

June 1, 1965

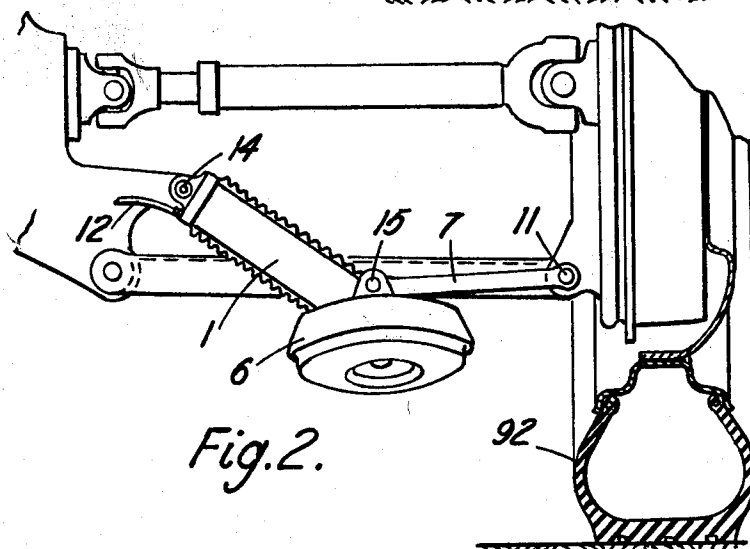
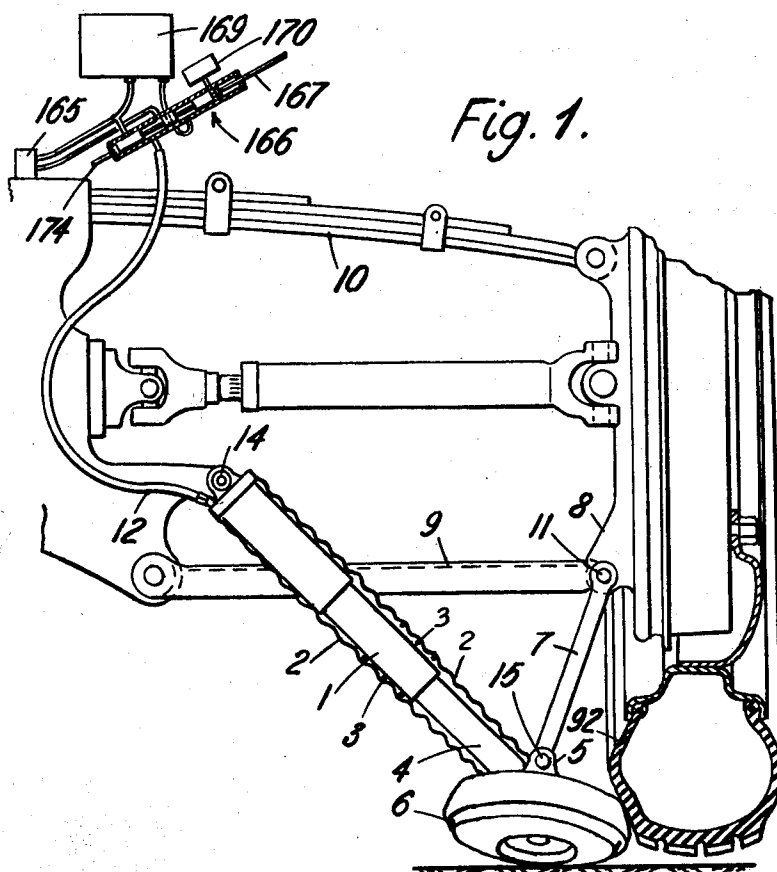
A. J. BUTTERWORTH

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HYDRAULIC RAMS

Filed Dec. 6, 1961

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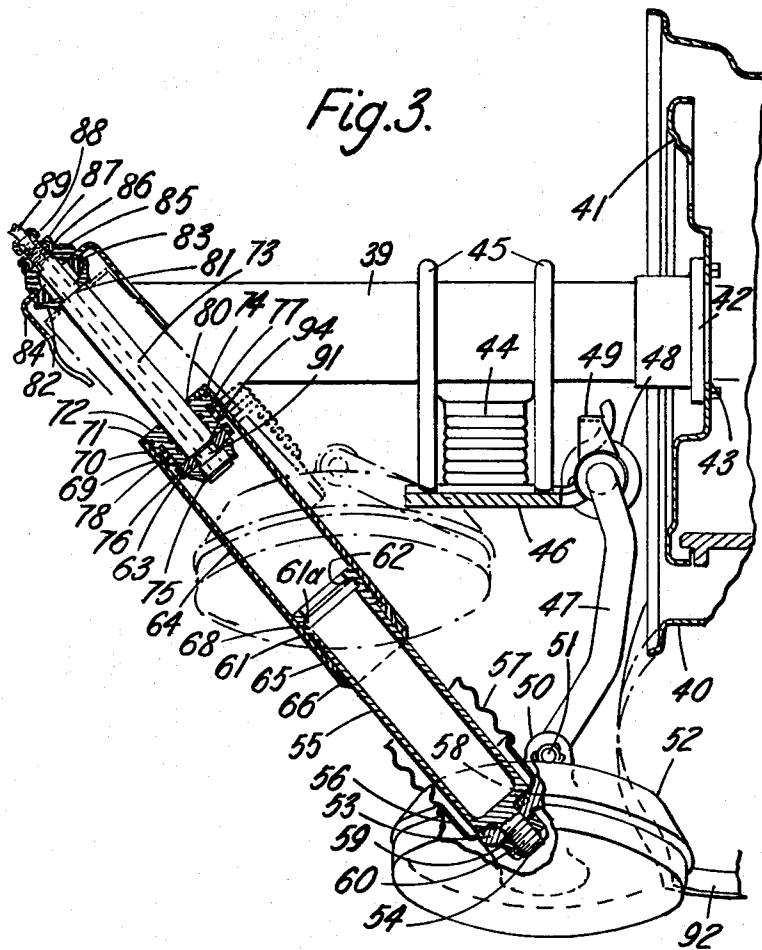
A. J. BUTTERWORTH

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INVENTOR

ARCHIBALD JAMES BUTTERWORTH

By Young & Thompson
ATTYS.

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A. J. BUTTERWORTH

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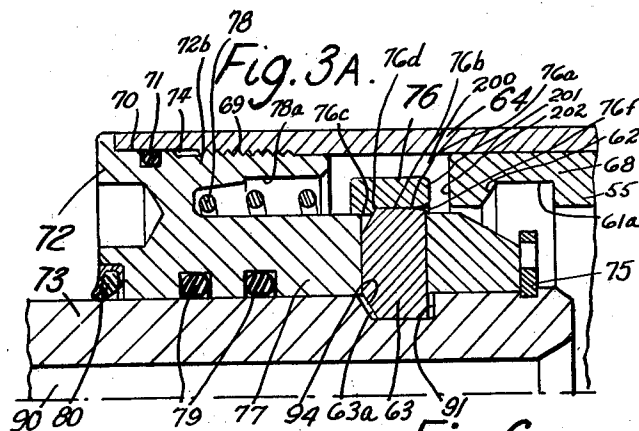


Fig. 5.

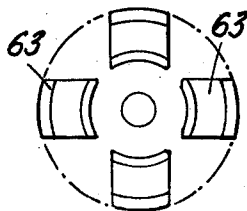


Fig. 6.

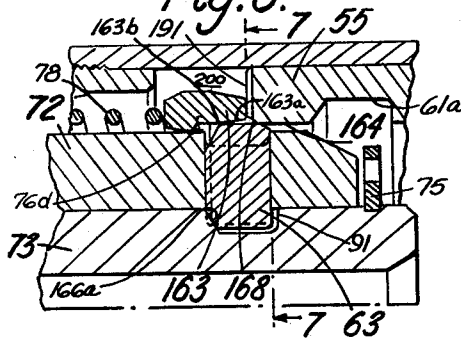


Fig. 7.

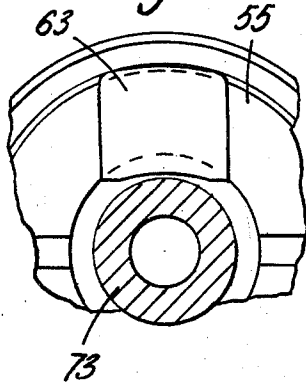
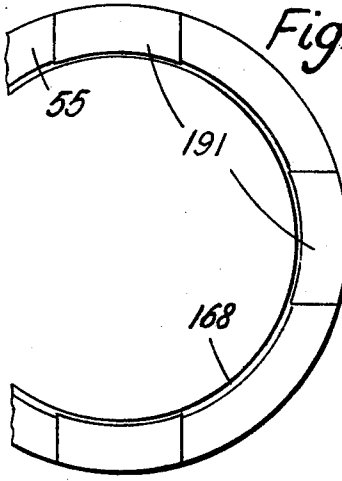


Fig. 8.



INVENTOR

ARCHIBALD JAMES BUTTERWORTH

By Young & Thompson

ATTYS.

June 1, 1965

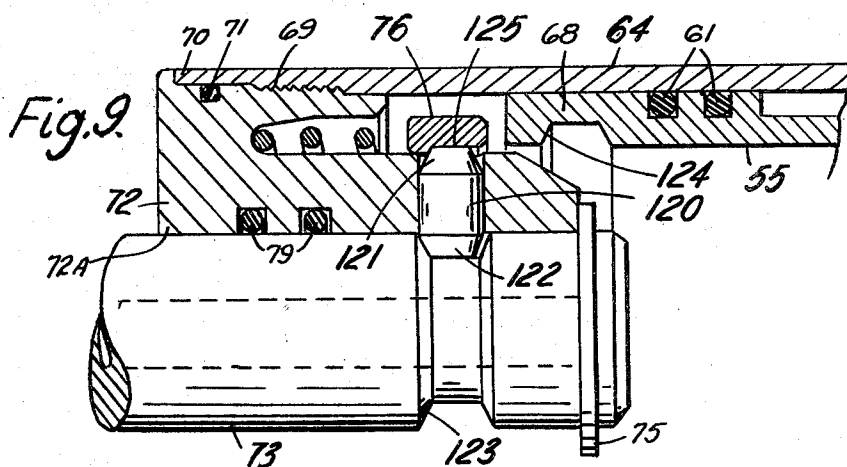
A. J. BUTTERWORTH

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INVENTOR

ARCHIBALD JAMES BUTTERWORTH

By *Young & Thompson*

ATTYS.

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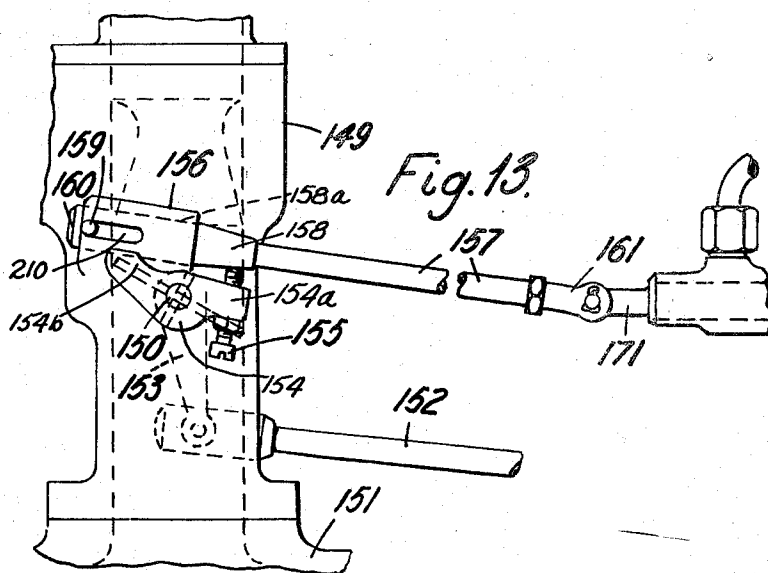
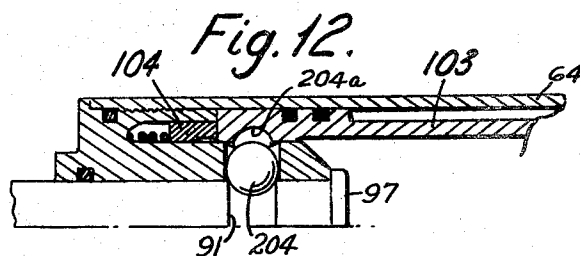
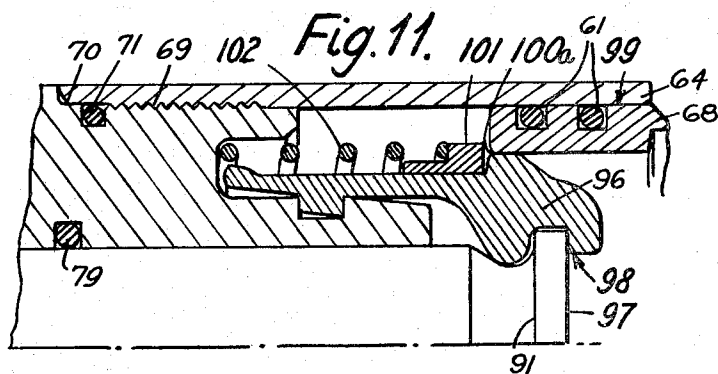
A. J. BUTTERWORTH

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HYDRAULIC RAMS

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6 Sheets-Sheet 6



INVENTOR

ARCHIBALD JAMES BUTTERWORTH

By *Young & Thompson*
ATTYS

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3,186,308

HYDRAULIC RAMS

Archibald James Butterworth, 7 Grove Garden, Frimley,
near Aldershot, England

Filed Dec. 6, 1961, Ser. No. 157,428

Claims priority, application Great Britain, Dec. 7, 1960,
42,051/60

11 Claims. (Cl. 91—169)

This invention relates to hydraulic rams of the kind comprising a number of nested tubular piston parts which can telescope into and out of one another in a fluid tight manner, and means embodying a control valve for introducing fluid under pressure into the interior of the assemblage whereby the tubular parts may be forced apart. With such an arrangement the tubular parts are contracted and nested together either by spring means in the case of a single acting ram or by fluid pressure in the case of a double acting ram and they are then extended by fluid pressure by appropriate actuation of the valve means. Usually the parts which move first are those having the largest areas exposed to the fluid pressure.

In certain uses of the ram, of this kind, it is desirable that there should be rapid extension of the ram parts under no load conditions followed by comparatively slow extension under load. It is of advantage that these operations should take place with the use of a pump of small capacity for generating the fluid pressure. Thus the smaller diameter ram parts should open out first. An object of this invention is to provide for these conditions. The invention is particularly applicable to parking devices for motor vehicles where ground engaging rollers are moved by rams into engagement with the ground lifting the road wheels and which rollers engage the road wheels by which they are driven and in rolling along the ground swing an end of the vehicle sideways.

According to this invention a hydraulic ram of the kind referred to is characterised in that detent means are provided for holding the ram parts, except the smallest ram parts, in their contracted condition, which detent means are so arranged that when pressure is generated within the ram, movement is first imparted to the smallest ram part and which movement is arranged to release the detent between the next larger parts so that they extend under continued pressure of the fluid until a complete extension of the assemblage is effected.

The movement of the smallest ram part may be arranged both to release the detent means between the next larger parts of the ram and to engage detent means with the smallest part, whereby when the larger parts are expanded by hydraulic pressure against the working load, the smallest part will be prevented mechanically from contracting again under the axial load which will now be greater than it can sustain hydraulically, owing to its small area.

One and the same detent element, which is movably mounted on one part of the ram, may be engageable with a socket on one or other of two other parts of the ram.

Other features of the invention are set out in the following description and claims which description is made with reference to the accompanying drawings in which:

FIGURES 1 and 2 are elevations of one part of a rear axle of a vehicle looking from the front thereof and showing a hydraulic ram for moving a ground engaging roller into and out of engagement with the road and vehicle wheel, FIGURE 1 showing the ram in an extended condition and FIGURE 2 in a contracted condition;

FIGURE 3 is a section through one form of ram according to this invention and mounted on the rear axle of the vehicle in a somewhat different manner to that shown in FIGURES 1 and 2;

FIGURE 3A is an enlarged view of a part of the upper end of the ram shown in FIGURE 3;

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FIGURE 4 is a part section and part elevation showing the parts of the ram of FIGURES 3 and 3A in a contracted condition;

FIGURE 5 is a diagrammatic face view of a disc from which the detent plungers are formed;

FIGURE 6 is an enlarged view similar to that of FIGURE 3A showing a modified and preferred form of detents and detent retaining rings;

FIGURE 7 is a section on the line 7—7 of FIGURE 6;

FIGURE 8 is a similar view to FIGURE 7 showing the slots in the end of one of the ram parts;

FIGURE 9 is a section through two parts of the ram showing an alternative form of detent mechanism;

FIGURE 10 is a section through the ram in a contracted condition showing yet a further alternative form of detent mechanism;

FIGURE 11 is an enlarged sectional view of the ram shown in FIGURE 10 and showing parts thereof in the fully extended position;

FIGURE 12 is a similar view to that of FIGURE 11 showing yet a further form of detent mechanism; and

FIGURE 13 is a side view of an arrangement for inter-linking the control valve for the rams with the throttle for the vehicle's engine.

As referred to above FIGURES 1 and 2 show the kind of vehicle parking apparatus to which the invention may be applied, the vehicle being provided with a comparatively small capacity engine driven pump which supplies hydraulic fluid to the hydraulic rams associated with say the two rear wheels of the vehicle which hydraulic pump and rams are arranged in closed circuit with a reservoir for the fluid and valve control mechanisms. FIGURES 1 and 2 show the manner in which a ram assemblage may be mounted on the vehicle and for this purpose a conventional ram assemblage is illustrated. Should, however, a ram assemblage according to the present invention be employed, the smallest part of the ram assemblage would be arranged uppermost and the intermediate sized part would be arranged lowermost as in FIGURE 3.

In the arrangement of FIGURES 1 and 2 a ram 1 is surrounded by a protective bellows 2 or cover which may be of synthetic rubber and which may also enclose or incorporate a tension spring 3. The lower element 4 of the ram 1 is rigidly attached to a roller mounting 5 which may be a high duty iron casting. The mounting 5 carries a roller 6 in bearings not shown in this view. A fore and aft extending horizontal pivot pin 15 passing through a part of the mounting 5 secures it to the lower end of a link 7. The upper end of this link is similarly pivoted at 11 on a stationary portion of the rear wheel mounting 8. The vehicle shown has independent suspension by means of a lower wish bone 9 and transverse leaf spring 10 in known manner. In this case the link pivot 11 has been formed as an extension of the wish bone pivot for convenience, but this pivot 11 may be located elsewhere if preferred. An hydraulic pipe 12 is connected to the ram 1 and through a valve 166 either with a pump 165 driven by the vehicle engine or with a reservoir 169 for hydraulic fluid. The valve 166 is arranged to be under the joint control of a manipulating shaft 167, the pressure of fluid in the valve casing and an electrical device 170 controlled in accordance with the speed of the vehicle, the operation of which device releases a detent enabling the valve 166 to be manually operated. The operation of valve 166 is explained in U.S. patent application Ser. No. 801,254, filed March 23, 1959.

Also the manipulating shaft 167 may be connected to the throttle valve of the engine carburetor as explained later.

The upper part of ram 1 is attached by a bracket 14 to the sprung portion of the vehicle's chassis frame or

body, that is to say, it does not move relative to the main structure when the wheels rise and fall under the influence of road irregularities. FIGURE 2 shows this construction in the retracted position. It will be seen that the link 7 now lies in a substantially horizontal position, and that when the wheel and hub assembly rise and fall due to the action of the road upon the vehicle's springs this link will idle like a normal suspension link without appreciably disturbing the position of the ram and roller assembly to which it is attached.

When the driver actuates the control valve, hydraulic fluid under pressure will be delivered through pipe 12 to ram 1 causing it to extend. As the pivot pin 15 is located below the centre-line joining the upper ram pivot 14 and the link pivot 11, extension of the ram will cause the roller assembly to be lowered until it touches the road. As shown in a latter part of this description this initial extension of the ram may be caused to take place rapidly by the use of a small diameter first-stage ram piston which is the first to be moved, detent means being provided for temporarily holding the other parts. When the roller reaches the ground it will exert pressure thereon, causing the rear wheel to be lifted slightly from the road and the roller to move into contact with it.

As the height of the upper ram pivot 14 can vary vertically, with relation to the road surface and therefore to the final position of roller 6 owing to movement of the car, the actual extension required in this ram may vary under differing conditions. For this reason it is desirable to provide sufficient travel in the ram to enable it to engage fully with the tire under the conditions of lightest load, bearing in mind the fact that the extensive force of the ram will also react on pivot 14 in such a way as to raise the chassis and body of the car an additional distance from the road.

Any convenient arrangement of spring means other than said spring 3 may be used to withdraw the roller 6 from its operating position and bring the equipment to the fully retracted position shown in FIGURE 2. Alternatively, a double-acting ram system may be used so that retraction as well as extension is performed hydraulically.

Where a conventional two-stage single-acting ram is employed, as in FIGURES 1 and 2, that part of the operating cycle which lowers the roller assembly from its retracted position to its first contact with the road will necessarily be performed by the larger of two concentric ram cylinders since the larger piston area of this ram stage will cause it to extend first. This situation has two disadvantages and it is an object of the present invention to overcome these. In the first place, a great deal of hydraulic liquid must be displaced to fill the larger ram cylinder, and if the fluid pump is to be of reasonable size this operation will involve a delay of several seconds. Secondly, while this large cylinder is filling, there is only the resistance of the retraction spring to be overcome, and as the piston area is relatively large, very little hydraulic pressure will be developed. The preferred control system described in above-mentioned U.S. patent application Ser. No. 301,254 is of the self-cancelling type, in that it is only held in the operating position by hydraulic pressure acting on a shoulder between two diameters of the control valve plunger. In the absence of such pressure the control valve plunger is pushed to the "off" position by a return spring and the equipment is immediately retracted by the spring means described above. The effect of this arrangement with the conventional two-stage ram is that the driver, on pulling out the valve control knob, must hold it out for several seconds until pressure builds up upon the roller reaching the road and beginning to take the weight of the vehicle. If he pulls it out and immediately releases his hold on it, as would be usual with other control panel knobs, it will simply snap back into "off" position. This need to hold out the knob may be regarded as an irritating inconvenience by the driver.

The disadvantages of the slow filling of the first stage rams and the lack of initial pressure on operating the equipment is overcome by the arrangement shown in FIGURES 3, 3A, 4, 5, 6, 7 and 8 which provides a special form of two stage ram wherein a small diameter first stage is constrained to operate first so as to bring the rollers near to the road very quickly. As soon as these first stage ram pistons are fully extended an interlock mechanism permits the activation of the main or working pistons, which then raise the vehicle and push the parking rollers into contact with the road wheels. This form of the invention has the additional advantage that the volume of fluid required to be disposed in operating the parking equipment is greatly reduced, so that a small pump may be employed with resulting economy and reduction in the stress on the pump drive.

In FIGURE 3 a vehicle rear axle casing 39 carries a wheel 40 and a brake back-plate 41 is secured to a flange 42 on the casing 39 by bolts 43. Axle casing 39 is secured to the road springs 44 by U-bolts 45 and spring plate 46. An extension of the latter carries a tubular bearing housing (not shown) in which is installed the link 47 of the parking device. Acting about the upper pivot of this link is a retraction spring 48 having an anchorage 49. As its lower end link 47 is attached to base casting 50 by pivot pin 51, a ground engaging roller 52 is mounted in bearings (not shown) in base casting 50. Another face 53 of base casting 50 is bored to accept the threaded stud 54 of a lower ram piston 55. Sandwiched between piston 55 and face 53 is a pressing 56 carrying on its upper lip the lower end of extensible bellows 57, which may be of synthetic rubber. A dowel 58 prevents a lower ram piston 55 from rotating relative to casting 50. Lower ram piston 55 is secured to base casting 50 by nut and washer 60 and 59. At its upper end the piston 55 carries oil seals 61. Piston 55 is of generally tubular construction and the lower end of its bore may be tapered so as to thicken the walls for greater strength. The upper part of this bore is formed with a recess 61a whose upper face 62 is arranged at a suitable angle to form a sliding contact with interlock plungers 63, hereinafter described, and which are carried at the upper end of a cylinder 64 in which the piston 55 slides. The travel of the piston 55 is limited at its lower extremity by shoulder 65 on the cylinder 64. Suitable spanner slots 66 are provided at the lower end of cylinder 64. The bore 64A of the shouldered portion below shoulder 65 is an easy sliding fit for the outside diameter of piston 55, and the main bore 67 of cylinder 64 is an easy sliding fit for an enlarged head 68 at the upper end of the ram piston 55. The upper end of cylinder 64 is formed with internal threads 69 and a short plain portion 70 above this thread. The mouth of this plain portion is slightly chamfered at a suitable angle to accept an O ring type seal 71 fitted to a plug 72 which is in screw threaded engagement with the internal threads 69 of the cylinder 64. An upper ram piston 73, which is provided with an axial passage 90, slides in a bore 72A in the plug 72. The plug 72 also has formed on it a plain portion above the external threads which engage with threads 69 and a shallow shoulder 74. Thus when plug 72 is screwed into cylinder 64 and upper piston 73 assembled therein the upper piston and the cylinder bore 67 are co-axial.

As shown in FIGURES 3 and 3A the piston 73 has its movement in relation to plug 72 limited by a circlip 75 fitted in a groove near the lower end thereof. A short distance further up the outside diameter of piston 73 there is formed a groove 91 similar in section to the recess 61a mentioned in lower piston 55. This again is suitably shaped to accept detent plungers 63 which are slidable in radially extending slots in the plug 72. In the fully extended position of the ram 1, as shown in FIGURE 3, the upper piston 73 is retained in its extended position because its retraction is prevented by the plungers 63 which are in interlocking engagement with the groove 91 in the

piston 73. The plungers are themselves prevented from escaping outwards by retaining ring 76. This ring surrounds the inner cylindrical portion 77 of plug 72, and the upward part of its inside diameter is an easy sliding fit thereon. This diameter, however, is such that it cannot pass over the outer surfaces of interlock plungers 63. The lower part 76a of the inside diameter of retaining ring 76 is, however, an easy fit over the interlock plungers 63 and the two differing bores 76b, 76c of this ring 76 are joined by a shallow step 76d formed at the same angle as the outer chamber 63a of the plungers. The plungers 63 have parallel sided sections which may be cut by a slitting operation from a circular ring having the same section as that shown in this view of the detent plungers. In this way four detent plungers may be economically manufactured from one turned or ground ring. Their upper and lower faces are parallel, except where towards the inner and outer edges of the upper annular face chamfers are formed at a suitable angle to permit radial sliding of the plungers when an axial force is applied to them, either by upper piston 73 or lower piston 55. The angle which these chamfers, when viewed in section, form to the remaining flat face should preferably be as small as is consistent with reliable operation, in order that when they are restraining either of the piston elements from movement under the influence of hydraulic or other forces, the radial load developed shall be the minimum in the interests of low stress in the retaining-ring 76, and a low rate of wear in the case where the plungers are bearing on the outer diameter of upper piston 73, as described below. The retaining ring 76 is urged in a downward direction by helical spring 78, which fits in a recess 78a between the outer cylindrical portion 72b of plug 72, which carries the threads and plain fitting diameters and the inner cylindrical surface 77. The bore of plug 72 is formed with grooves containing oil seals 79 and combined dust seal and scraper ring 80. The upper part of piston rod 73 has a shoulder 81, to which is fitted spherical bearing seat 82. Against the spherical surface thereof a self-lubricating part-spherical bush 83 rests, and this may be located in a hole in a suitable pressing or lug attached to the axle casing 39, as 84, for example. Alternatively, the pressing may be formed with a male spherical bulge, against which spherical seat 82 may work direct, or with anti-friction material interposed. In the former case seating 82 may be made of cast iron or similar material having good anti-friction properties. A rubber or similar pliable bush 85 is fitted above the pressing 84 and secured by a nut 86 and locknut 87. These nuts are screwed on to the threaded extremity of piston rod 73, and this thread may conveniently be of the pipe-thread type, whereto union nut 88 may secure feed-pipe 89.

Assuming the hydraulic pressure within the assemblage is released, the effect of the spring 48 will be to move the hollow piston 55 up into the cylinder 64 until the enlarged part 68 engages the retaining ring 76 forcing it upwardly against the action of the spring 78 and the bore of the enlarged part 68 passes over the plug 72 and the outer ends of the detent plungers 63 until the circumferential groove 61a is opposite them. The cylinder part 64 can then move upwardly over the piston 73 and in so doing forces the detent plungers 63 outwardly out of the groove 91 into the groove 61a whereafter the parts reach the fully contracted position as shown in FIGURE 4. On hydraulic pressure being applied via the feed pipe 89, and hole 90 through the piston rod 73, oil pressure will act on the faces of both piston units, but no movement of the lower piston 55 relative to the piston 64 is possible due to the locking action of the plungers 63. The cylinder 64, however, is free to move downwardly over the upper piston 73, the cross-sectional area of which latter piston is sufficient to overcome the restraining force of retraction spring 48 acting on the ram assembly through link 47 and base casting 50. The cylinders 64 and 55 therefore move together downwardly while the detent plungers 63

are pressed against the surface 95 of piston rod 73 due to the inward force exerted on them by the angled upper face 62 of the recess 61a in the lower piston 55 bearing against the chamfered face 62a on the plungers 63. When the plungers 63 come opposite the groove 91 in upper piston 73, the said inward force on these plungers will cause their inner portions to occupy the groove 91, thus simultaneously locking the upper piston 73 to plug 72 of cylinder 64 and freeing the lower piston 55 which can then move relative to cylinder 64. This change point is arranged to occur when the roller 52 is approaching but just clear of the ground under those conditions of loading and other variables which bring it nearest to the ground. Hydraulic pressure is now able to force lower piston 55 outwards and downwards, so that it brings roller 52 into contact with the road. In its movement away from the upper end of the cylinder 64 it is followed by retaining ring 76 urged by spring 78. The retaining ring 76 moves downward across the outer surfaces of the interlock plungers 63 until arrested by the shoulder or step 76d mentioned above. On the downward extension of the ram there is no resistance to this movement of the retaining ring, as the plungers are free to move to their fully inward position, whereas their largest dimension is smaller than the larger bore 76b of the retaining ring 76. On the other hand, when the ram is being retracted upwards by force of the retraction spring 48, there is some outward radial force applied to the plungers 63 by the angled surface 94 of the groove 91 in upper piston 73. The lower piston 55, in order to complete its retractive movement, must push the retaining ring 76 upwards and its upper bore must pass over the outer surfaces of the plungers 63. This inside diameter of the upper portion of the lower piston 55 should therefore be slightly larger than the major bore 76b of the retaining ring 76, otherwise a danger of jamming would exist if the bore of lower piston 55 were equal to or slightly smaller than the retaining ring bore, since in order to commence passing over the surface of the detent plungers 63, the lower piston 55 might have to compress the detent plungers 63 towards one another against the outward radial force mentioned above. As any such force which lower piston 55 might have to exert would itself add to the outward radial force mentioned above, a jamming condition might be set up.

In cases where a ram of this type is continuously subjected to a compressive force such as that of a retraction spring, there will always be a small outward radial force exerted on plungers 63. In some cases this may be sufficient to resist the downward movement of retaining ring 76, if the mouth of this retaining ring has only the short chamfer 76f shown in FIGURE 3A. FIGURE 6, therefore, shows an alternative construction in which a fine conical lead 163a, say 10°, is applied to the mouth of the retaining ring 163. The effect of this lead is to ensure that a substantial part of the length of the ring shall have passed over the plungers before any possibility occurs of the retaining ring being halted by outward radial movement of the plungers 63, as the plungers are retained in their innermost position by the bore 164 of lower piston 55.

The minor diameter 163b at the inner end of the conical lead 163a in retaining ring 163 may either adjoin the shoulder 76d which ultimately limits the movement of retaining ring 163, or it may be separated from it by a short parallel portion slightly smaller in diameter than the bore 164 of lower piston 55. In either case the conical lead 163a is so arranged that it attains a diameter equal to bore 164 at a plane lying near to its inner limit.

FIGURE 6 shows the mechanism at the point where the plunger 63 first makes contact with retaining ring 163, while the position of the plunger 63 is still controlled by the bore 164 of the lower piston 55.

It will be seen that as the side-angle of the conical lead 163a is too small for it to act as a reversible inclined plane, outward pressure of plungers 63 resulting from an axial force applied by reversible slope 166a of upper piston

73 cannot cause retaining ring 163 to be pushed upwards (leftwards, as shown in FIGURE 6) against pressure of retaining ring spring 78.

Downward extension of lower piston 55 leads to the creation of an annular space 200 outside the retaining ring 163, which is following lower piston 55 in its movement. This space must be filled with fluid, but there is no easy path of access for the oil while the retaining ring 163 is pressed into firm contact with the lower piston 55 by the action of retaining ring spring 78, as the clearance between retaining ring 163 and surface of plug 72 is too small to apply fluid sufficiently and quickly to fill the space created by downward movement of retaining ring and upper piston.

Unless special provision is made, the pressure difference resulting from the evacuation of this space 200 will force the retaining ring 163 back out of contact with lower piston 55, until a sufficient space exists between the front face 201 (FIG. 3A) of the retaining ring and the rear face 202 of the piston 55 to allow sufficient fluid to pass. Such an uncontrolled separation of the retaining ring from the lower piston might be attended by vibration and angular tipping of the retaining ring, which might cause its minor diameter to jam on the supporting diameter of plug 72, or its outer diameter to jam in the major bore of plug 72.

In order to provide a suitable oil path to the area closed off by retaining ring 163, therefore, shallow slots 191 may be formed on the rear face 202 of the piston 55. Conveniently two slots about $\frac{1}{100}$ " deep might be milled at right angles to each other straight across the face of lower piston 55 as shown in FIGURE 8. Their depth should be less than the depth of a chamfer 168 at the mouth of the bore 164.

It will be noted that two chamfers are shown on the ring 163 and a clearance indicated between the outside diameter of retaining ring 163 and the larger bore of the plug 72. The purpose of these dimensions is to prevent the possibility of jamming between these surfaces and to allow an easy path for oil to flow into the recess as the retaining ring moves out of it.

As the parking device takes the weight of the vehicle and its continued extension lifts the road wheel 40 and tire 92 clear of the road, the small area of piston rod 73, when acted upon by the working pressure of the fluid pump, will not be sufficient to sustain piston rod 73 in its fully extended position where circlip 75 butts against lower face 93 of plug 72. The ram, therefore, will close slightly until the clearance between the plunger 63 and angled face 94 of the groove 91 is taken up. Thereafter the main compressive load applied to the piston rod 73 is taken by the inner chamfers of plungers 63. With continuing extension of the lower piston 55, the roller 52 will roll along the road until it is pushed into contact with the tire 92, and the assembly is so arranged that it can force its way into the flexible tire to a sufficient extent to create a good friction drive under all conditions. The vehicle may now be driven sideways in either direction by selecting low or reverse gear, and operating the controls in a normal manner. As soon as the parking operation is completed and the valve control knob is pushed to the "off" position all pressure is released in the system, and the combined forces of the distorted tire 92 acting on the roller 52 and the retractive force of spring 48, push the roller 52 to the left, as shown in FIGURE 3, that is to say towards the centre of the vehicle. Owing to the locked condition of upper piston 73, the lower piston 55 is the first to retract and this movement continues until the roller is slightly clear of the road and the rear face of the front piston 55 meets the lower face of retaining ring 76. As lower piston 55 completes its retractive movement, the retaining ring 76 is pushed to the position shown in FIGURE 4, and recess 61a of lower piston 55 reaches a position opposite plungers 63. The retractive force of spring 48, which acts equally on the upper piston 73, urging it towards retraction, now causes the angled face 94

of groove 91 to push the plungers 63 outwards, until their outer portions occupy recess 61a. The main diameter 95 of upper piston 73 is thus able to pass the plungers 63 and the ram is able to retract fully to the position shown in FIGURE 4.

FIGURE 5 shows four interlock plungers 63 as they would be manufactured from a single circular piece of material. The portions cut away by the slitting operation are shown in chain-line.

FIGURE 9 shows a further alternative, wherein the sliding plungers 120 are cylindrical in form, with conical ends. This figure shows a view similar to FIGURE 3A. The upper piston 73 is shown in full, but plug 72, retaining ring 76 and the associated cylinder and piston are shown in half section. The construction is generally similar to that of FIGURES 3 and 4, except that the holes in plug 72, into which fit interlock plungers 120, are circular. Each cylindrical plunger 120 has conical extremities 121 and 122 which engage angular faces 123 and 124 on the upper piston 73 and lower piston 55 respectively. The outer surface 125 of interlock plunger 120, which engages the retaining ring 76, may be formed very slightly convex, so that it presents a suitable surface to slide against the bore of retaining ring 76. In this construction the locking action takes effect through a line contact only between the various conical surfaces of the pistons and interlock plungers so it will be desirable to harden all these surfaces.

FIGURES 10 and 11 show a further alternative form of detent mechanism, wherein rocking arms 96 perform the same function as sliding plungers 63 in the previous examples. FIGURE 10 shows a ram assembly of this type in the fully retracted position, and FIGURE 11 shows an enlarged view of the detent assembly at the moment when the upper piston rod 97, having been fully extended and being now locked by the front lobe 98 of rocking arm 96, and lower piston 99 has been released by the outer locking surface 100a of rocking arm 96. As shown in FIGURE 11, the lower piston 99 has commenced its extension, followed by retaining ring 101, which has now reached the locking shoulder 100, urged by spring 102. In each of these examples a single sliding plunger 120 or rocking arm 96 type of detent may be used or a plurality thereof.

FIGURE 12 shows a further alternative arrangement in which a number of metal balls 204 are used instead of either sliding plungers 120 or rocking arms 96. The inner face of the upper part of lower piston 103 is formed with a part-spherical groove 204a which can be engaged by the balls 204 when the piston 97 is in its retracted position. The groove 91 in the piston 97 is shaped to partially accommodate the balls when the piston 97 is fully extended. This arrangement operates in a similar manner to the arrangement shown in FIGURE 9, and is shown at the stage where the balls have been released by full retraction of the lower piston 103 and retaining ring 104.

In using this parking device it is a possibility that an inexperienced driver might stall the engine through not opening the throttle sufficiently when moving sideways up a camber for example. Another possible error would be to move the vehicle sideways with excessive power and speed, owing to opening the throttle too far. It was thought desirable to minimise either of these possibilities of error, this might be done by interconnecting the valve control rod with a link which opened the throttle slightly to a fast "tick-over" speed when the valve control knob was pulled, i.e. to a speed slightly in excess of the normal idling speed with the vehicle stationary and the engine under no load and which at the same time locked the normal accelerator control, so that the throttle could not be opened further beyond a small degree. Such an arrangement is shown diagrammatically in FIGURE 13, wherein a carburettor 149 is mounted on an engine manifold 151, and has a throttle spindle 150. This throttle is normally operated by means of rod 152, and lever 153,

shown on the remote side of the carburettor. The throttle spindle protrudes through the carburettor body on the nearside, as drawn, and carries a throttle stop piece 154, one arm 154a of which carries the normal slow running control screw 155. A support 156 fixed to the carburettor, is formed with a circular hole, wherein fits the enlarged end 158a of rod 157. This end portion of rod 157 comprises a ramp 158 which is in contact with the end of the screw 155, or it may be in contact with a non-adjustable portion of the throttle mechanism. Another arm 154b of the throttle stop piece 154 lies adjacent to a slot 210 in the support for rod 157, and in this slot a pin 159 lies, and is secured to the end 160 of the rod 157. The other end 161 of the rod 157 is connected by a pin point to an extension 171 of the manipulating shaft 167. On the valve 166 being operated by pulling the manipulating shaft 167 and extension 174 (FIG. 1) to the right, as drawn, the rod 157 will also be carried to the right, and the ramp 158 will cause the carburettor throttle to be opened slightly by acting on screw 155. At the same time pin 159 will be moved to the right to a point opposite lever arm 154b; the effect of these movements is that, in the first place, the throttle will be slightly opened to a fast "tick-over" speed suitable for normal sideways parking movements, and at the same time the pin 159 will prevent further excessive opening of the throttle by blocking the path of lever arm 154b should the accelerator be depressed.

I claim:

1. A hydraulic ram comprising in combination a plurality of nested parts of different cross dimensions arranged to telescope within each other in fluid tight manner, means including a control valve for supplying fluid under pressure to the interior of the ram, mechanical locking means releasably locking together said parts other than the said part of smallest cross dimension whereby when fluid under pressure is supplied to the interior of the ram relative movement takes place at first only between said smallest part and a locked part, mechanical means conditioned by said relative movement and adapted to release said locking means at the end of the relative movement, said nested parts being three relatively movable ram parts of different diameter, the smallest diameter ram part having an external recess at the end which projects into the largest diameter ram part and the intermediate diameter ram part having an internal recess at the end thereof which projects into the other end of the largest diameter ram part and in which a hollow boss encircles the smallest diameter ram part within said largest diameter ram part to one end of which ram part it is fixed, said hollow boss having movably mounted upon it at least one detent, said at least one detent being movable between limits of movement and at one limit of its movement having a portion engageable with said external recess on said smallest diameter ram part and at the other limit of its movement having a part engageable with said internal recess in said intermediate diameter ram part, the interengaging parts of said recesses and said at least one detent being so shaped that when the recesses are opposite one another and relative axial movement takes place between one said ram part and said at least one detent, movement is imparted to said at least one detent so that one part thereof disengages one said recess and another part engages the other said recess.

2. A hydraulic ram as claimed in claim 1, in which said at least one detent comprises a ball disposed in a substantially cylindrical guide passage in said hollow boss.

3. A movable ram as claimed in claim 1, in which an axially movable detent-retaining member is mounted on said boss, said retaining member maintaining said at least one detent in said external recess in said smallest diameter ram part when the ram is in an extended condition, said retaining member being disposed in the path of move-

ment of said intermediate diameter ram part so that, shortly before said recesses are brought into alignment, said retaining member is withdrawn from said at least one detent permitting one part of said at least one detent to be moved out of said external recess in said smallest diameter ram part and another part of said at least one detent to be moved into said internal recess in said intermediate diameter ram part.

4. A hydraulic ram as claimed in claim 3, in which said boss has a smaller external diameter than the internal diameter of said intermediate diameter ram part which encircles it when the ram is contracted and in which said retaining member comprises a ring which encircles said boss and is axially slidable upon it and is movable against the action of a spring when engaged by said intermediate diameter ram part.

5. A hydraulic ram as claimed in claim 1, in which said at least one detent comprises a rocker arm extending along said smallest diameter ram part and mounted on said hollow boss to rock about an axis transverse to the axis of the ram and having outwardly and inwardly extending projections disposed away from said rocking axis, the latter of said projections being engageable with said external recess on said smallest diameter ram part and the other of said projections being engageable with said internal recess in the intermediate diameter ram part.

6. A hydraulic ram as claimed in claim 5, in which an axially movable said detent-retaining member is mounted on the hollow boss and comprises a ring which encounters said rocker arm.

7. A hydraulic ram as claimed in claim 1, in which said at least one detent comprises a plunger slidably mounted in a guideway in the hollow boss, said guideway extending transversely of the axis of said hollow boss, the inner and outer ends of said plungers having chamfered portions which are engageable respectively with chamfered sides of said recesses in said smallest diameter and intermediate diameter ram parts, so that axial movement of these parts, when the plunger is in one of said recesses, forces the plunger out of that recess into the other of said recesses when said recesses are in alignment.

8. A hydraulic ram as claimed in claim 7, in which each said plunger is circular in cross section and the ends of each said plunger are tapered to provide said chamfering.

9. A hydraulic ram as claimed in claim 7, in which each said plunger is circular in cross section.

10. A hydraulic ram as claimed in claim 7, and a detent-retaining ring having a stepped bore, the smaller diameter portion of said bore being nearer that end of said largest diameter ram part which is closed by said hollow boss and the radius of said smaller diameter portion of the bore being such that the resulting shoulder overlaps the outer end of each plunger when the plunger bottoms against the recess in the smallest diameter part of the ram.

11. A hydraulic ram as claimed in claim 10, said bore of said retaining ring being slightly tapered so that the largest diameter is at that end which is engaged by an end of said intermediate diameter part of the ram.

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A. HARRY LEVY, *Primary Examiner.*