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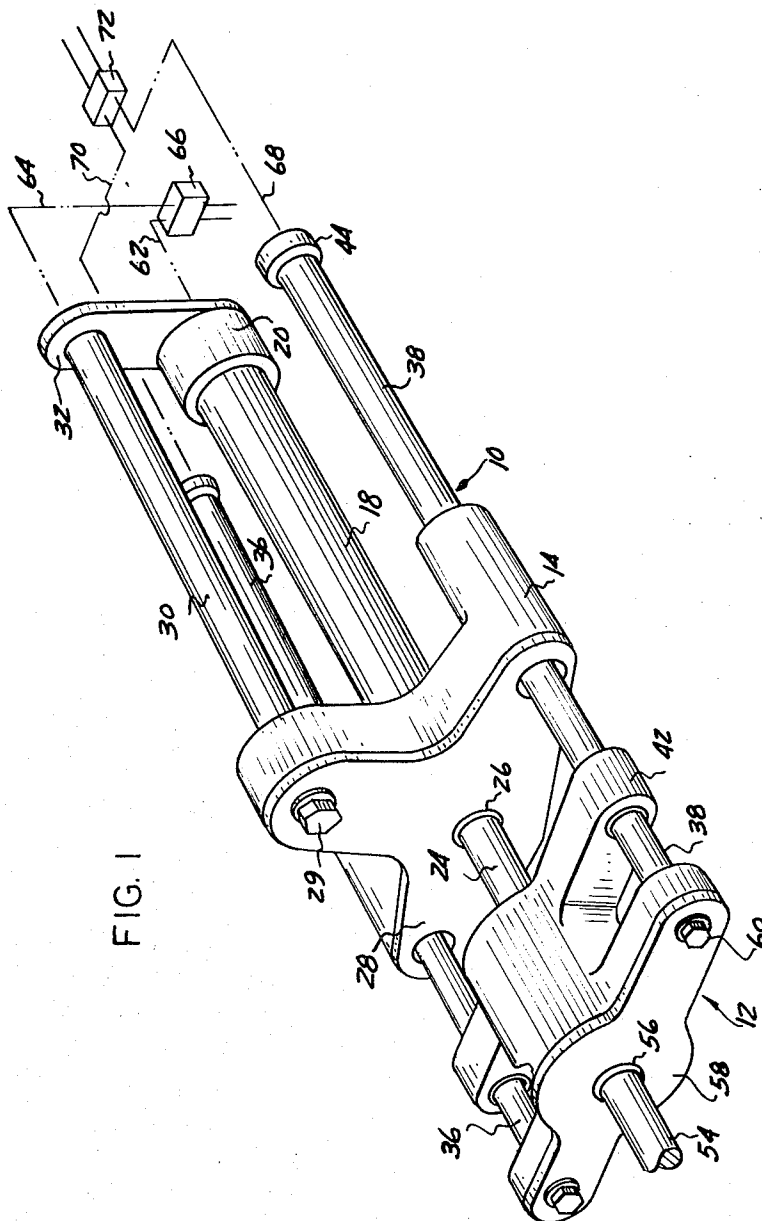
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MATERIAL-HANDLING DEVICE ACTUATOR

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2 Sheets-Sheet 1



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MATERIAL-HANDLING DEVICE ACTUATOR

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ABSTRACT OF THE DISCLOSURE

An actuating mechanism for a reciprocating workpiece gripper comprises a pair of parallel fluid actuated power cylinders mounted in tandem so that the gripper actuating cylinder is mounted for reciprocation with the travel cylinder piston rod. Guide rods for the actuating cylinder structure double as conduits for supplying actuating pressure to the actuating cylinder chamber. A support rod for the entire mechanism doubles as a conduit for supplying actuating pressure to the travel cylinder chamber.

This invention relates generally to material-handling equipment, and more particularly, to a device for positioning and actuating a workpiece gripper.

Automatic handling equipment employed for loading and withdrawing a panel or workpiece from a stamping press or the like generally includes a series of hydraulic or pneumatic actuating cylinders. In conventional practice, the supply lines carrying the actuating fluid are generally in the form of exposed hoses. Because of their proximity to moving elements, heat, sparks, and the like, these exposed hoses tend to become tangled and abraded, and are further subject to fatigue failure from the numerous cycling to which they are subjected. Periodic shut-downs are therefore required for maintenance and replacement of the hoses.

Accordingly, it is an object of this invention to provide an improved material-handling device which is simple and reliable in operation, and which eliminates the requirement of frequent maintenance on hoses.

This and other objects of this invention will become apparent from the following specification when considered in conjunction with the accompanying drawings.

In these drawings:

FIG. 1 is a perspective view of the device of this invention.

FIG. 2 is a fragmented plan view partially in section of the device of FIG. 1, viewed in the direction of arrows 2—2 of FIG. 3.

FIG. 3 is a fragmented side elevational view partly in section of the device of FIG. 1, viewed in the direction of arrows 3—3 of FIG. 2.

Referring now to the drawings, the device of this invention comprises generally a travel cylinder assembly 10 and an actuator cylinder assembly 12. Travel cylinder assembly 10 in turn comprises a guide body 14 into which is set a rod end cap 16 (see FIGS. 2 and 3) which receives one end of travel cylinder tube 18. The opposite end of travel cylinder tube 18 is sealed by blind end cap 20. Reciprocally mounted within travel cylinder tube 18 are travel piston 22 and travel piston rod 24. Piston rod 24 exits from guide body 14 through rod gland 26, which is secured within the guide body by cover plate 28 and screws 29 (only one of which is illustrated). The travel cylinder assembly is tied together by a series of tie rods (unillustrated) which thread through guide body 14 and blind end cap 20 in a conventional manner.

Hanger rod 30 is recessed into guide body 14 at one end (see FIGS. 1 and 2) and is secured at its other end to blind end cap 20 by means of rod support bracket 32. Hanger rod 30 is in turn mounted within a universal joint housing 34 which may form the terminal portion of a

swinging arm (not illustrated). By means of hanger rod 30, the entire assembly of this invention may be suspended and transported as desired.

A pair of guide rods 36, 38 are reciprocally mounted within guide rod bushings 40 in guide body 14. The left hand end portions of guide rods 36, 38 are received by actuator cylinder body 42 and are locked thereto by a plurality of locking screws or pins 43 (see FIG. 3) which key through the actuator cylinder body into the guide rods. The right hand end portions of guide rods 36 and 38 are provided with stops 44 which function to limit the leftward stroke of the actuator cylinder assembly.

The left end of piston rod 24 is provided with a T portion 46 which is secured to actuator cylinder assembly 12 by cover plate 48. In this way, actuator cylinder assembly 12 reciprocates in conjunction with travel cylinder piston 22.

Another cylinder body 42 is provided with a cylinder bore 50 in which reciprocates actuator cylinder piston 52 and actuator cylinder rod 54. Rod gland 56 is retained within body 42 by cover plate 58 and screws 60.

The free end of actuator cylinder rod 54 may be utilized to operate any type of workpiece gripping device, such as a conventional toggle-operated pair of jaws. The details of such a gripping unit do not form a part of this invention and is accordingly unillustrated.

The actuation of the travel cylinder and the actuator cylinder may be controlled by a hydraulic system. A travel cylinder advancing line 62 may be connected to a port in a blind end cap 20 to drive the travel piston toward the left. The return stroke of travel piston 22 would be effected by the admission of hydraulic pressure supplied through passage 64 (see FIG. 3) which passes through hanger rod 30 and guide body 14. Lines 62 and 64 would be selectively connected to either a source of fluid pressure or an exhaust line by a travel cylinder control valve 66 (see FIG. 1).

Actuator cylinder piston 52 would similarly be controlled by a pair of hydraulic supply lines 68 and 70 which pass through the hollow bore of guide rods 38 and 36, respectively. The advance or leftward stroke of the actuator cylinder piston would be controlled by passage 68 (see FIG. 2), while the return stroke of actuator cylinder piston 52 would be controlled by passage 70. Lines 68 and 70 would be selectively connected to the source of fluid pressure or an exhaust by means of actuator cylinder control valve 72.

In the normal sequence of operation, the device of this invention may be swung into the desired position by means of some type of control arm connected to the device through universal joint 34 or could be fixed on a suitable support. Once in position, travel cylinder control valve 66 would be actuated to supply pressure through passage 62 to drive travel cylinder piston 22 to the left. The leftward movement of piston 22 and piston rod 24 would cause a leftward stroke of the actuator assembly 12, the latter assembly being guided and maintained in horizontal attitude by means of guide rods 36 and 38. At the completion of the stroke of the travel cylinder, actuator cylinder control valve 72 would be actuated to supply fluid pressure through passage 68 to effect the leftward stroke of actuator cylinder piston 52 and piston rod 54, which in turn would produce the desired action of the workpiece gripping structure. Once a grip on the workpiece had been acquired, the setting of valve 66 would be reversed to exhaust passage 62 and supply passage 64 with pressure. This would cause travel piston 22 to return to its right hand position, thereby withdrawing the workpiece from the press or whatever other operation was involved. At this point, the setting of valve 72 would be reversed so as to exhaust passage 68 and supply passage 70 with hydraulic pressure, whereby actuator cyl-

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inder piston 52 would return to its right hand position. This would effect the release of the workpiece. The device would then be in condition to repeat the above cycle on the next workpiece.

The proper sequencing of valves 66 and 72 could be achieved by a series of solenoids and a cam-operated timer switch or the like.

It can be seen that the device of this invention provides an extremely reliable and maintenance free construction. The hydraulic supply lines are all concealed and protected within steel structural elements. By such a construction, the problem of hose fouling and wear is eliminated.

This invention may be further developed within the scope of the following claim. Accordingly, the above specification is to be interpreted as illustrative of only a single embodiment, and not in a strictly limited sense.

I now claim:

1. A material-handling device actuator comprising:
 - a source of fluid pressure;
 - a travel cylinder assembly comprising a housing, a hollow cylinder secured to said housing, a hollow supporting rod secured to said cylinder and said housing, and a piston and piston rod assembly mounted for reciprocating movement within said travel cylinder under the influence of differential pressure applied to the opposed faces of said travel cylinder piston, said supporting rod serving as a conduit for actuating pressure to be applied to said travel cylinder piston, said travel cylinder piston rod having an end extending out through one end of said travel cylinder;
 - an actuating cylinder assembly fixed to said protruding end of said travel cylinder piston rod and comprising a hollow cylinder housing, a piston and piston rod assembly mounted for reciprocating movement with-

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in said actuating cylinder under the influence of differential pressure applied to the opposed faces of said actuating cylinder piston, the stroke of said actuating cylinder piston being parallel to and coaxial with that of said travel cylinder piston, said actuating cylinder piston rod having an end extending out through one end of said actuating cylinder and adapted to be connected to a workpiece gripping unit;

said actuating cylinder assembly further comprising a pair of hollow guide rods rigidly secured to said actuating cylinder housing and parallel to said travel cylinder piston rod, said guide rods being mounted for reciprocating movement through said travel cylinder housing;

and fluid circuit means operatively connecting said source of fluid pressure to said travel cylinder and to said actuating cylinder, the circuit to said actuating cylinder utilizing said hollow guide rods as conduits.

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