

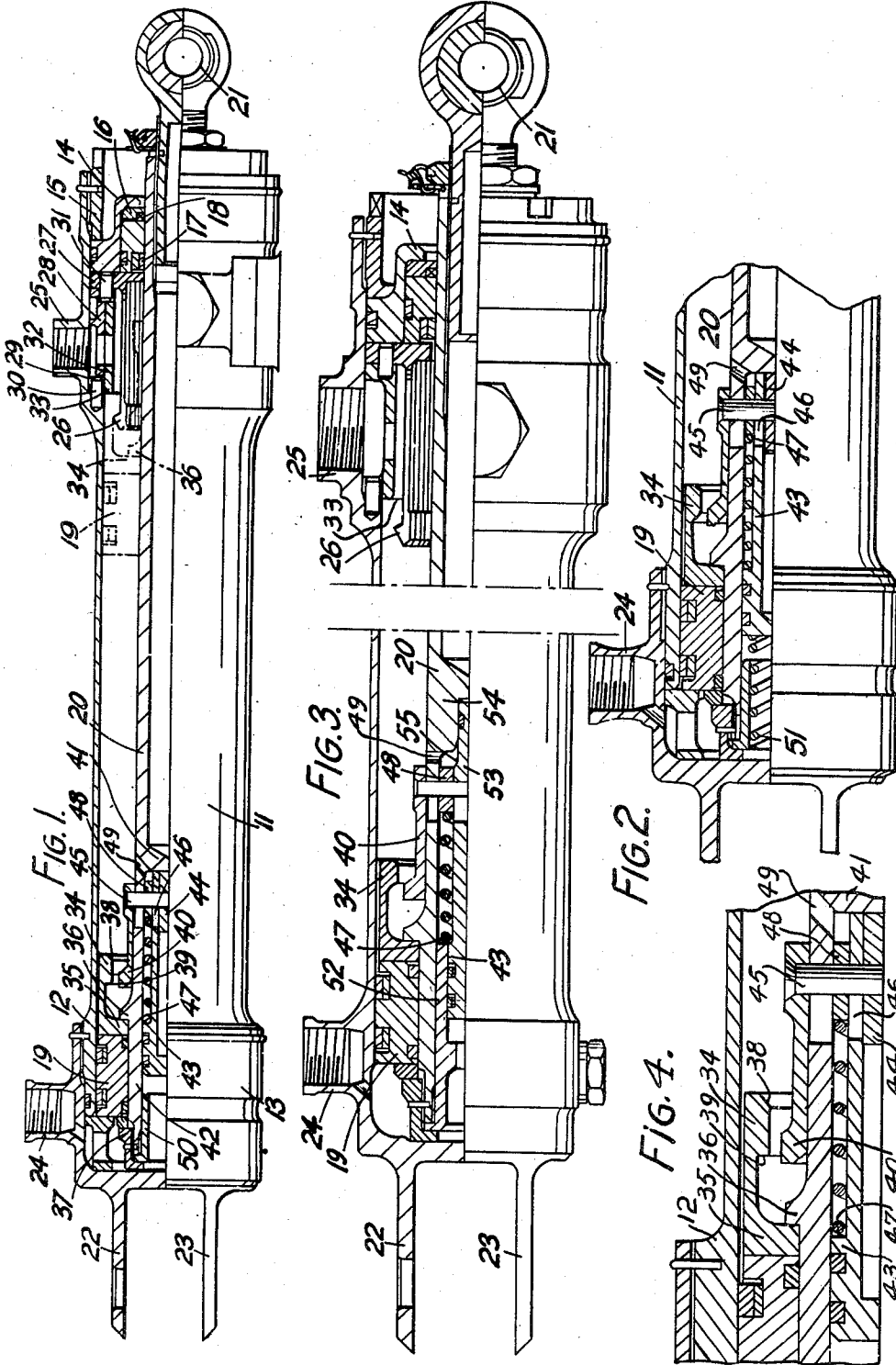
July 1, 1958

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2,841,123

LOCKING MEANS FOR HYDRAULIC JACKS

Filed May 18, 1954



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2,841,123

LOCKING MEANS FOR HYDRAULIC JACKS

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Application May 18, 1954, Serial No. 430,630

Claims priority, application Great Britain May 19, 1953

6 Claims. (Cl. 121—40)

The present invention concerns improvements in or relating to hydraulic jacks.

This invention relates to locking devices for hydraulic jacks which comprise a crown of spring claws mounted on one of the elements of the jack and arranged to co-operate with a yieldingly urged sliding locking-ring carried by the other jack element, so that when the moving parts of the jack approach the end of their stroke the claws and locking ring come into engagement and the locking-ring gives way to the claws until the said claws reach a locking recess into which they spring radially so permitting the locking-ring to advance again behind them and lock them in the recess. Such locking devices are for example described in British patent specification No. 527,225. In the said specification the spring claws are carried on the piston and jack-rod assembly and the locking-ring is carried on a secondary spring-urged locking piston which surrounds the jack-rod and fits the interior of an extension of the cylinder. The locking-ring is urged into locking position by the spring and is automatically unlocked when pressure is applied to the interior of the jack cylinder by reason of this pressure forcing the secondary locking piston back. The construction, is however, lengthened by the room provided for the locking piston and its spring, beyond the end of the normal jack cylinder.

Various constructions have been evolved so that the size of the locking-ring spring may be reduced and that the overall length of the jack may be similarly reduced. It is an object of the present invention to provide a jack of improved and more compact construction.

According to the present invention in a hydraulic jack of the type described a crown of spring locking-claws is attached to the cylinder, the locking recess is provided in a part of the piston and jack-rod assembly, the locking-ring is slidably mounted upon this assembly and a secondary piston is located within the jack-rod and connected to the locking-ring to disengage it from and unlock the crown of claws when pressure is applied to cause the secondary piston to move.

By locating the locking recess in a part which moves with the jack-rod instead of so that it is fixed in the cylinder and by disposing the secondary piston, which operates the locking-ring inside the jack-rod, it becomes possible to reduce the overall length of the construction so that it has a length no greater, as compared with a jack not containing such a lock, than what is necessitated by the length of the spring claws.

The following is a description by way of example of three constructions in accordance with the invention.

In the accompanying drawing:

Figure 1 is a longitudinal view in half-section of one form of jack.

Figure 2 is a partial view of a second form, showing an alternative construction,

Figure 3 is a view similar to Figure 1 of a third construction, and

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Figure 4 is an enlarged fragmentary view of the locking portion of the jack shown in Figure 1.

A hydraulic jack is provided which comprises a cylinder 11, which is received at one end, 12, thereof in an end-cap 13 and is provided at the other end with a front cover 14, held in place by a ring 15 and containing a stuffing-box 16 with packing-rings 17, 18. Within the cylinder 11 is a piston 19 mounted on a hollow-jack-rod 20. The jack-rod 20 extends through the stuffing-box 16 and carries an eye 21 for attachment to the part which is to be operated. The end-cap 13 carries a pair of spaced lugs 22, 23, which are intended to be used for pivoting the jack to the body of the aircraft. In the end-cap 13 there is an inlet 24 for pressure fluid and in the other end of the cylinder there is a further inlet 25.

Inside the cylinder at the stuffing-box end there is a crown of locking-spring-claws 26, the root 27 of which takes the form of a flange which is gripped between the periphery of the stuffing-box 16 and a spacing member 28 which bears at its end 29 on an internal shoulder formed in the end of the cylinder 11. The parts are prevented from relative rotation by pins 30, 31 and they are screwed up tight against one another by the hollow sleeve 15 which is screwed into the end of the cylinder 11. Within the spacing member 28 is a sleeve 32 which is of slightly smaller internal diameter than the cylinder 11, and the end face 33 of which acts as a stop.

In front of the piston 19 and mounted on the jack-rod 20 is a locking collar 34. The locking collar 34 has an internal flange 35 at its base. This flange 35 and the piston 19 are secured to the jack-rod 20 between a shoulder 36, on the outside of the jack-rod, and a clamping nut 37, screwed on to the end of the jack-rod. The locking collar 34 has a chamfered leading edge at 38 and an internal circumferential locking recess 39. A locking ring 40 is slidably mounted on the jack-rod within the locking collar 34. Within the jack-rod, which is hollow, there is an internal partition 41 and the part of the jack-rod to the rear of the partition forms a cylinder 42 which contains a secondary piston 43. The secondary piston 43 is hollow, and within the hollow central space there slides a plug 44. The locking-ring 40 is secured to the plug 44 by a diametral rivet 45. The rivet passes through a slot 46 in the piston 43 near the end thereof, so as to allow a certain amount of lost motion between the piston 43 and the locking ring 40. The secondary piston 43 is reduced in diameter between its head or rear end and the pin 45. In the annular space thus provided there is a helical spring 47 which bears on a ring 48, through which the rivet 45 passes, and tends to urge the locking-ring 40 in the direction away from the piston 19 so that the lost motion between the piston 43 and locking-ring 40 provided by the slot 46 can be taken up.

When oil pressure is admitted through the inlet 24 to the cylinder 11, the piston 19 and the jack-rod 20 with its lock collar 34 and locking ring 40 are caused to move forward, thus operating the element to which the pivot 21 is connected, which might be an aircraft bomb-door or under-carriage part or the like. When the piston 19 approaches the end of its stroke the chamfered leading edge 38 of the lock collar comes in contact with the end of the crown 26 of spring claws and causes the spring claws to contract and slide within the lock collar. The claws in their contracted position engage the rim at the end of the locking-ring 40 and force it back against the pressure of the spring 47. It will be understood that at this time, pressure being behind the secondary piston 43 the piston is held forward in the position shown in the drawing so that the end of its reduced portion bears against the partition 41 inside the jack-rod 20. When

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the locking-ring 40 has been forced back sufficiently along the jack-rod against action of spring 47 by the spring claws 26, the heads of the claws are able to spring outwards within the circumferential recess of the lock collar 34, and then the locking ring 40 is moved forward along the jack-rod 20 by the spring 47 so that it comes within the crown of spring-claws 26 and prevents them from being drawn out of the recess in the lock collar 34. As a result, when the jack has been expanded to its fullest extent, it will automatically lock itself in this position. The position of the parts in the locked state is indicated by chain lines in Figure 1.

In order to permit the jack to unlock itself when pressure is applied to the inlet 25 of the cylinder 11, the pressure surrounding the jack-rod 20 has access to the forward portion of the piston 43 through apertures 49. This forces the piston 43 back against a stop ring 50 located inside the end of the jack-rod and it carries with it the locking-ring 40 a sufficient distance to make it slide clear of the interior of the crown 26 of claws, and thus permits them to move inwardly. The ends of the claws 26 are sloped on their faces which engage the lock collar 34, and therefore, the pressure on the main piston 19 is able to force the spring-claws inwardly and slide the lock collar with the piston endwise, thus enabling the piston to perform the return stroke.

In Figure 2, there is shown a slight modification in which a spring 51 bears on the back of the secondary piston 43 and helps to urge it toward the locking position. This helps to maintain the parts locked, even if there is no pressure applied at the inlet 24.

Referring now to Figure 3, the bulk of this figure is the same as Figure 1 and the parts are similarly numbered. However, there is a difference in the arrangement of the locking-ring 40 and secondary piston 43. An abutment sleeve 52 is secured in the end of the jack-rod 20 and the secondary piston 43 works inside the sleeve 52. The spring 47 abuts upon the end of the sleeve 52 and the ring 48 so that a force is exerted on the locking-ring in the locking direction irrespective of any fluid pressure forces acting on the piston 43.

This form of jack enables the control to be effected against a constant pressure applied through the inlet 25. If the pressure at 24 is released the jack will be contracted by the pressure at 25. The jack is extended by also applying the pressure at the inlet 24. The force produced by such pressure is greater than that produced by the pressure at 25 because the total area of the back of piston 19 is greater than the annular area exposed to pressure on the jack-rod side. As soon as pressure is relieved at 24, the jack will contract again. With this differential-pressure type of jack the construction shown in Figure 1 will not lock because the fluid pressure has access to both faces of piston 43, and the spring 47 is incapable by itself of moving the locking-ring 40 into the locked position. In the case of Figure 3, however, the spring 47 reacts against the sleeve 52 instead of against the piston 43. Moreover, the piston 43 has an extension 53 extending into a portion 54 of the jack-rod 20 which is bored out to fit it, and thus has a larger area exposed to pressure on its left hand side than on its right hand side. The result is that pressure applied

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through the inlet 24 is able to move the piston 43 forward, so as not to hinder the movement of the locking-ring by the spring 47. When pressure is released at 24, the pressure in 25 is able to force the locking-ring 40 back against the spring 47 because there is no counter-pressure on the piston 43 and the shoulder 55 between the extension 53 and the piston 43, affords enough area to affect the movement.

I claim:

1. A hydraulic jack comprising in combination a cylinder, a piston and jack rod assembly operating in the cylinder, the jack rod being hollow to form a secondary cylinder, a crown of spring locking claws surrounding the jack rod within the cylinder and secured to the cylinder at the jack-rod end thereof, a lock-collar carried by the piston of the said assembly having a recess to surround and receive the ends of the locking claws, a locking ring slidably mounted on the jack-rod of said assembly to slide into engagement with the interior of the claws when they are in the recess, means to urge the locking ring normally toward locking position, a secondary piston located within the secondary cylinder, a lost-motion device operatively connecting the secondary piston to the locking ring, a spring urging the locking ring in the direction to take up the lost-motion toward the locking claws, and a port from the side of the main piston which lies toward the locking claws to the secondary cylinder to cause the secondary piston to unlock the locking ring when pressure is applied through said port.

2. A hydraulic jack as claimed in claim 1, wherein the secondary piston has a greater area exposed to fluid pressure acting in the locking direction than in the unlocking direction.

3. A hydraulic jack as claimed in claim 1, wherein the spring abuts upon a shoulder which is fixed relatively to the jack-rod and the secondary piston works in a bore within said shoulder.

4. A hydraulic jack as claimed in claim 3, wherein the secondary piston has a greater area exposed to fluid pressure acting in the locking direction than in the unlocking direction.

5. A hydraulic jack as claimed in claim 1, wherein the secondary piston carries an abutment and the spring which takes up the lost motion is located between the said abutment and a part connected rigidly with the locking-ring.

6. A hydraulic jack as claimed in claim 5, wherein an additional spring is provided to urge the secondary piston toward the locking position.

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