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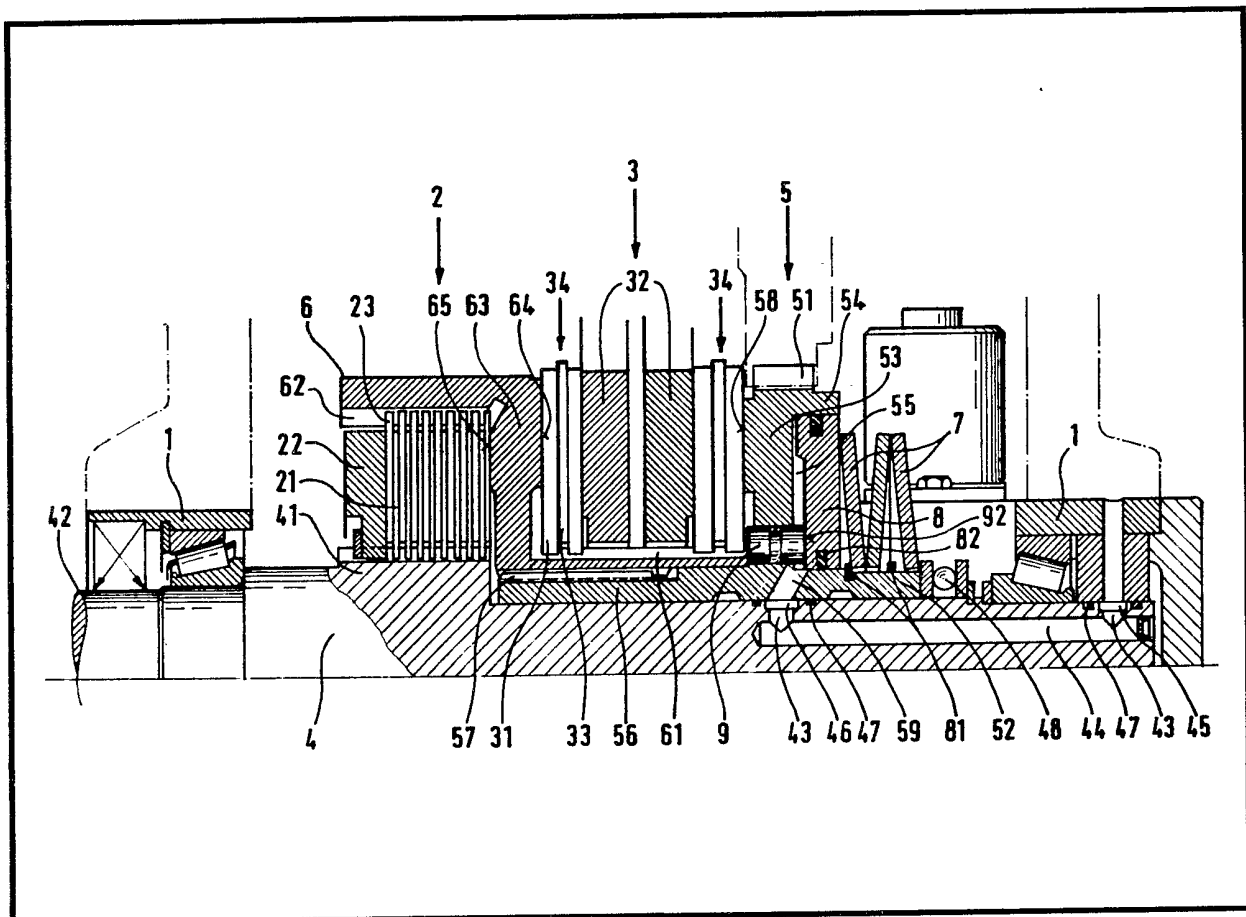
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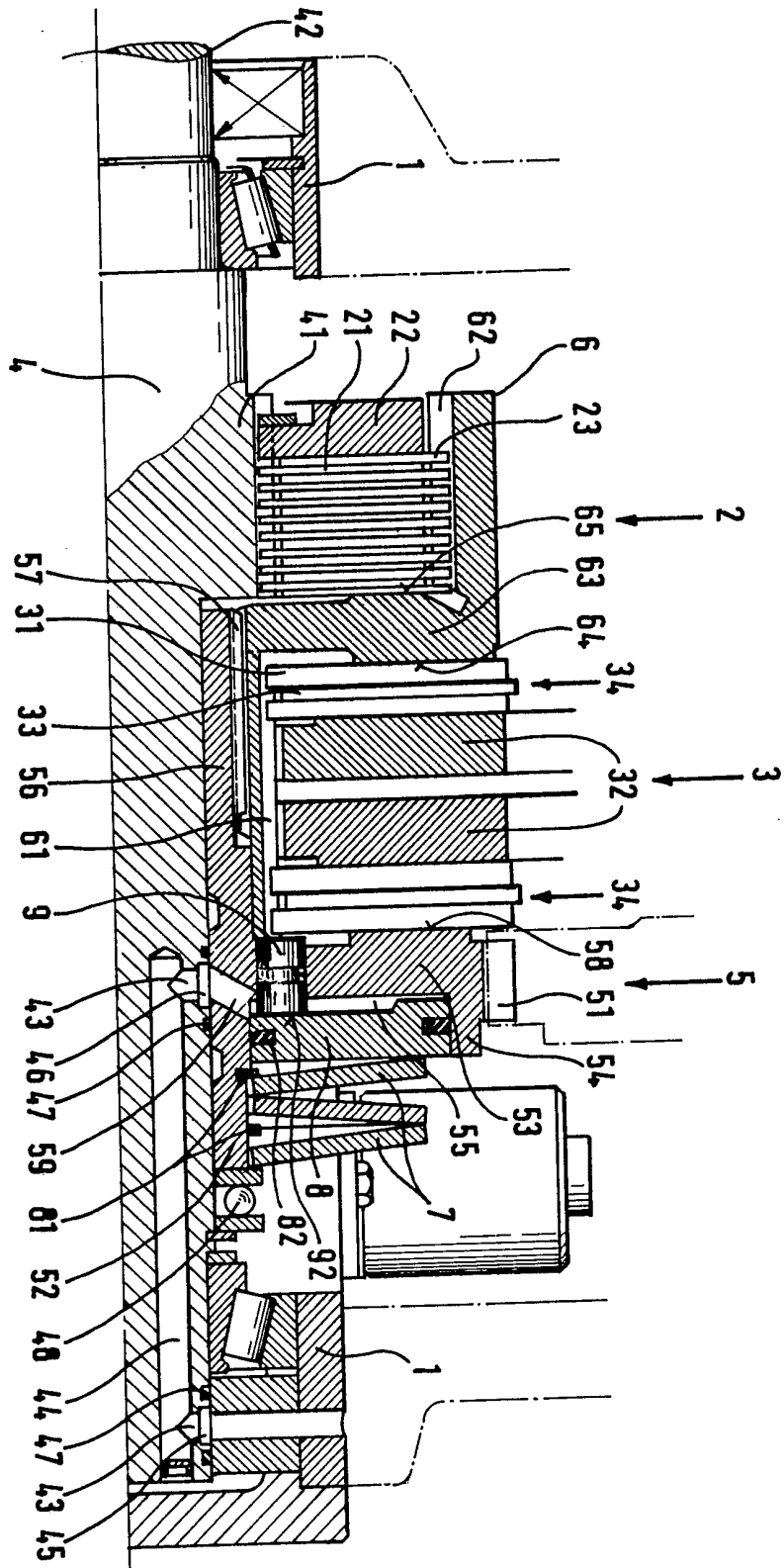
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(54) Axle drive and parking brake mechanism

(57) Axle drive and parking brake mechanism for a vehicle having a first permanently driven axle and a second selectively drivable axle comprises a main shaft 4 carrying a drive wheel 5 which can be coupled to the shaft 4 by a clutch 2 includ-

ing a disc carrier 6 non-rotatable with respect to the drive wheel 5, and a parking brake 3 which when actuated acts on both the drive wheel 5 and disc carrier 6. Actuation of the parking brake thus also engages the clutch so as to brake both the shaft 4 and the drive wheel 5 (thus braking both vehicle axles). A spring 7 through a transmission piston 9 acting on the carrier 6 closes the clutch 2, and a hydraulic piston 8 with a pressure chamber 55 opens the clutch 2 so that the clutch is also engageable independently of the brake. Wet multi-disc clutches and brakes are preferred. The transmission piston 9 may be connected to the power piston 8.





SPECIFICATION

Axle drive mechanism

- 5 The invention relates to an axle drive mechanism for a vehicle drivable by more than one axle.

Axle drives with clutches are known which enable an optional connection to be made
 10 between the front axle of a tractor and its transmission. Tractors of this kind are equipped with parking brakes arranged either on the main drive axle or on the transmission or added onto the transmission. What is com-
 15 mon to all these parking brakes is that they act only upon the main drive axle, for example the rear axle. However, development in tractors is leading to ever greater front axle loads with more and more accessories so that lock-
 20 ing of the rear axle is no longer sufficient.

A mechanism according to the invention comprises a main shaft, a drive wheel non-rotatably mounted on the main shaft, a clutch disc carrier non-rotatable but axially movable
 25 with respect to the drive wheel whereby the main shaft can be brought into engagement with the drive wheel, and a parking brake lockable with respect to the drive wheel and disc carrier. This enables all drivable axles to
 30 be locked by operating the parking brake without having to consider the position of the clutch for the engageable axle.

By accommodating the parking brake in the axle drive in connection with the clutch, the
 35 drive axle can be locked by the interaction between the brake and axle even when this axle is not connected with the transmission. The locking action of the parking brake is non-positive on the drive wheel but positive
 40 on the main drive shaft, so that all drive shafts both those connected to the transmission all the time and the engageable drive shafts are locked in position when the parking brake is operated. In addition, the arrange-
 45 ment requires little constructional space, and provides a technically favourable solution and a simple construction.

A wet multi-disc clutch and a wet expanding multi-disc brake are preferred. Accommo-
 50 dation in one housing is particularly simple and cost-effective because there is no need for dry chambers to be sealed off against one another. Such a wet load-engagable clutch is subject to only a small amount of wear and
 55 required little maintenance. A spring is preferably provided for closing, and hydraulic means for opening the clutch. This facilitates a favourable and simple construction. The axial load of the parking brake can be sup-
 60 ported entirely by the main shaft so that no axial loads has to be absorbed by the main shaft bearing.

It is possible to relieve the clutch from spring pressure by supplying fluid into the
 65 clutch-opening pressure chamber. However,

when the parking brake is closed, the clutch remains closed and only opens when the parking brake is released. The fluid, by acting upon the pressure piston, opens not only the
 70 clutch, but has the effect, via the pressure surface on the transmission piston that the discs in the clutch lightly touch each other. This contact pressure can be adjusted in a very simple way by altering the diameter of
 75 the transmission piston. It is also possible to ventilate the clutch i.e. not let the discs touch each other by simply connecting the pressure piston and transmission piston or constructing them in one piece. The hydraulic actuating
 80 cylinder may be superimposed on the parking brake, and permanently or intermittently connected to a service brake circuit.

DRAWING

85 The drawing is a half-section through an axle drive according to the invention. It shows an axle drive with a clutch 2 and a parking brake 3 inside a housing 1. A main shaft 4 arranged inside and mounted in the housing 1
 90 has a collar 41 which is designed as both a carrier for inner discs 21 and an end disc 22 of the clutch 2, and as a drive shaft connection 42 for the vehicle axle (not shown).

Mounted on this main shaft 4 of the axle
 95 drive, so as to be axially fixed, but rotatable, is the drive wheel 5, which is driven via radial toothing 51 from an intermediate gear of the transmission shown only in outline. A first collar 52 of the drive wheel 5 carries springs
 100 7 and a pressure piston 8, which in conjunction with a web 53 and a tooth crest 54 forms a pressure chamber 55. A second collar 56 carries a toothing 57 in non-rotatable connection with a disc carrier 6. The second
 105 side of the web 53 is shaped as reaction member 58 for the parking brake 3, and the web itself has an aperture for a transmission piston 9 between the pressure piston 8 and the disc carrier 6.

110 Inner discs 31 of the parking brake 3 and outer discs 23 of the clutch 2 are arranged respectively on external toothings 61 extending parallel to the main shaft 4 and on internal toothings 62 of the disc carrier 6
 115 (which is Z-shaped in profile). The discs are arranged so as to be non-rotatable, but axially movable. A radially extending connecting web 63 through its first side acts as a reaction member 64 for the parking brake 3, and
 120 through its second side as a pressure piston 65 for the clutch 2. The parking brake 3 also has expanding jaws 32 firmly attached to the housing 1 and outer discs 33.

The drive connection to the axle from the
 125 transmission is effected with the clutch 2 closed due to pressure from the springs 7 via the pressure piston 8, the transmission piston 9 and the disc carrier 6. The second side of the radially extending connecting web 63 act-
 130 ing as a pressure piston 65 presses against

the discs 21, 23 of the clutch 2 which are supported against the end disc 22. Thus a non-positive connection is set up between the main shaft 4 and the disc carrier 6 which is positively locked onto the drive wheel 5.

To open the clutch 2, pressure fluid is passed into the pressure chamber 55 via bores 43, 44 and annular grooves 45, 46 in the main shaft 4 and bores 59 in the drive wheel 5. The pressure piston 8 moves in the direction of the springs 7 thus relieving the disc carrier 6 via the transmission piston 9. The resulting high axial pressure of the springs 7 is cushioned by thrust bearings 48 to reduce friction.

By stops 81 the path of the pressure piston 8 is limited. Altering the size of the pressure surface 92 on the transmission piston 9 makes it possible for the discs 21 and 23 to touch each other as a result of the pressure remaining when the clutch 2 is open. If the transmission piston 9 is connected with the pressure piston 8—either in a one-piece construction or by positive locking with a Seeger ring for example—it is also possible to achieve ventilation between the discs 21 and 23 of the clutch 2.

If the brake linkage of the parking brake 3, which causes the expanding jaws 32 to operate, is superimposed by a force activated by a service brake system—for example by a hydraulic operating piston—the parking brake 3 becomes an additional wear-resistant service brake. By this arrangement permanent or optional operation of the brake is possible. The pressure chamber 55 and the supply lines for the pressure fluid are protected against excessive pressure loss by seals 47, 82.

When the parking brake 3 is applied, not only the axle engageable via the clutch 2 but also the main drive axle connected via the transmission is locked. This is independent of whether the clutch 2 is closed due to the pressure of the springs 7 or of the fluid in the pressure chamber 55.

The parking brake may be operated purely mechanically or hydraulically or pneumatically. With a mechanical operation, spheres or cams—not illustrated—would be employed to press the two expanding jaws 32 non-rotatably attached to the housing 1 in an axial direction against disc packets 34. With this arrangement, the support would be effected on the one side against the side of the web 53 of the drive wheel 5 shaped as reaction member 58, on the other side via the radially extending web 63 of the disc carrier 6, and via the disc packet 34 of the clutch 2 against the end disc 22 axially fixed to the drive shaft 4.

It is feasible for instance to arrange pressure springs instead of the saucer springs 7, or to use the parking brake 3 or parking/service brake combination only as an additional wear-resistant service brake. Thus a hydraulic

actuating cylinder may be superimposed on the parking brake, and permanently or intermittently connected to a service brake circuit.

70 CLAIMS

1. An axle drive mechanism for a vehicle drivable by more than one axle comprising a main shaft, a drive wheel non-rotatably mounted on the main shaft, a clutch disc carrier non-rotatable but axially movable with respect to the drive wheel whereby the main shaft can be brought into engagement with the drive wheel, and a parking brake lockable with respect to the drive wheel and disc carrier.

2. An axle drive mechanism according to claim 1 in which the clutch is a wet multi-disc clutch.

3. An axle drive mechanism according to claim 1 or claim 2 in which the parking brake is an expanding wet multi-disc brake.

4. An axle drive mechanism according to any preceding claim including a spring for closing and hydraulic means for opening the clutch.

5. An axle drive mechanism according to claim 4 in which the hydraulic means comprises a transmission piston slidable with respect to the drive wheel for moving the clutch disc carrier.

6. An axle drive mechanism according to claim 5 in which the transmission piston is made in one piece with a power piston of the hydraulic means.

7. An axle drive mechanism as herein described with reference to the drawing.

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