Nov. 18, 1958 W. R. PETERSON 2,860,908

HYDRAULIC MATERIAL HANDLING APPARATUS

Filed April 12, 1956

Fig. 1.

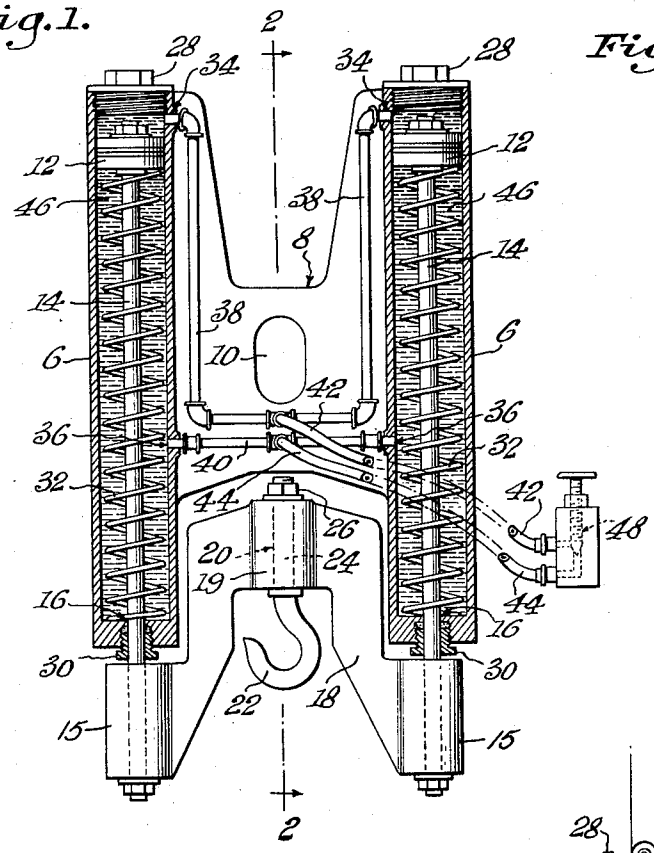
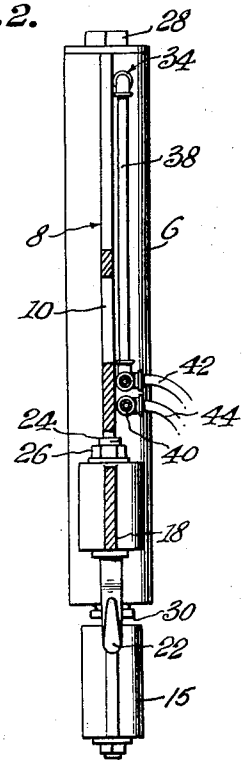



Fig. 2.



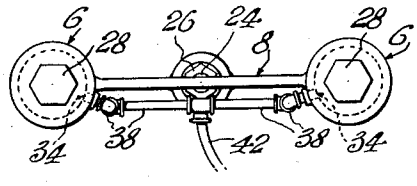




Fig. 3.

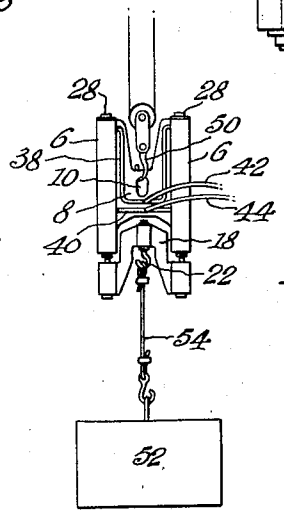



Fig. 4.

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# HYDRAULIC MATERIAL HANDLING APPARATUS

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1 Claim. (Cl. 294—88)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

The present invention relates to load supporting devices and more particularly to an hydraulic apparatus to be used as an attachment with a crane or hoist hook for the precise lowering of a heavy load into a desired location.

It is an object of the instant invention to bring a heavy article suspended by a crane or hoist from a position slightly above the place it is to occupy down in the exact desired location with great slowness and accuracy.

It is another object of this invention to provide an hydraulically operated apparatus to be used in conjunction with a crane or a hoist to deliberately and accurately lower a heavy load to a desired final location, or to a position in which it can be easily meshed with or brought into engagement with a stationary object, as in progressively adding heavy parts to a structure.

It is a further object of the invention to provide an attachment for cranes or hoists for slowly lowering heavy loads by releasing controlled volumes of enclosed hydraulic fluid from beneath load supporting pistons.

Another object of the invention is to provide a construction whereby load supporting pistons may be slowly and deliberately lowered by the downward force of the load acting against the resistance of hydraulic fluid to passage or flow through a restricted aperture of variable magnitude and against the increasing resistance of coiled springs.

Desirable features of an hydraulic material handling and load lowering apparatus are short effective length so that hook elevation for a given crane installation will be decreased a minimum amount when the apparatus is attached, a load supporting hook that can be independently mounted for easy swiveling without the need for costly machining of parts, and means for slowly releasing enclosed load supporting hydraulic fluid by remote control.

It is, therefore, an object of this invention to minimize the loss of effective crane height by providing a specially designed auxiliary load lowering apparatus.

Another object is to provide a material handling and load lowering apparatus having a load supporting hook mounted in a frame between two load carrying pistons in a manner to permit ease of swiveling and relatively friction free rotation of the hook independently of its supporting frame.

A still further object of the invention is to provide a construction whereby release of hydraulic fluid supporting a load carrying piston can be accomplished through the operation of a valve in a location remote from the apparatus.

Other objects and a more thorough understanding of the invention may be had by reference to the following description and claims taken in conjunction with the accompanying drawings which show an illustrative embodiment of the construction forming the basis of the invention and in which—



Fig. 1 is a view showing the hydraulic load lowering apparatus in elevation and partially in section;

Fig. 2 is a vertical section of the apparatus shown in Fig. 1 and taken along the line 2—2 of Fig. 1;

Fig. 3 is a plan view of the apparatus; and

Fig. 4 is a view illustrating the mode of operation of the apparatus in conjunction with a conventional crane hook and load.

With reference to the drawing, two cylinders **6** integrally closed at the bottom and open at the top are mounted on each side of the apparatus as illustrated (Fig. 1). The cylinders **6** are rigidly held in mutually spaced parallel relation to each other by a U-shaped cylinder connecting frame **8** incorporating a centrally located lifting eye **10**, the U-shaped cylinder frame **8** with the parallel cylinders **6** forming an H-shaped cylinder unit. Housed within each cylinder **6** is a piston **12** attached to piston rod **14** which projects through an aperture **16** in the bottom of the cylinder **6**. A piston connecting frame **18** in the shape of an inverted U with the ends of the legs having outwardly projecting lugs **15** is firmly attached to the projecting ends of the piston rods **14** and holds them in mutually spaced parallel relation to each other. The center of the piston connecting frame has a reinforced portion **19** and an elongated vertical aperture **20** within the reinforced portion **19**. A load supporting swivel hook **22** is independently carried in the aperture **20** so that its shank **24** is encompassed by the reinforced portion **19** of the connecting frame **18**, and the hook proper **22** extends below the reinforced portion **19** of the frame **18**. Attached to the top of the shank **24** is a stop **26** which holds the hook in position and permits it to rotate freely in its mounting. The axis of load support of the apparatus is determined by the line between lifting eye **10** and shank **24** of hook **22**.

Removable sealing plugs **28** are threadedly connected to the top of each cylinder **6**. Packing glands **30** mounted in the bottom of each cylinder **6** encompass each piston rod **14**. Positioned between the bottom of each cylinder **6** and its piston **12** are two helically coiled compression springs **32**. These springs **32** are tensioned to resist compression, and they yieldably oppose the downward movement of the piston **12** under the force of a load.

An upper port **34** and an intermediate port **36** are provided in the wall of each cylinder **6**. The two upper ports are connected oy an upper conduit **38**, and the two intermediate ports are interconnected by a lower conduit **40**. Flexible hose lines **42** and **44** are respectively connected to upper conduit **38** and lower conduit **40**.

Both of the cylinders **6** are filled with hydraulic fluid **46** and the flexible hose lines **42** and **44** are connected through a hand operated needle valve **48**.

In the operation of the material handling apparatus, the apparatus is attached to a crane or hoist hook **50** (Fig. 4) by its lifting eye **10**, and a load **52**, such as a heavy piece of machinery, is in turn attached to the swivel hook **22** of the apparatus either directly or by means of suitable intermediate tackle **54**. The load **52** is moved near the desired location by the crane or hoist and then lowered while the needle valve **48** is closed until it is a few inches above its final position. Precision control of the lowering operation is obtained independently of the crane or hoist brake by opening needle valve **48** the proper amount to effect an accurate and deliberate setting of the load. When the needle valve **48** is opened by the operator, the hydraulic fluid **46**, trapped in the cylinder **6** beneath the pistons **12**, is released and permitted to flow through the intermediate ports **36**. conduit **40**, hose line **44**, needle valve **48**, hose line **42**, conduit **38**, and upper ports **34**, into cylinders **6** at a point above the pistons **12**. The precisely controlled release of the fluid

46 permits the pistons 12 and piston rods 14 to move downward under the force of the load simultaneously and in equal amplitudes, and the piston connecting frame 18 and swivel hook 22 move responsively to the movement of the rods 14.

Conduits 38 and 40 permit the fluid 46 to flow freely from one cylinder 6 to the other on both sides of the pistons 12 at all times, and thus serve to equalize hydraulic pressures in the two cylinders 6. Within cylinders 6 the downward movement of the pistons 12 is yieldably opposed by return springs 32; thus, when the load 52 is released and needle valve 48 left open, springs 32 will force the pistons back to the top of cylinders 6 whereupon some of the fluid 46 will be transferred from above the pistons 12 back to its original position below the pistons, in the reverse of the path of flow followed in lowering. Intermediate ports 36 are positioned at a suitable height on the cylinders 6 to prevent piston travel below a certain point, the permanently trapped fluid 46 stopping any further piston movement below the intermediate ports 36. The positions from which the operator may control movement of the apparatus are limited only by the length of the two flexible hose lines 42 and 44.

An advantageous feature of the present invention not obtainable with the use of a single hydraulic cylinder is the minimal loss of crane height made possible through the combination of the U-shaped cylinder connecting frame 8 and the inverted U-shaped piston connecting frame 18 with the two double acting hydraulic cylinders 6. A further desirable property of the instant invention is the independent suspension of the swivel hook 22 in the vertical aperture 20 of the piston connecting frame 18 which permits relatively friction free rotation of this load carrying hook about its shank 24 as an axis without the need for the costly machining or the undue increase in the length of the unit which is required to provide a freely rotatable hook when only one hydraulic cylinder is used.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

A hydraulic material handling apparatus comprising a first U-shaped web and a second U-shaped web placed back to back in a common plane with proximate bight portions and oppositely extending legs, the ends of the legs of the first U-shaped web defining the top of the apparatus, the ends of each leg of the second web having an outward projection, the first web having a hook receiving means centrally of its bight portion, the second web having a hook member attached to the bight portion between the legs thereof, said hook and said hook receiving means establishing an axis of load support through the apparatus; said first web supporting a pair of spaced, elongated hydraulic cylinders parallel to but spaced from said axis of load and extending one along each leg of the U of said first web and beyond the bight portion of said first web to form an H-shaped unit, each cylinder containing a piston in the upper portion, an axial piston rod having one end attached to the piston and the other end extending through the lower end of the cylinder and being attached to said outward projection on one leg of said second web and a coil compression spring around said rod biasing said piston away from said lower end; a first conduit communicating between the upper ends of said cylinders, a second conduit communicating between the central portions of said cylinders, an elongated flexible conduit interconnecting said first and second conduits and a control valve in said elongated conduit whereby a load supported by said hook, when the apparatus is supported by said hook receiving means and said pistons are in the upper portions of the cylinders, may be retained by hydraulic pressure in the cylinder by maintenance of said valve in a closed position and said load may be lowered by opening said valve to permit hydraulic fluid to flow from below to above the pistons in said cylinders, said springs returning the pistons to their upper positions when said hook is not supporting a load and said valve is open.



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