between said movable device and said support member; and

linearly moving the movable device relative to said support member, during release of the press fit connection.

40. The method as recited in claim 39, wherein the releasing step further comprises the steps of:

pressurizing an interface defined between said support member and said movable device.

41. The method as recited in claim 40, wherein the pressurizing step further comprises the steps of:

selectively applying a hydraulic pressure to the interface.

42. The method as recited in claim 41, further comprises the steps of:

restoring the releasable press fit connection between said support member and said movable device, following movement of the movable device.

43. The method as recited in claim 42, wherein the restoring step further comprises the steps of:

selectively withdrawing hydraulic pressure from the interface.

44. The method as recited in claim 39, further comprises the steps of:

restoring the releasable press fit connection between said support member and said movable device, following movement of the movable device.

45. The method as recited in claim 44, wherein the releasing step further comprises the steps of:

pressurizing an interface defined between said support member and said movable device.

46. The method as recited in claim 45, wherein the restoring step further comprises the steps of:

reducing the pressurization of the interface.

47. A method to control a machine combination, said machine combination comprising a support member and a movable device arranged in releasable press fit connection with said support member and defining an interface therewith, said method comprising the steps of:

pressurizing the interface to release the press fit connection between said movable device and said support member; and

linearly moving the movable device relative to said support member, during release of the press fit connection.

48. The method as recited in claim 47, further comprises the steps of:

restoring the releasable press fit connection between said support member and said movable device, following movement of the movable device.

49. The method as recited in claim 48, wherein the restoring step further comprises the steps of:

reducing the pressurization of the interface.

50. The method as recited in claim 47, wherein the pressurizing step further comprises the steps of:

selectively applying a hydraulic pressure to the interface.

51. The method as recited in claim 50, further comprises the steps of:

restoring the releasable press fit connection between said support member and said movable device, following movement of the movable device, by selectively withdrawing hydraulic pressure from the interface.

52. A method for use with a combination comprising a first member and a second member arranged in releasable press fit connection with one another, said method comprising the steps of:

releasing the press fit connection between said first member and said second member; and

actuating relative linear movement between said first member and said second member, during release of the press fit connection.

53. The method as recited in claim 52, wherein the releasing step further comprises the steps of:

pressurizing an interface defined between said first member and said second member.

54. The method as recited in claim 53, wherein the pressurizing step further comprises the steps of:

selectively applying a hydraulic pressure to the interface.

55. The method as recited in claim 54, further comprises the steps of:

restoring the releasable press fit connection between said first member and said second member, following the relative movement therebetween.

56. The method as recited in claim 55, wherein the restoring step further comprises the steps of:

selectively withdrawing hydraulic pressure from the interface.

57. The method as recited in claim 52, further comprises the steps of:

restoring the releasable press fit connection between said first member and said second member, following the relative movement therebetween.

58. The method as recited in claim 57, wherein the releasing step further comprises the steps of:

pressurizing an interface defined between said first member and said second member.

59. The method as recited in claim 58, wherein the restoring step further comprises the steps of:

reducing the pressurization of the interface.

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