

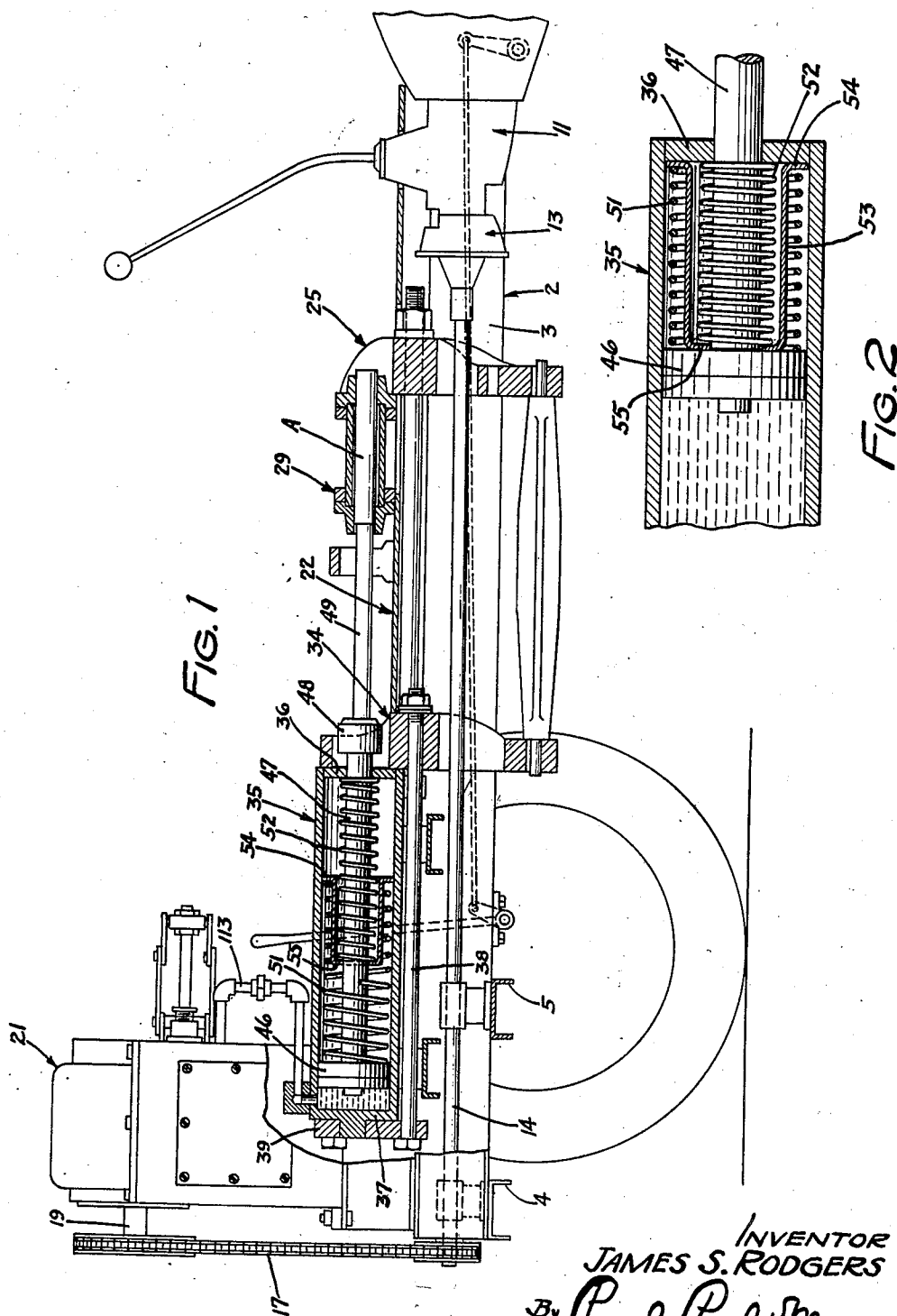
April 6, 1943.

J. S. RODGERS

2,315,816

PRESSURE APPLYING APPARATUS

Original Filed Feb. 18, 1938



INVENTOR
JAMES S. RODGERS
By *Paul, Paul & Moore*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,315,816

PRESSURE APPLYING APPARATUS

James S. Rodgers, St. Louis Park, Minn., assignor to Rodgers Hydraulic Incorporated, St. Louis Park, Minn., a corporation of Minnesota

Original application February 18, 1938, Serial No. 191,277. Divided and this application January 10, 1942, Serial No. 426,365

3 Claims. (Cl. 121—38)

This application is a division of my pending application Serial No. 191,277, filed under date of February 18, 1938 (now abandoned).

The present application is directed more specifically to a dual spring mechanism for returning the ram of a hydraulic press to its normal inoperative position within the ram cylinder.

A hydraulic apparatus of the type herein disclosed is often called upon to impart a long stroke to the work, and this requires a ram having a relatively long power stroke. It is desirable, however, in such apparatus that the overall length of the power cylinder be made as short as possible to economize space, and the present apparatus has been designed to provide a ram having a relatively long stroke in proportion to the length of the power cylinder, and in which spring means is provided for returning the ram to its normal inoperative position following the power stroke.

An important object of the present invention therefore is to provide a pressure applying apparatus comprising a cylinder having a ram mounted therein and provided with spring means for returning the ram to its normal inoperative position, at the termination of each power stroke, said spring means being so arranged within the cylinder that the return movement of the ram may be constant and uniform, when the pressure fluid is released to permit the return of the ram.

A further object is to provide a pressure applying apparatus comprising a cylinder having a ram mounted for reciprocal movement therein, and a pair of springs being mounted within the cylinder for returning the ram to its normal inoperative position, said springs being of different diameters whereby one end of one of said springs may be disposed within the adjacent end of the other of said springs, and a suitable cup-shaped retainer being provided for retaining the adjacent ends of the springs in axial telescoping relation.

A further object is to provide an apparatus of the class described comprising a pair of springs for retracting the ram after each power stroke, and said springs being substantially uniform in strength and having their adjacent ends telescoped, whereby the overall length of the power cylinder may be reduced in proportion to the length of the stroke of the ram.

Other objects of the invention reside in the novel arrangement of the springs within the cylinder whereby the expansion and contraction of said springs, as a result of ram travel, will be

substantially uniform; in the provision of a cup-shaped member within the cylinder for retaining the adjacent ends of the springs in axial telescoping relation, and whereby said member in addition to retaining said springs in proper position within the cylinder, may also function as a limit stop for limiting forward movement of the ram, thereby to prevent damage to the springs by the ram; in the novel arrangement of the springs within the cylinder whereby they cannot accidentally cause injury to workmen, should one become broken while under pressure; and in the simple and inexpensive construction of the apparatus whereby it readily lends itself for manufacture in quantity production at a low cost.

Other objects of the invention will appear from the following description and accompanying drawing and will be pointed out in the annexed claims.

In the accompanying drawing there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawing:

Figure 1 is a view showing the invention embodied in a power press of the type disclosed in the hereinbefore mentioned pending application; and

Figure 2 is an enlarged detail sectional view showing the ram head at the limit of its forward movement against the spring retainer, and also showing the springs as when under maximum pressure of the ram.

In the selected embodiment of the invention herein disclosed, there is illustrated in Figure 1, for purposes of disclosure, a portion of a hydraulic power press comprising a main supporting frame, generally designated by the numeral 2, which may be composed of side beams 3 and cross-members 4 and 5. A suitable engine, not shown, may be mounted at the front end of the frame 2, and is adapted to be operatively connected to a drive shaft 14 through a transmission 11 and universal joint 13. The rear end of the shaft 14 is shown having a chain drive 17, operatively connecting it to a crank shaft 19, adapted to operate one or more pumps, not shown, which may be located within a suitable housing 21.

An important object of the present invention resides in the unique construction of the power

applying means of the apparatus which, as shown in the drawing, comprises a cylinder, generally designated by the numeral 35. The ends of the cylinder 35 are closed by suitable heads or end walls 36 and 37, the head 37 being operatively mounted in a plate 39 having tension rods 38 engaged thereto and a member generally designated by the numeral 34. The plate 39 and member 34 are suitably mounted upon and secured to the main supporting frame 2 by suitable means, not shown.

A thrust member 25, shown mounted in spaced relation to the member 34, and a suitable work table 22 is disposed between the member 34 and thrust member 25. The work to be operated upon, as for example traction links 23, are supported on the work table 22 against the thrust member 25, as will be clearly understood by reference to Figure 1.

A suitable ram 47 is mounted for reciprocal movement within the cylinder 35, and is provided at its inner end with a piston head 46, which fits the bore of the cylinder, as shown. The opposite end of the ram projects through a guide opening in the end wall 36 of the cylinder, and may be provided with a suitable work engaging head 48 adapted to engage one end of a rod 49, whose opposite end may be engaged with the work, as for example a wrist pin A, of a traction link.

A pipe or conduit 113 leads from the pump, not shown, to one end of the cylinder 35 back of the ram head 46, whereby when the pump is operated, fluid is pumped into the cylinder back of the ram head 46, whereby the ram is moved forwardly against the work, as will be understood by reference to Figure 1. A suitable fluid control valve, not shown in the drawing, may be provided in connection with the conduit 113 to release the fluid from the cylinder 35 at the termination of the working stroke of the ram.

An important feature of the present invention resides in the novel means provided within the cylinder for returning the ram to its normal inoperative position, at the termination of each power stroke.

The means provided for thus returning the ram comprises a pair of springs 51 and 52. The spring 51 has one end seated against the ram head 46 and its opposite end against an outwardly turned flange 54 provided on one end of a cup-shaped spring retaining member 53. The member 53 is adapted to fit into one end of the relatively larger spring 51, and is provided at its opposite end with an inturned flange 55 against which the adjacent end of the relatively smaller spring 52 is seated. The opposite end of the spring 52 is seated against the end wall 36 of the cylinder 35, as shown in the drawing.

The member 53 retains the adjacent ends of the springs 51 and 52 in axial telescoping relation, and the cylindrical wall thereof serves to guide the coils of the springs in such a manner as to prevent any tendency of the springs to buckle, when under compression. The member 53 is also free to move longitudinally within the cylinder and with respect to the ram 47, which it will be noted, passes through a suitable opening provided in the left hand end of the member 53, when viewed as shown in the drawing.

Another important feature of the invention resides in the construction of the springs 51 and 52, which are so designed that they are substantially uniform in strength. In other words, the relatively larger spring 51 is made of a heavier wire than the smaller spring 52 because of its

greater diameter, whereby the two springs are substantially equal in strength. By so designing the springs 51 and 52, when the ram is moved forwardly in its power stroke, the springs 51 and 52 will compress in substantially the same degree, thereby causing the retaining member 53 to move forwardly within the cylinder until it may reach the position shown in Figure 2. When thus positioned, the relatively smaller spring 52 may be completely enclosed within the retainer 53, and the relatively larger spring 51 will be coiled about the member 53 between the ends thereof. Thus it will be noted that the member 53 provides a limit stop for the forward movement of the ram 47 and, at the same time, properly retains the springs in their telescoping relation, as clearly illustrated in the drawing.

By making the two springs substantially equal in strength, the springs will always flex simultaneously and at substantially the same degree or amount, when the ram is reciprocated within the cylinder. I have found that by proportioning the springs as herein set forth, the return movement of the ram from an operative to an inoperative position may be expedited, and with the assurance that the springs will always be retained in substantially axial alinement with the ram 47.

Another feature of the invention resides in the arrangement of the springs within the cylinder, whereby should one of the springs accidentally snap or become broken, as a result of pressure thereon, such damaged spring cannot cause damage to a workman or other person stationed adjacent to the apparatus, because the springs are completely confined within the cylinder, as will be understood by the drawing. The retainer 53 so guides the coils of the relatively larger spring 51 that they cannot frictionally engage or rub against the wall of the cylinder, whereby excessive wear is reduced to a minimum, and the life of the spring prolonged.

It will be apparent to those skilled in the art that I have accomplished at least the principal objects of my invention, and it will also be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim as my invention:

1. A cylinder having means at one end for supplying a fluid pressure thereto, a ram mounted for reciprocal movement within the cylinder and having a piston head at one end, a spring coiled about the ram and having one end seated against one end of the cylinder, a cup-shaped retainer mounted within the cylinder and providing an abutment for the opposite end of said spring, a relatively larger diametered spring having one end seated against the piston head and its opposite end against the opposite end of said cup-shaped retainer, and whereby the inner ends of said springs are retained in axial and telescoping relation, said springs being substantially equal in strength whereby they will yield uniformly to pressure when the piston is actuated by fluid pressure, and the over-all length of said retainer being slightly greater than the combined over-all length of said springs when the springs are completely compressed, whereby said retainer may also function to provide an abutment stop

for the ram when the ram is at the limit of its forward movement.

2. A cylinder having means at one end for delivering a pressure fluid thereto, a ram mounted within the cylinder and having one end projecting from the opposite end of the cylinder, a piston head secured to the inner end of the ram, means within the cylinder for returning the ram to its normal inoperative position, said means including a spring which is coiled about the ram and has one end seated against one end of the cylinder, a cup-shaped retainer mounted for axial movement within the cylinder and having an aperture for receiving the ram, said member being fitted over the opposite end of the spring and having an annular inwardly turned flange against which the adjacent end of said spring is seated, a relatively larger spring within the cylinder having one end seated against the piston head and having its opposite end fitting over said cup-shaped member, said member having an outwardly turned flange against which the opposite end of the relatively larger spring is seated and whereby the adjacent ends of said springs are retained in telescoping relation, and said springs being substantially equal in strength, whereby the flexing thereof, when compressed by forward movement of the ram, will be substantially uniformly distributed between all of the coils of said springs, thereby increasing the useful life of the springs, said cup-shaped retainer, in addition to supporting the telescoped ends of the springs, providing

an abutment stop for the ram when at the limit of its forward movement, thereby to avoid damage to the springs.

3. A cylinder having means at one end for delivering a pressure fluid thereto, a ram mounted within the cylinder and having one end projecting from the opposite end of the cylinder, a piston head secured to the opposite end of the ram, a pair of springs mounted within the cylinder for returning the ram to its normal inoperative position, one of said springs being coiled about the ram and having one end seated against one end of the cylinder, a cup-shaped member mounted within the cylinder and having an aperture for receiving the ram, said member having an annular inwardly turned flange against which the opposite end of said spring is seated, a relatively larger spring within the cylinder having one end seated against the piston head, and an outwardly turned flange on the opposite end of said member against which the opposite end of the relatively larger spring is seated and whereby the adjacent ends of said springs are disposed in telescoping relation, and the overall length of said member being slightly greater than the combined overall lengths of said springs, when the springs are completely compressed, whereby said member may also function to provide an abutment stop for the ram, when at the limit of its forward movement, and whereby damage to the springs is minimized.

JAMES S. RODGERS.