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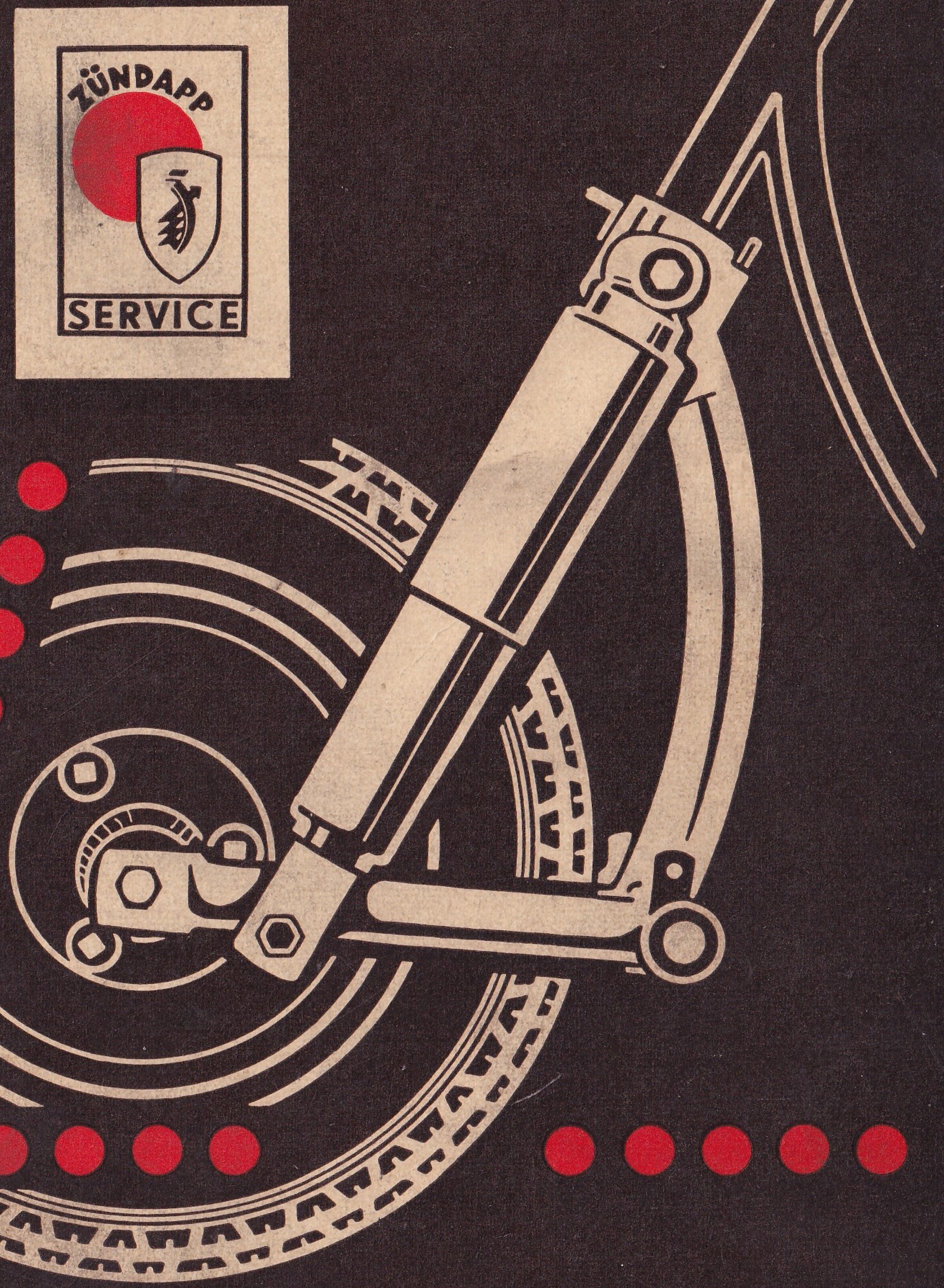

Vehicle Suspensions

ZÜNDAPP

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VEHICLE SUSPENSIONS

for Models

DB 201, DB 202, COMFORT, NORMA,
NORMA-LUXUS, ELASTIC 200,
ELASTIC 250, 175 S, 200 S, BELLA R 150,
BELLA R 151, BELLA R 153, BELLA R 200,
BELLA R 201, KS 601

MAINTENANCE AND REPAIR

NOVEMBER 1956

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Foreword

The rapid development in the construction of two-wheeled vehicles, especially with regard to vehicle suspensions, has entailed completely new problems for repair shops.

To explain this in detail and render assistance to all concerned is the sole purpose of this present Repair Manual for ZÜNDAPP Suspensions.

It constitutes a supplement to our series of publications which we have begun with our handbook "Repair Work on Two-Stroke Engines".

Any important changes will be published in our "Technical Bulletins".

ZÜNDAPP-WERKE G.M.B.H. NÜRNBERG-MÜNCHEN

WERK NÜRNBERG

Contents

A) Front Wheel Suspensions

1. Telescopic Fork for Models DB 201, DB 202, Comfort, Norma, Norma-Luxus, Elastic 200, Elastic 250, 175 S, 200 S

The first telescopic fork built in the ZÜNDAPP factory was used for the 1950 Model DB 201. Since that time the design of this fork was changed only slightly. It is, however, quite possible to adapt earlier forks to the most recent development without difficulty.

Design and Method of Operation of the Telescopic Fork

The telescopic fork is held in position by the lower fork connecting member with fork shank in the steering head of the frame and the upper fork connecting member, mounted in ball bearings. The lower fork guide tubes slide on the hard chromium-plated fork tubes mounted in the lower and upper fork connecting members. Two slide bushings with babbit metal lining held apart by a spacer tube of aluminium are clamped in position at the lower fork guide tubes by means of threaded bushings. The fork guide tubes, at their lower ends, have one shoe each which permits easy and effortless mounting and demounting of the front wheel.

In order to obtain especially soft springing effect, a spring unit consisting of a pre-load, short lower spring plus a stronger, longer upper spring is inserted into each fork guide tube. This spring unit, below, is mounted in the fork guide tube, and above in the fork tube. Both springs are connected by means of a spring carrier and a clamping screw in such a way that, under normal load, small irregularities are ironed out by the two short springs and the stronger long springs become active only at loads of up to 200 kgs. The maximal extension of the fork, measured from the completely load-free fork, is 116 mm, from the motor cycle rolling on even ground 80 mm. In order to eliminate hard jolts when the fork kicks through, rubber rings are mounted inside the protective sleeves which act as buffers between the lower fork connecting member and the threaded sleeves mounted on the fork guide tubes. When there is no load on the front wheel, the fork guide tubes with the clamping screws screwed into them are suspended from the spring carriers of the long pressure springs, which, in this particular case,

are subjected to tensile stress. Rubber rings between the heads of the clamping screws and the spring carriers prevent both parts from knocking against eachother.

100 c. c. of oil are poured into each fork leg in order to prevent the tubes from seizing. The oil is transported onto the sliding surfaces through the lower oil holes of the fork tubes since the telescoping movement of the springs will transport the oil upward. Sealing members forced into the threaded bushings arranged at the ends of the fork guide tubes eliminate oil leakage.

Disassembling the Telescopic Fork

Take off rubber stopper, unscrew cylinder screw, pull off fork guide tube together with spring unit. If there is no need for disassembling the demounted parts any further, the oil can be left inside the fork guide tubes. For subsequent reassembling they should be stored in vertical position.

After the oil has been drained out, the spring unit is removed from the fork guide tube by loosening the slotted circular nut while holding the clamping screw in position with a screwdriver. For access to slotted circular nut, remove the round neck nut, the spring washer, the shoe, and the hex screw.

The sliding tubes can be taken out as soon as the threaded bushing has been unscrewed from the fork guide tube. For access to slide bushings proceed as follows: hold fork guide tube, with its opening pointing upward, in your hand and, from above, knock onto the lateral shoulder for the central fitting of the front fender with a wooden or rubber hammer, whereby the slide bushings will come out on top. Damage to the babbit running surfaces in the slide bushings must be avoided under all circumstances.

The long pressure spring can be unscrewed from the spring carriers. Remove the spring carrier, the short pressure spring and the spring plate after removing the slotted pin and the adjusting collar from the clamping screw.

Fork tubes can be pulled out after the clamping screws at the upper and the lower fork connecting member have been loosened. Now the headlight carrier can be removed. The protective sleeve with the rubber ring is turned to such a degree that it can be taken out from below.


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Reassembling

Reassembling is done in reversed sequence. The following points are of special importance: Push rubber ring, with the thinner part pointing downward, into the upper end of the protective sleeve before the latter is stuck onto the lower fork connecting member. The distance between the upper ends of the fork tubes and the upper rim of the clamping lug at the lower fork connecting member must be 150 mm. The lower hole must always point forward. The circlip must have good fit in the groove provided for this purpose since it has to bear the total spring pressure.

When mounting the spring unit, tighten the slotted nut well so that the shim inside the fork guide tube prevents the oil from leaking out. We recommend to provide the shim with a sealing compound.

When tightening the cylinder screw (upper fastening of the spring unit), make sure that the slots in the shim correspond with the recesses in the spring carrier; otherwise oil cannot be added. When readjusting the ball bearings in the steering head, loosen the two clamping screws for the fork tubes arranged at the upper fork connection, and then only retighten the two nuts in the fork shank. After readjusting, tighten the aforementioned nuts against eachother in order to guarantee firm fit. Tighten both clamping screws at the upper fork connecting member.

Maintenance

Drain out oil in telescope fork after every 10,000 km (6000 miles) by loosening the drain plugs at both fork legs. Reinsert plugs. Then remove rubber stoppers at the upper leg ends and refill

100 c.c. of SAE 50 motor oil
at outside temperatures of above + 15° C (= + 60° F)

or

100 c.c. of SAE 10 motor oil
at outside temperatures of below + 15° C (= + 60° F).

Always use the correct type of oil corresponding with outside temperatures since the oil influences the running properties between slide tube and fork tube to a considerable extent. Thin oil will result in softer springing, thick oil will make the springing harder.

Using the fork w i t h o u t oil will destroy the babbit lining in the slide bushings and the fork tube surfaces within a very short time.

Changes and Alterations

For DB 201:

Up to Chassis No. 770 918 a one-piece slide tube 1330 z 81 was used instead of the two slide bushings with spacer tube 180 z 16. The improved part can be built in, yet the fork guide tube has to be replaced.

From Chassis No. 770 919 on DB 201, as well as, from the beginning of this series on, DB 202, Comfort, Norma, Norma-Luxus, Elastic 200 feature the same fork design.

The front fork of model Elastic 250 features a different upper fork connecting member (aluminium finish) and headlight carrier (aluminium instead of sheet metal).

Models 175 S and 200 S feature almost the same design as other models. Changes became necessary in order to obtain the same riding qualities for these models with smaller wheel diameters.

Changes in fork tubes: hitherto 1331 z 563, 507 mm long
now 1331 z 832, 532 mm long

in fork guide tubes: hitherto 1330 z 93 left and 1330 z 94 right
length to center front axle 358 mm
now 200 z 103 left and 200 z 104 right
overall length 371.5 mm

Further changes:
Front axle mounting,
Clamping screws, hitherto 1540 z 11 with thread length 12 mm in guide bars, now 1650 k 119 with thread lengths of 30 mm; the new design is forced into the fork guide tube,
the upper fork connecting member features a different handlebar mounting.

Fork for Motor Cycles with Sidecars

For sidecar work it will, in most cases, become necessary to adapt the fork to the changed operation conditions by building in the reenforced springs 321 z 503 and 321 z 504 (2 each) provided therefor. Any further changes are unnecessary. A steering damper must, of course, be provided for.

Trouble in the Mechanism

F o r k l o s e s o i l :

a) at the shoe for the front axle.
R e m e d y : Retighten slotted nut.

b) at the welded seam at the fork guide tube (only with DB 201 of older design).

Remedy: Weld again or replace fork guide tube.

c) at the threaded bushing.

Remedy: Replace sealing member in threaded bushing.

d) Oil leakage at the headlight carrier.

Remedy: Check fork tubes and make sure that de-aeration orifice in upper end does not point backward so that oil, during filling, runs into the headlight carrier.

e) Rubber stopper pops out when the fork operates.

Remedy: Too much oil in fork. Pressure too high. Drain out oil and refill.

Fork works too hard or too easily:

Remedy: Fill correct type of oil corresponding with outside temperature since the oil influences running properties between slide tube and fork tube. Thin oil results in softer springing, thick oil in harder springing.

Fork jams:

a) Bent fork tubes.

Remedy: Replace bent fork tubes, since such tubes cannot be straightened any more.

b) Fork tube twisted (upper fork connecting member twisted in relation to lower fork connecting member).

Remedy: Straighten fork connecting member until fork tubes are completely aligned.

c) Too long set screws for the central fender stay have pressed the fork guide tubes inward.

Remedy: Replace fork guide tubes plus screws.

Rattling noise when the fork operates:

Short pressure spring deviates laterally. Spring windings scrape at the lower fork tube end.

Remedy: Clamping screw without spring guide is interchanged against such with spring guide (Part No. 1540 z 11). (Only for earlier DB 201.)

Remarks:

The gargling noise which is the result of the short pressure spring and the spring carrier being immersed cannot be eliminated.

Steering "whips":

Remedy: Adjust bearing play in steering head.

Fork kicks, is difficult to control:

Wrong type of oil.

Remedy: Drain out oil. Refill correct type of oil for the season.

Protective sleeve rattles:

Remedy: Loosen protective sleeve, replace rubber ring.

2. Telescopic Fork for Models Bella R 150, Bella R 151, Bella R 200, Bella R 201

Telescopic Fork Design

The telescopic fork is held between two ball bearings in the steering head of the frame. The top ball race, at the same time, acts as a nut, and on top there is a lock nut.

The steering tube as well as the two hard chromium-plated fork tubes are forced into the aluminium fork connecting member, and cannot be replaced separately. A slide bushing from babbit metal has been cast into the aluminium fork legs (guide tubes); the second one on top is held in place by a threaded bushing into which a sealing member has been forced. The pressure spring, on one end, is screwed into the cover lid arranged below, at the other end it is screwed into the upper fork connecting member.

The two protective sleeves are fastened to the upper fork connection by means of a bayonet joint.

In order to prevent any oil leakage from the de-aeration holes, two steel wool oil filters have been forced into the upper fork connecting member. These filters are held in position also by the lateral fender screws (these screws also serve as oil filler screws).

Disassembling the Telescopic Fork

Before disassembling, the two handlebar clips must bei removed. The nuts on the fork shank can be loosened with the help of the socket wrench pair ZWN 788/789 = 2501 k 77-2/2501 k 78-2 (new Part Nos.).

The front fork together with the front wheel and the fender can be pulled out from below after the two lock nuts have been removed and the brake cable unhooked. This method is recommended in such cases where only the ball races or the fender must be replaced.

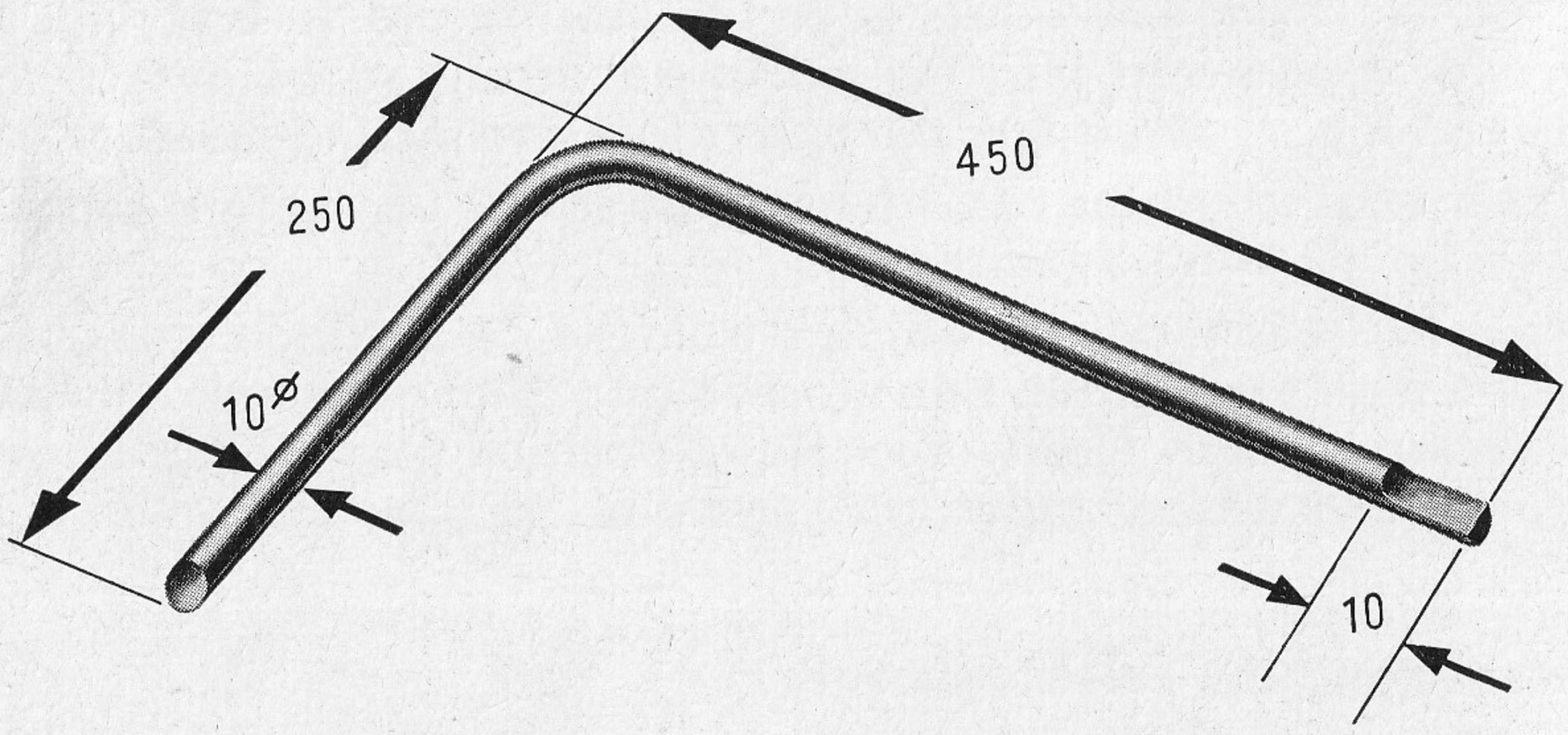
For repair work on the fork proper it is recommended to take off the front wheel together with the brake drum before. The bushing which holds the brake drum on the left hand fork leg is forced into the latter, and can be forced out with a suitable tool.

The front fender is fastened to the fork by means of 3 screws of which the 2 ones lying on the outside also serve as oil filler screws.

After front fender, front wheel, connecting strut and brake drum habe been removed, the fork can be disassembled further. This is done the same way on both sides:

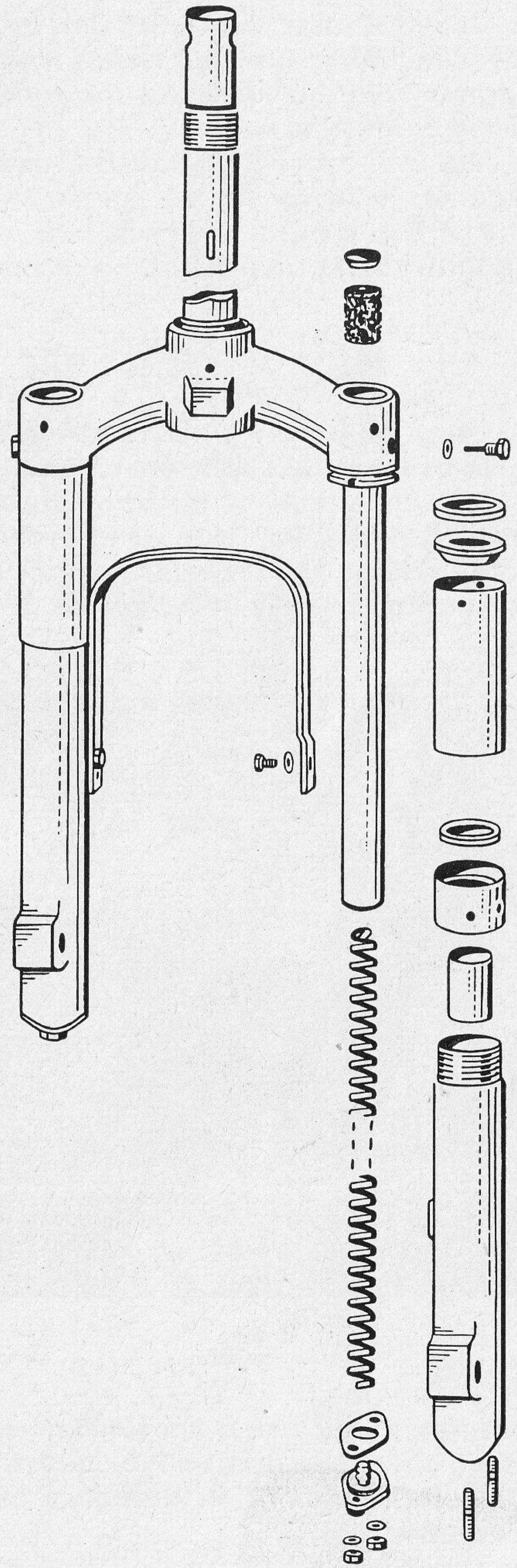
First remove the two nuts on the underside and force off the cover from the fork leg over the staybolts. (Caution! Oil will run out.)

Now turn the cover counter-clockwise. Thus either the cover with the spring is unscrewed from the spring support or the cover alone is unscrewed from the spring itself. In the former case the fork is disassembled as far as possible, with the exception of the protective sleeves. If the spring still remains inside the fork tube it can be removed with a tool you will have to make yourself. (See sketch.)



After the cover has been removed, the fork leg can be taken off from below. Inside the fork leg there is a cast-in sliding bushing (cannot be removed) and a loose bushing, which can be removed after the clamping nut has been removed.

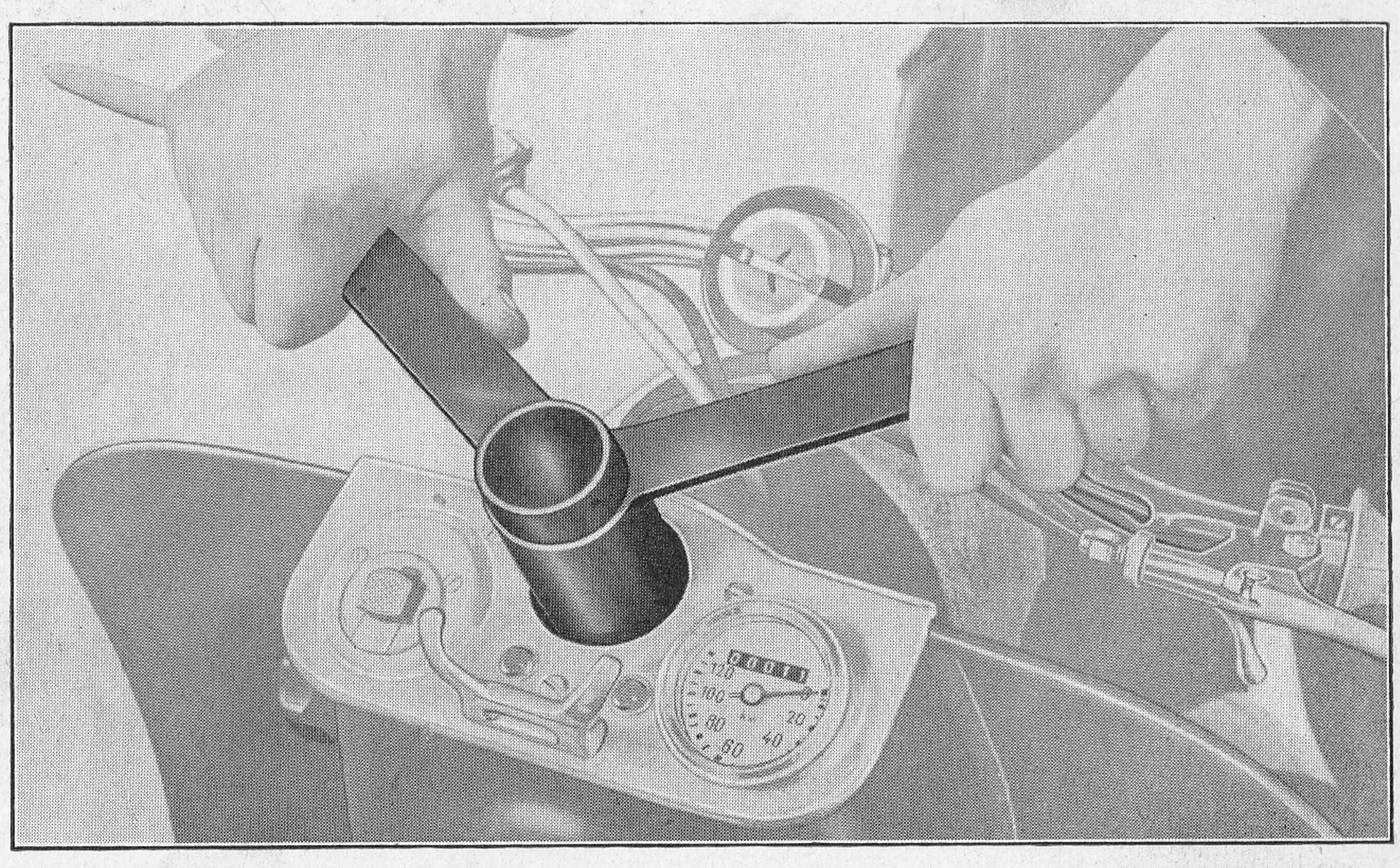
A packing washer has been forced into which can be forced out from the opposite direction.



The protective sleeve is fastened to the fork by means of a so-called bayonet-joint. Whenever the punch mark visible at the sleeve corresponds with the recess at the fork, the protective sleeve can be taken off from below.
The fork tubes, the fork connecting member and the fork shank are forced together and cannot be taken apart. In case of damage to one of these parts the front fork consisting of the three specified individual parts should be replaced.

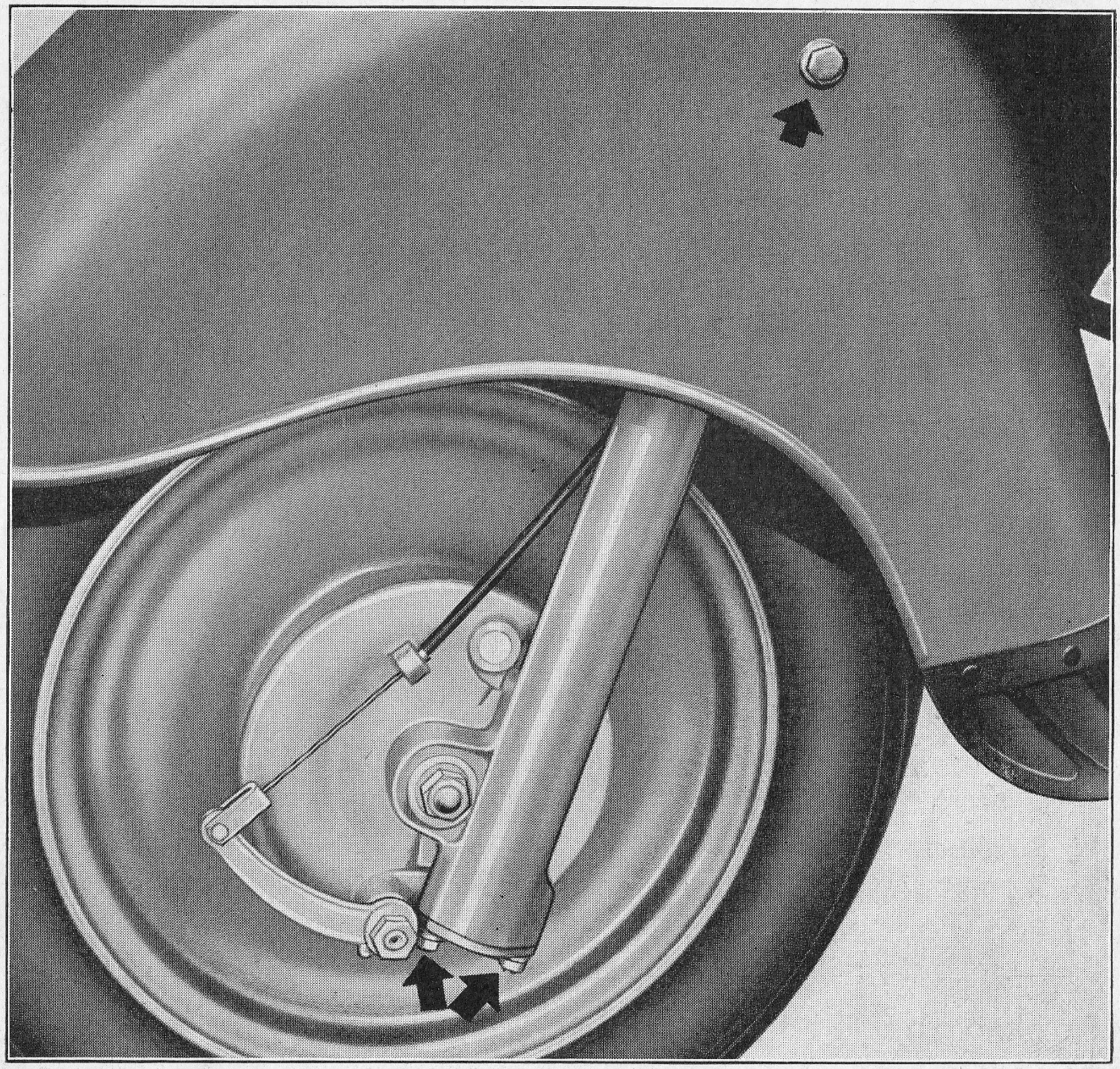
Reassembling

Reassemble according to para. "Disassembling the Telescopic Fork"), yet in reversed sequence. Important : Adjustment of steering bearings can be done by means of the special tool ZWN 788/789 = 2501 k 77-2/2501 k 78-2 (new Part Nos.). The constant checking of steering bearing adjustment is of the utmost importance : bearings adjusted too tightly, or too loosely, will become defective within a very short time.



Maintenance

Change oil in front fork every 10,000 km (6000 miles). For draining out the oil, loosen the cover jam nuts on the underside and take off the covers from the fork legs. When changing oil, also replace paper gaskets every time.



Oil should be filled in with an oil can at the openings provided therefor. For access to these oil holes, remove lateral fender set screws.

Fill each leg with 40 c.c. The type of oil should be coordinated with prevailing climatic and operational conditions.

For warm weather and heavy load SAE 50 oil
For warm weather and normal load SAE 40 oil
For cool weather and heavy load SAE 30 oil
For cool weather and normal load SAE 10 oil

Changes

With Bella R 150 :

From chassis no. 9925 on, longer springs have been built in
old model No. 321 z 531, 48 windings
new model No. 321 z 568, 61 windings.
With scooters which have the new, longer spring, the lock nut will protrude out of the protective sleeve to some extent.
Springs can be interchanged without difficulty.

With Bella R 150 :
From chassis no. 1544 on, the lower slotted nut for the fastening of the front fork to the frame also serves as a ball race for the fork bearing. Replacing these parts will meet with no difficulties if the thread will be ground off by approx. 5 mm on its lower end.
Bella R 200, from the beginning on, has the new design.

Trouble Shooting

F o r k l o s e s o i l :

a) at the threaded bushing.
R e m e d y : Retighten threaded bushing.

b) Sealing member defective.
R e m e d y : Replace sealing member in threaded bushing.

c) Paper gasket on flange defective:
R e m e d y : Replace paper gasket.

F o r k o p e r a t e s i n j e r k s :

a) Fork twisted by force.
R e m e d y : Replace front fork together with fork tubes (fork tubes cannot be replaced singly).

b) No oil, too little oil, or too thick oil in the fork.
R e m e d y : Use correct type of oil corresponding with outside temperatures, since the type of oil used will influence running properties between fork tube and fork leg. Thin oil will result in soft springing, thick oil in harder springing.

B a l l r a c e s s e i z e :
R e m e d y : Lubricate sufficiently, readjust steering bearing.

F o r k o p e r a t e s t o o h a r d o r t o o s o f t l y : *)
R e m e d y : Use correct type of oil, see above para. b).
*) Extra strong springs for extraordinarily heavy loads are not available.

3. The Telescopic Fork for KS 601

Designs and Method of Operation of the Telescopic Fork

The telescopic fork, in the steering head of the frame, is held in position in ball bearings by the upper as well as the lower fork connection with fork shank. The lower fork guide tubes (fork legs) slide on the hard-chromed fork tubes which are mounted in the upper and lower fork connecting members. Each of the fork guide tubes, at its lower end, has a shoe which permits easy and effortless assembling and disassembling of the front wheel without the set screws having to be removed.

In order to obtain especially soft cushioning effect, a spring unit consisting of a pre-loaded, short lower spring and, on top of it, a stronger long spring, has been inserted into each of the two fork guide tubes. The spring unit, at its lower end, is mounted in the fork guide tube and at its upper end inside the fork tube. Both springs are connected by means of a spring carrier and a clamping bolt in such a way that the two short springs under normal load, will iron out smaller irregularities, and the two stronger springs will only come into action alone at higher loads. The spring action range with completely extended fork is 120 mm, and approx. 85 mm when the motor cycle is rolling along on even ground. An oil-hydraulic shock-absorber, arranged between the fork guide tubes and the upper fork connecting member, exercises a dampening effect while the fork extends. A steering damper that can be adjusted manually has been provided at the fork shank in order to eliminate fork "whip" in motor cycles with sidecar, or on rough roads. Adjusting screws permit readjusting the damper mechanism free from play at any time.

150 c.c. of oil are filled into each fork leg in order to prevent the tubes sliding in eachother from seizing. The oil is filled into the lower oil holes of the fork tubes since the telescoping movement of the springs will transport it upward. Sealing members forced into the threaded bushings at the ends of the fork guide tubes eliminate oil leakage.

Disassembling the Telescopic Fork

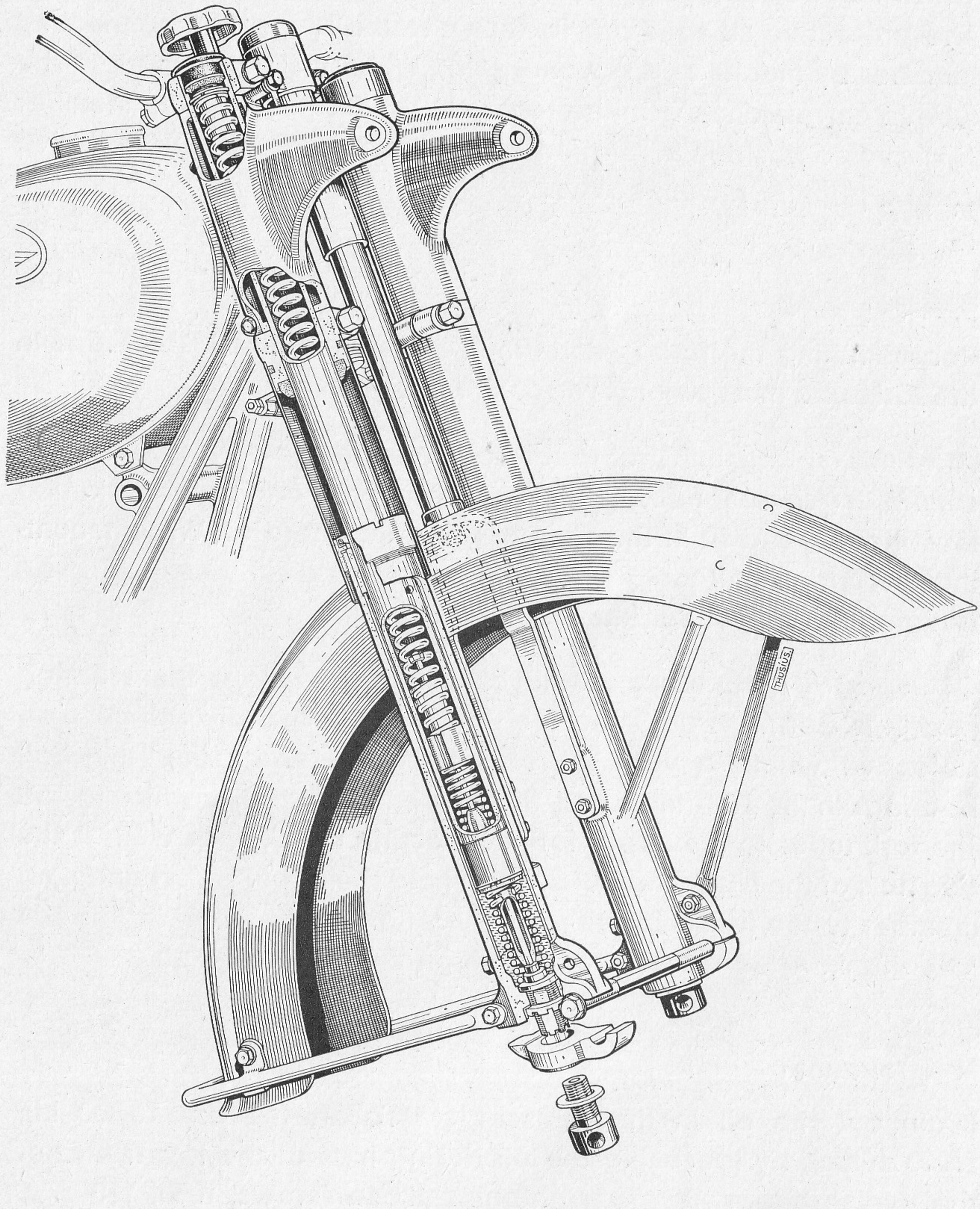
Repair work on the fork, i.e. on spring or guide members, can in general be carried out without the fork having to be taken out of the frame. Removing front wheel and fender only in such cases where it is absolutely necessary (e.g. when replacing fork legs) will save many work hours. For repair work on the front fork bearing there is no necessity for removing the front wheel and the fender.

First unhook the brake cable and demount the headlight, then loosen the shock absorber at the upper fork connection member, and unscrew the star knob and screw with plate of the steering damper. Now take out the rubber stoppers and loosen the two nuts each of the upper fork connection on front and rear. Finally the fork connecting member can be knocked off towards above with a rubber mallet.

Ball races can be replaced without difficulty in the usual manner.

Demounting the front wheel and the front fender will greatly facilitate repair work on the spring or guide members. Disassemble the fork in the following sequence (this covers repair work on one leg only!): Remove upper rubber stopper and take out external circlip visible under the former. Now the fork leg can be pulled downward to some extent whereby the clamping nut becomes visible; unscrew the latter. Then the fork leg can be taken off the fork tube from below.

Now the springs connected by means of the spring carrier can be taken out of the fork leg; for this purpose release and loosen the circular nut at the lower end. The long pressure spring is screwed onto the two spring carriers only. In order to remove the short spring, loosen the so-called two-hole nut. Inside the fork leg there is still the long sliding bushing which will slide out whenever the leg is knocked against wood. The long fork guide tube is clamped in position at the two fork connecting members and at the headlight bracket. The tube can be taken off from below after the screw connections provided therefor have been loosened.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At the lower part of the tube there is still the small sliding bushing which can be taken off after the retainer ring has been removed. The protective sleeves are fastened to the lower fork connecting member by means of a bayonet joint. When the punch mark of the sleeve corresponds with the recess in the fork connecting member (transverse position in relation to the direction of travel) the sleeve can be pulled off from below.

Reassembling

Reassembling the fork is done in reversed sequence. The holes in the fork tube must point towards the direction of travel.

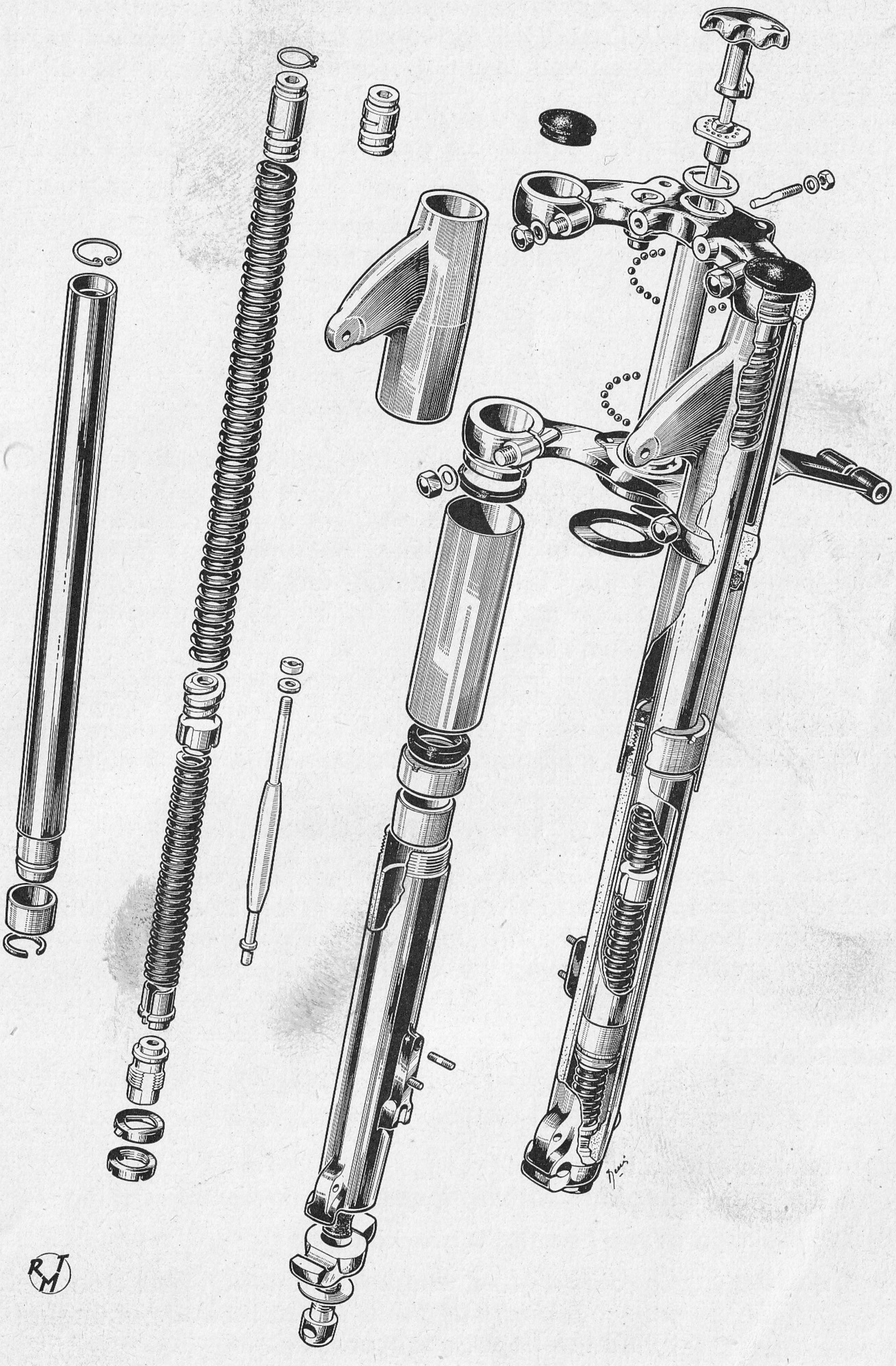
After the spring unit has been mounted in the fork guide tube, secure the circular nut. The circlip in the upper end of the fork tube must have good fit in the groove provided therefor. When mounting the spring unit make sure that one steel disk is located over, and another one under, the circlip.

Of especial importance is the correct adjusting of the steering bearings. Bearings adjusted too tightly or too loosely will become defective within a very short time. When readjusting the ball bearings in the steering head, first loosen the two nuts which fasten the fork tubes to the upper fork connecting member as well as the two nuts of the clamping bolts which hold the upper fork connecting member to the fork shank; then only retighten the screwing on the fork shank. After readjusting, retighten the loosened nuts.

Maintenance

Drain out the oil in the telescopic fork after every 10,000 km (6000 miles), by loosening the oil drain plugs at the lower end of the two fork legs. After retightening these screws, refill 150 c. c. of motor oil:

SAE 50 with warm weather and heavy load
SAE 40 oil with warm weather and normal load
SAE 20 oil with cold weather and heavy load
SAE 10 oil with cold weather and normal load.



Use correct type of oil corresponding with outside temperatures, since the type of oil used will influence the running properties of the fork tubes. Thin oil will result in softer springing, thick oil in harder springing.

In order to fill in the oil, take off the two rubber stoppers at the upper fork end.

For steering bearing lubrication, use special grease with water-repellent properties guaranteed by the manufacturer.

Changes

Oil-hydraulic shock absorber:

For some time now we have been using oil-hydraulic shock absorbers with added cushioning power. The new model can be exchanged against the hitherto used one, yet the star knob of the steering damper at its underside must be turned off (shortened) until the knob does not touch the damper any more.

Front axle mounting:

The screw plug for the fastening of the clamping shoe of the front axle now has a round head with a transverse hole instead of a hexagonal head. Use a mandrel for loosening the screw plug.

Fork for motor cycles with sidecar:

In case the front fork must be readjusted for sidecar work, use the shorter upper spring carrier with the order No. 633 z 13 instead of the longer model No. 633 z 101. Increase the pre-load of the lower pressure springs by inserting the intermediate bushing 173 z 10.

Breakdown

Fork loses oil:

a) at the threaded bushing.
   Remedy: Replace sealing member in threaded bushing.

b) Oil leakage at the headlight bracket.

   Remedy: Check fork tube whether ventilation hole does not point backward and thus oil has leaked out through it into the headlight bracket.

c) Rubber stopper pops out when spring operates.

Remedy: Too much oil in fork. Pressure too high. Fill correct amount

Fork movement too hard or too soft, or fork kicks through*)

Remedy: Use the correct type of oil corresponding with outside temperatures, since the type of oil used will greatly influence the sliding properties between sliding tube and fork tube. Thin oil makes the fork operate harder, thick oil softer. Replace oil-hydraulic shock absorbers.

*) Stronger springs for extra high loads are not available.

Fork jams:

a) Fork tubes bent.

Remedy: Replace bent fork tubes, since straightening them is impossible.

b) Fork tubes twisted (Upper fork connecting member twisted in relation to lower fork connecting member).

Remedy: Straighten fork connecting members until fork tubes are aligned correctly.

Gargling noise when the fork operates:

The gargling noise noticeable whenever the short spring and the spring carrier are immersed cannot be eliminated.

Steering "whips":

Remedy: Adjust bearing play in steering head.

Fork kicks, is difficult to control:

Wrong type of oil.

Protective sleeve rattles:

Remedy: Loosen protective sleeve, replace rubber ring.

Ball races seize:

Remedy: Lubricate sufficiently, re-adjust steering bearings.

Unsatisfactory performance in solo work:

Remedy: Check whether fork has not been adjusted for sidecar work, i. e. whether short spring carriers have been built in above. Interchange against long ones.

Unsatisfactory performance in sidecar work:

Remedy: Check whether fork has not been adjusted for solo work, i. e. whether long spring carriers have been built in above. Exchange against short ones.

Sidecar mounted incorrectly, toe-in and angle of inclination too great or too small.

4. Front Wheel Pivoted-Fork of Models Bella R 151, Bella R 153, Bella R 201

During the course of the technical development it was quite natural that the designers had the wish to replace the telescopic fork, which, for so long, has influenced motor cycle and motor scooter designs the world over by another fork design — the long pivoted-Fork — which because of its relatively minimal specific friction responds to surface irregularities much better than the telescopic fork.

Design of the Front Pivoted-Fork

The front pivoted-Fork is mounted in ball bearings in the steering head of the frame. The pivot arms are mounted on a shaft which rotates in cylindric bronze bushings. The right-hand pivot arm can be displaced laterally in order to adjust the bearings. Between left-hand arm and fork shank the spring unit is mounted in permanent rubber bearings. The spring unit contains a long pressure spring plus an oil-hydraulic shock absorber which guarantee soft spring operation together with accurate damping effect. Spring stroke at the front axle amounts to 143 mm. The front brake cover has its support at the right-hand pivot arm.

Disassembling the Pivot Arm

Demounting the fork from the chassis will only become necessary if

The steering bearings are worn
The fender must be replaced or if
The tubular connecting member to the pivot arm bearing is damaged.

Demounting can be done as with scooters with telescopic fork by means of our special tool ZWN 788/789 = 2501 k 77-2/2501 k 78-2 (new Part Nos.). Before demounting, unhook brake cable and — if necessary — demount front wheel.

Demounting the two pivot arms is done as follows:

First remove the front wheel, then unhook the brake cable and the brake drum. Next loosen the lower fastening of the spring unit and loosen the nut of the clamping on the right-hand pivot arm side.

Loosen the clamping bolt by knocking with a hammer against the nut, then remove nut and clamping bolt. Then the two pivot arm halves can be separated.

For demounting the so-called spring leg, raise the center prop stand by approx. 20 cm. Next remove split pin and bolt at the brake lever and loosen the lower fastening of the spring leg so that the front wheel touches ground. Now remove the three clamping bolts for the fender; the fender can now be pressed sidewise to such a degree as to render the upper clamping screw of the spring leg accessible: loosen the latter and the spring leg itself can be taken off without difficulty.

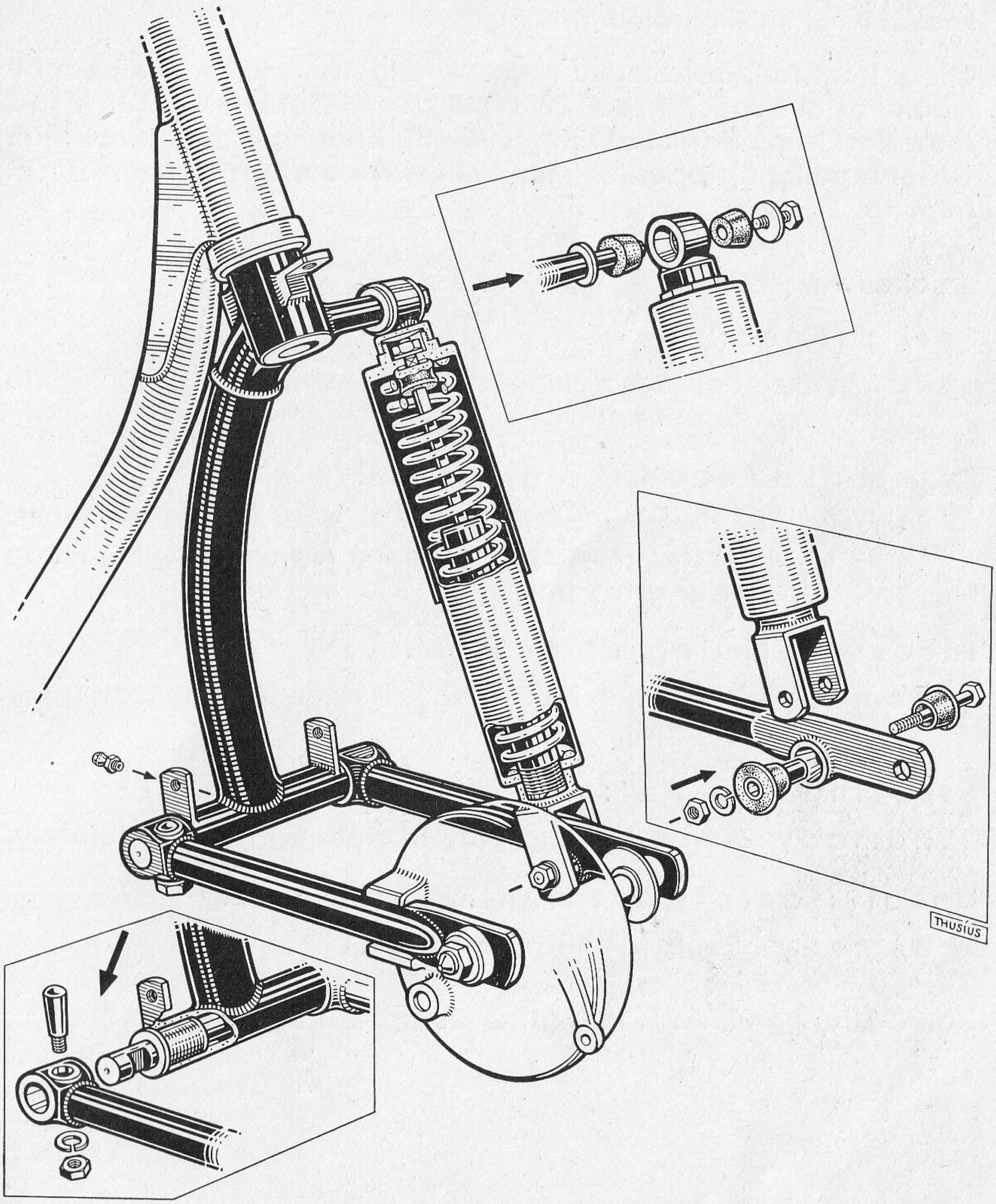
Disassembling the Spring Leg is done in the following way:

First remove the safety pin visible in the upper bar head. Then remove the bar head by unscrewing, whereby counterpressure must be exerted with a narrow socket wrench SW (opening) 36. Next loosen the nut visible under the head, and take out the upper protective sleeve as well as the pressure spring.

The drawing shows the oil-hydraulic shock absorber with its bottom part screwed into the lower bar head and secured by means of a strong lock washer. For further disassembling clamp the shock absorber especially carefully (preferrably with round chuck jaws with soft lining) and remove its lower head.

Then unscrew the lower protective sleeve from the shock absorber. Oil-hydraulic shock absorbers can only be repaired by the manufacturer. Send us your defective shock absorbers and we will forward them.

Reassembling the spring leg is done in reversed sequence. Important: Make sure the oil-hydraulic shock absorber is screwed into the lower bar head as far as possible, i. e. until the lock washer is completely compressed.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Maintenance

Lubricate pivoted-fork only within the general lubrication service, i. e. approx. every 1000 km (600 miles) with Shell Retinax G (also known as Shell Ambroleum).

Check front fork adjustment regulary and, if necessary, correct by means of our special tool ZWN 788/789 = 2501 k 77-2/2501 k 78-2 (new Part Nos.). For lubricating steering bearings, use grease with water-repellent properties only, otherwise there is danger of rust forming.

Breakdown

Fork rattles:

Remedy: Replace damaged rubber mounts of spring leg on top or below.

Fork makes squeaking noises:

Remedy: Rub plastic mushroom-shaped buffers in lower protective sleeve of spring leg with soap or spray with spray gun.

Incorrect truing-up of wheels:

Remedy: Straighten fork which has been bent by a collision or crash.

Steering "whips":

Remedy: Adjust bearing play in steering head accurately.

Unsatisfactory cushioning properties:

Remedy: Replace oil-hydraulic shock absorber.

Note: Stronger springs for extraordinary loads are not available.

B) Rear-Wheel Suspensions

1. Rear Wheel Suspension for Comfort and Norma-Luxus

Rear Wheel Suspension Design

The rear wheel suspension operates after the telescopic principle like the telescopic front fork or the Jurisch Rear Wheel Suspension for subsequent mounting in our models DB 200, DB 201, and DB 202.

Frame ends are welded to the guide housings in which the guide tubes are mounted. The fork ends reveice the rear wheel, slide on the guide tubes by means of bushings, and are rigidly connected to eachother by means of the socket axle. The wheel load is borne by one pressure spring each, and one damping spring each prevents the fork from kicking through. One catch spring on each side prevents the spring unit from falling through. The entire spring mechanism is completely enclosed against the ingress of dust and dirt.

Disassembling the Rear Wheel Suspension

Before the rear wheel suspension proper can be disassembled it is necessary to demount the rear wheel, the chain guard, and the rear wheel drive.

After these parts have been removed the rear wheel suspension can be disassembled into its integral parts without difficulty. For this purpose remove the cover lid on top and the screw lying under it which serves for the fastening of the spring. The damping spring can be taken off.

Furthermore, release the lower clamping nut, and unscrew. Then the fork end can be pulled out from below. Likewise, the two pressure springs can be pulled out. The spring bolt is screwed into the fork end; after it has been unscrewed, the aluminium protective sleeve can be removed. The long sliding tube is screwed fast at its upper end to the frame and can be removed immediately.

Reassembling is done in reversed sequence.

Maintenance

Rear wheel suspensions with grease lubrication have force-feed lubrication nipples which must be greased with the standard type of grease every 500 km (300 miles).

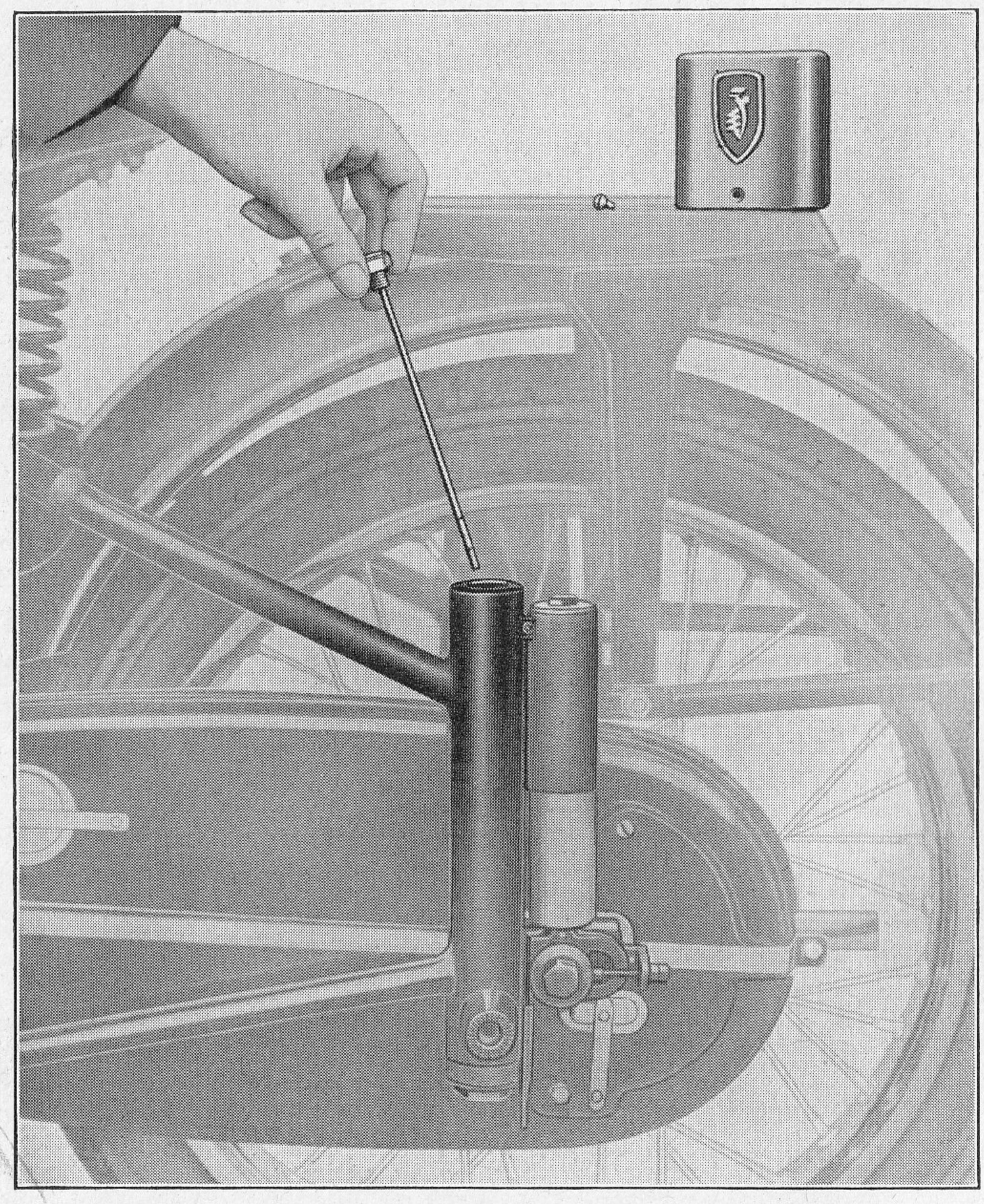
Rear wheel suspensions of more recent design have oil-type lubrication (recognizable by the missing nipples).

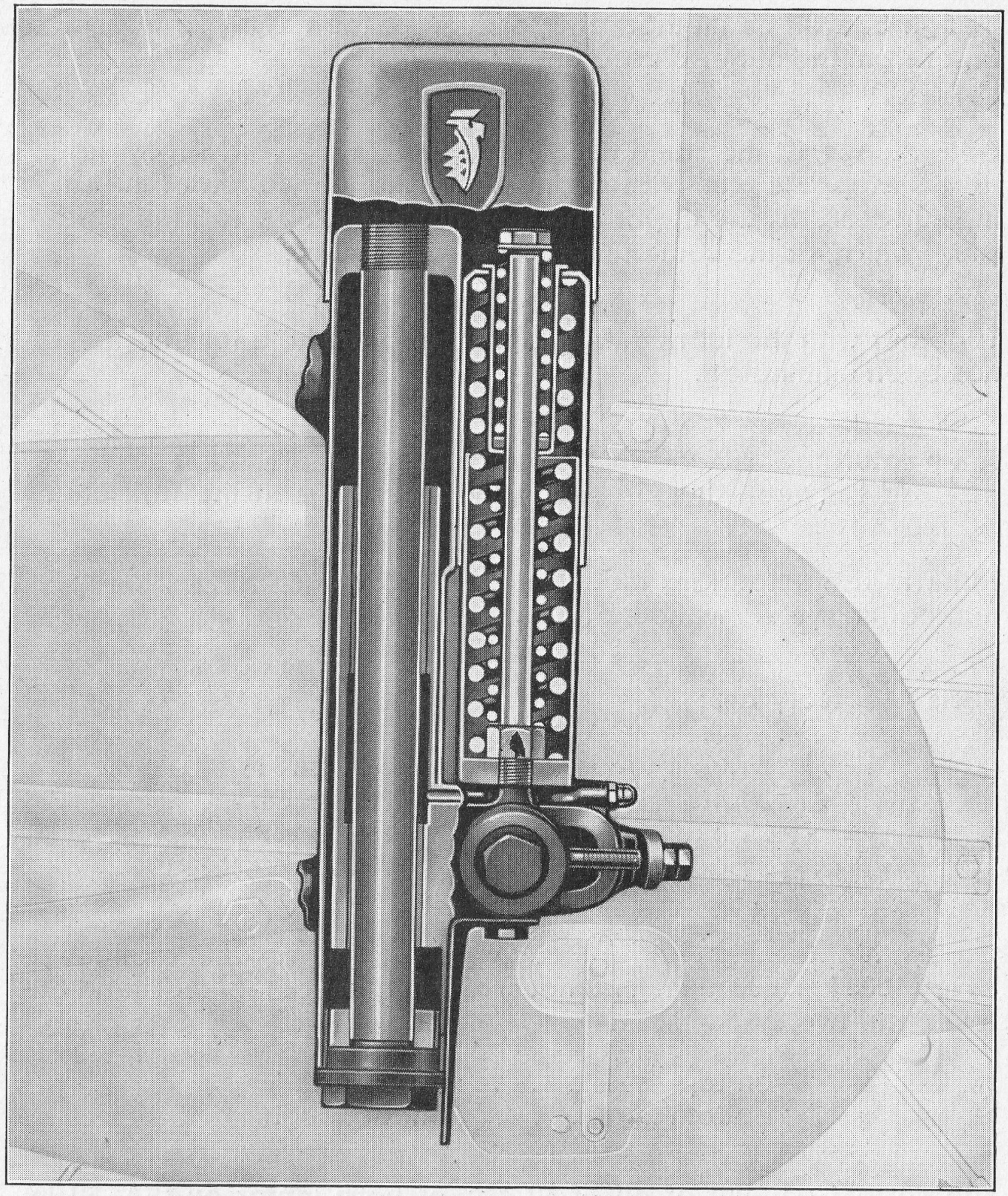
Check oil level every 1000 km (600 miles); remove protective caps and unscrew the oil dipstick in front. Do not screw in dipstick while measuring oil level.

The two marks on the dipstick mean

top mark . . . . . too much
bottom mark . . . not enough.

The correct amount of oil (30 c. c. of each motor oil — SAE 50 in summer, SAE 10 in winter) will register in the middle between the two marks on the dipstick.





Changes Oil lubrication:

Norma-Luxus, from chassis No. 857 528 on, has oil-type lubrication. Complete rear wheel suspensions as replacements for models Norma and Comfort are also delivered with this type of lubrication. Of importance, however, is whether the vehicle in question is equipped with or without enclosed chainbox. Order numbers are

6700 k 280 for vehicles without enclosed chainbox
6700 k 281 for vehicles with enclosed chainbox

Design as well as method of operation of the new type does not differ from the hitherto used one.

Guide tubes, at the same time, serve as oil reservoirs. They have rubber stoppers plus 2 lateral holes for the lubrication of the sliding surfaces. At the upper end they have a thread for the screw plug, which, at the same time, serves as dipstick.

Together with the lubricating nipples, also the hole for the grease has been eliminated.

A felt saturated with oil which slides along the guide tube has been inserted between the forced-in guide bushings in the fork ends.

Hitherto used standard models can be provided with an oil-type lubrication system without difficulty.

Parts necessary are:

2 guide tubes	1330 z 182
2 felts	1146 z 68
2 oil dipsticks	1550 z 107
2 packing rings	A 10x16 DIN 7603

Grease nipples must be replaced by screw plugs. Check oil level every 1000 km (600 miles). Do not screw in dipstick for measuring oil level. The two marks mean

on top	too much
bottom mark	not enough.

The correct amount of oil of 30 c. c. of each motor oil (SAE 50 in summer, SAE 10 in winter) will register approximately in the middle between the two marks on the dipstick.

Chainguard Holder for Norma-Luxus:

From chassis No. 901 255 on, a plastic guide member 616 z 245 has been built in instead of the slide roller 1401 z 104 and the rubber ring 1236 z 220. The guide member can be mounted without difficulty.

Breakdown

Rear wheel suspension rattles:

a) in the rear wheel suspension itself.

Remedy: With no-load suspension, the small pressure spring located within the big pressure spring has vertical play. Disassemble suspension and press the small pressure springs together on one end so that they have firm fit on the spring bolt: the lower spring below, and the upper spring above.

b) at the chainbox.

Remedy: Mount plastic guide member 616 z 245 instead of slide roller 1401 z 104 and the rubber ring 1236 z 220; if necessary, replace chain guard bracket.

c) at the fork ends:

Remedy: Worn-out fork ends of rear wheel suspensions of our own make (ZÜNDAPP) will be provided by us with new bushings 184 z 502. The guide tubes will have to be replaced in any case.

Suspension "kicks" through:

Remedy: Build in two stronger pressure springs equal as to diameter, length, and wire strength, yet with 15 windings instead of 16 (321 z 506 — 15 windings).

Incorrect truing-up of wheels:

Remedy: Replace worn-out fork ends, tighten loose slide tube fastening by means of lock nut.

2. Rear Wheel Suspension for KS 601

Rear Wheel Suspension Design

The rear wheel suspension operates after the telescopic principle like the telescopic front fork. Guide bushings have been fastened at the frame ends on top and below, in which the slide tubes fastened to the rear axle gearbox and at the left-hand spring guide are mounted slidingly. The wheel load is received by one pressure plus one additional spring each, and a catch spring on each side guarantees soft cushioning effect in central position. Rubber buffers prevent hard bumps on the catch springs whenever pressure springs extend completely during cross-country rides. Total spring movement is 64 mm. The whole spring mechanism is completely enclosed against the ingress of dirt and dust.

Disassembling the Rear Wheel Suspension

First remove the two chromium-plated lock nuts; in case of an additional spring, remove the internal circlip on which the spring rests. Now the additional spring can be taken out without difficulty, since it has been held in position by circlip and upper cover nut only.

For any further disassembling of the suspension it is imperative to demount the rear wheel. Only then the spring element can be compressed by means of our special tool ZWN 779 = 2501 k 68-0 (new Part No.) to such an extent that it can be taken out sideways between the two frame ends.

After the spring elements demounted in this way have been completely relieved of tension all individual parts are at hand without further disassembling.

Reassembling is done in reversed sequence.

Maintenance

Just grease pressure nipples every 5000 km (3000 miles) with standard type grease.

Changes

Additional spring:

From chassis No. 551 801 — and from No. 554 158 with KS 601 Sport — on no additional spring is used any more; extensive tests have revealed that such a spring will only become necessary under extraordinarily high loads. The spring can be mounted later on. Necessary parts:

2 circlips	25 × 1.2 DIN 572
2 spring carriers	630 z 202
2 springs	321 z 288
2 upper lock nuts	1001 z 125
2 rubber rings	1236 z 213
2 hex screws	1551 z 218

Breakdown

Spring action too hard (With additional spring built in):

Remedy: Remove additional spring; the additional spring has been left out from chassis No. 551 801 — and No. 554 158 with KS 601 Sport — on.

Spring action too soft:

Remedy: For extraordinarily high loads an additional spring can be built in later. For necessary parts see under "Changes".

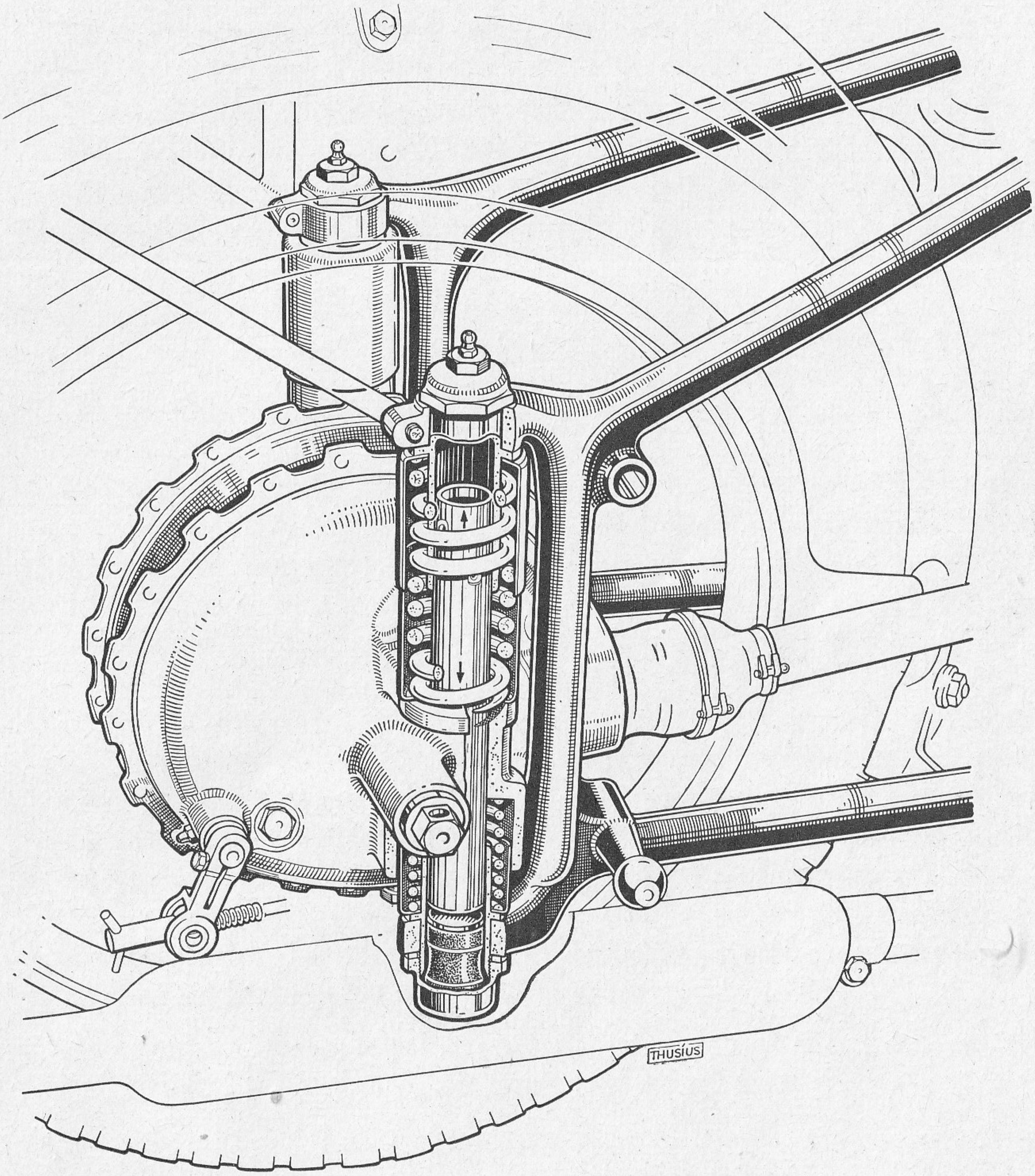
Springing rattles:

a) during the rebound.

Remedy: Remove rubber buffer in lower lock nut.

b) during kicking through.

Remedy: Under especially high loads the upper protective spring sleeve will get in contact at the cardan housing and, as a consequence of this, it will scrape against the lower protective spring sleeve. As a remedy, cut off a portion of the lower rim of the upper protective spring sleeve.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3. Rear Wheel Pivoted-Fork Suspension for Bella R 150, Bella R 200, Bella R 151, Bella R 201

Rear Wheel Pivoted-Fork Design

The rear wheel pivoted-fork rotates around a fulcrum located in the rear engine support. Shocks are absorbed by 2 springs and damped by an oil-hydraulic shock absorber. The pivoted-fork consists of one piece and is mounted in adjustable taper bearings.

Disassembling the Rear Wheel Pivoted-Fork

Before demounting the fork, remove the rear wheel, the chainbox plus the brake drum together with the rear wheel drive. Next loosen the two pressure springs from their mounting place at the pivoted fork, and unscrew from the upper spring carrier welded to the frame. Finally, remove the oil hydraulic shock absorber.

Now the pivoted-fork can be demounted. Tapered bronze bushings are clamped in it on both sides which can be removed after their lock screws have been loosened. If necessary, they can be freed by means of a chisel. The pivoted-fork proper, however, can only be removed after the right-hand taper bolt has been removed. The latter is clamped in position in the rear engine support. For disassembling, loosen the lock screw. or, if necessary, relieve the locking of tension by means of a chisel.

Maintenance

The pivot arm bearings must be lubricated every 5000 km (3000 miles) with Shell Retinax G (Shell Ambroleum). On this occasion, check the pivoted-fork bearings for play; if necessary, loosen the clamping of the bearing bushings and eliminate play by pressing the bushings against the bolt.

Changes

Pressure Springs:

Bella 150, from chassis No. 12 856 on, comes with springs whose spirals are very close together at both ends. When changing over to the new design, the spring carriers must be finished by means of a round file.

Stronger springs:

For extraordinary high loads re-enforced springs can be built in; standard springs have a wire thickness of 8 mm
the springs 321 z 560 8.5 mm
the springs 321 z 567 9.0 mm.

Rubber sleeve 616 z 246:

For some time this sleeve has been built into the pressure spring in order to eliminate whirring noises originating from the spring.

Breakdown

Springs whirr:
Remedy: Build in rubber sleeves 616 z 246 (see changes)

Springing kicks through:
Remedy: For extraordinarily high loads use stronger springs (see changes).

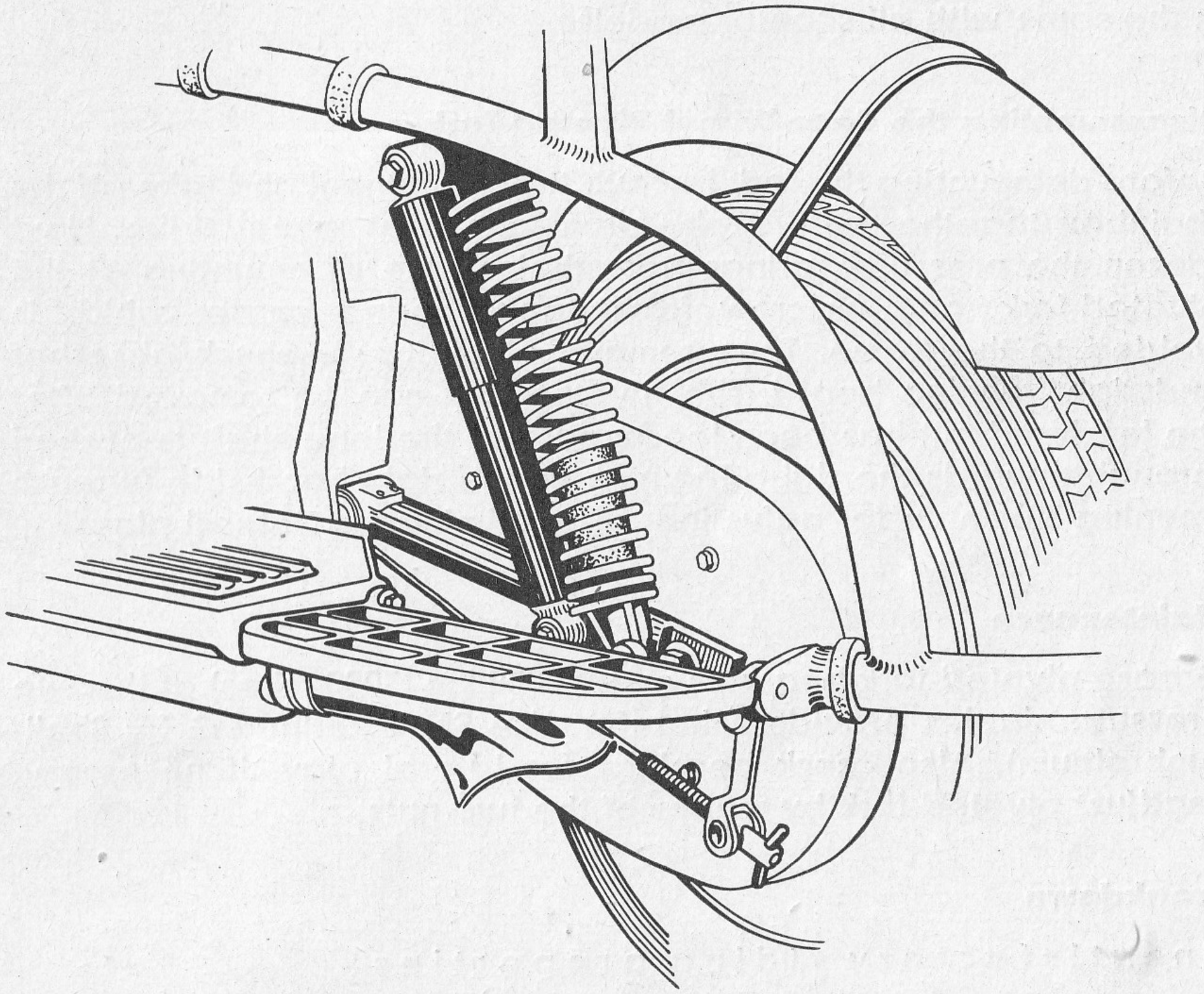
Unsatisfactory riding properties:

a) Oil-hydraulic shock absorber defective:
Remedy: Replace shock absorber. Send in defective shock absorbers for us to forward to manufacturer.

b) Springing too hard:
Remedy: Check mounting of pivot arm.

c) Pivot arm bearings show play:
Remedy: Readjust pivot arm bearings or replace bearing bushings.

d) Incorrect tire pressure:
Remedy: Regulate tire pressure according to instructions.



Rear Wheel Pivoted-Fork for Bella R 153

Rear Wheel Pivoted-Fork Design

In contrast to the conical pivoted-fork bearings with Bella R 150/151 and Bella R 200/201, Bella R 153 has cylindrical bearings. Also the two pressure springs show different characteristics. Long rubber elements have been pressed into the springs (with R 150/151/200/201 short rubber elements as dampers). The shock absorber, however, is the same with all scooter models.

Disassembling the Rear Wheel Pivoted-Fork

Before demounting the fork remove the rear wheel and take off the chainbox together with brake drum and rear wheel drive. Next loosen the pressure springs from their place of mounting at the pivoted-fork, and unscrew from upper spring carrier which is welded to the frame. Then remove oil-hydraulic shock absorber and right running board. The pivoted-fork can be removed after the left-hand nut has been loosened and the long shaft is pushed through towards the right. The nuts on the right-hand side (wrench opening 30) serve for adjusting, resp. eliminating, lateral play.

Maintenance

Grease pivoted-fork bearings every 5000 km (3000 miles) at the two pressure nipples provided therefor. Use Shell Retinax G (= Shell-Ambroleum). Also check bearings for lateral play. If necessary, readjust pivoted-fork by means of the two nuts.

Breakdown

Unsatisfactory riding properties:

a) Defective oil-hydraulic shock absorber:
   Remedy: Replace oil-hydraulic shock absorber. Send in defective shock absorber for us to forward to manufacturer.

b) Spring action too hard:
   Remedy: Check pivot arm bearings.

c) Pivot arm bearings show play:
   Remedy: Readjust pivot arm bearings or replace bearing bushings.

d) Incorrect tire pressure:
   Remedy: Inflate tires according to instructions.

4. Rear Wheel Pivoted-Fork for Elastic 200 and Elastic 250

Rear Wheel Pivoted-Fork Design

The rear wheel suspension is a long-stroke rear wheel pivoted-fork with oil-damped spring legs. The amply dimensioned pivoted-fork mounting which guarantees excellent wheel alignment at minimal inherent friction can be readjusted.

The Pivoted-Fork consists of two halves, the right-hand pivot arm (into which the bearing shaft has been forced) and the left-hand pivot arm. Both halves are joined by means of two clamping bolts. 2 conical bronze bushings forced into the frame serve as a bearing.

The two spring legs contain one soft (short) and one hard (long) spring each with an adjusting sleeve interposed plus an oil-hydraulic shock absorber.

Spring legs can be adjusted for solo, resp. pillion or sidecar work. Adjustment is made without any tool: just turn the lower sleeve to "hard" (= H) or "soft" (= W). This will result in increased or decreased pre-load. For this purpose prop motor cycle on center stand.

Disassembling the Rear Wheel Pivoted-Fork

Before demounting the pivot arms, remove rear wheel, chainbox with rear wheel drive as well as the spring legs.

First remove the two clamping bolts on the left-hand side; then the pivot arm can be taken off from that side. For removing the other pivot arm, proceed in the same manner.

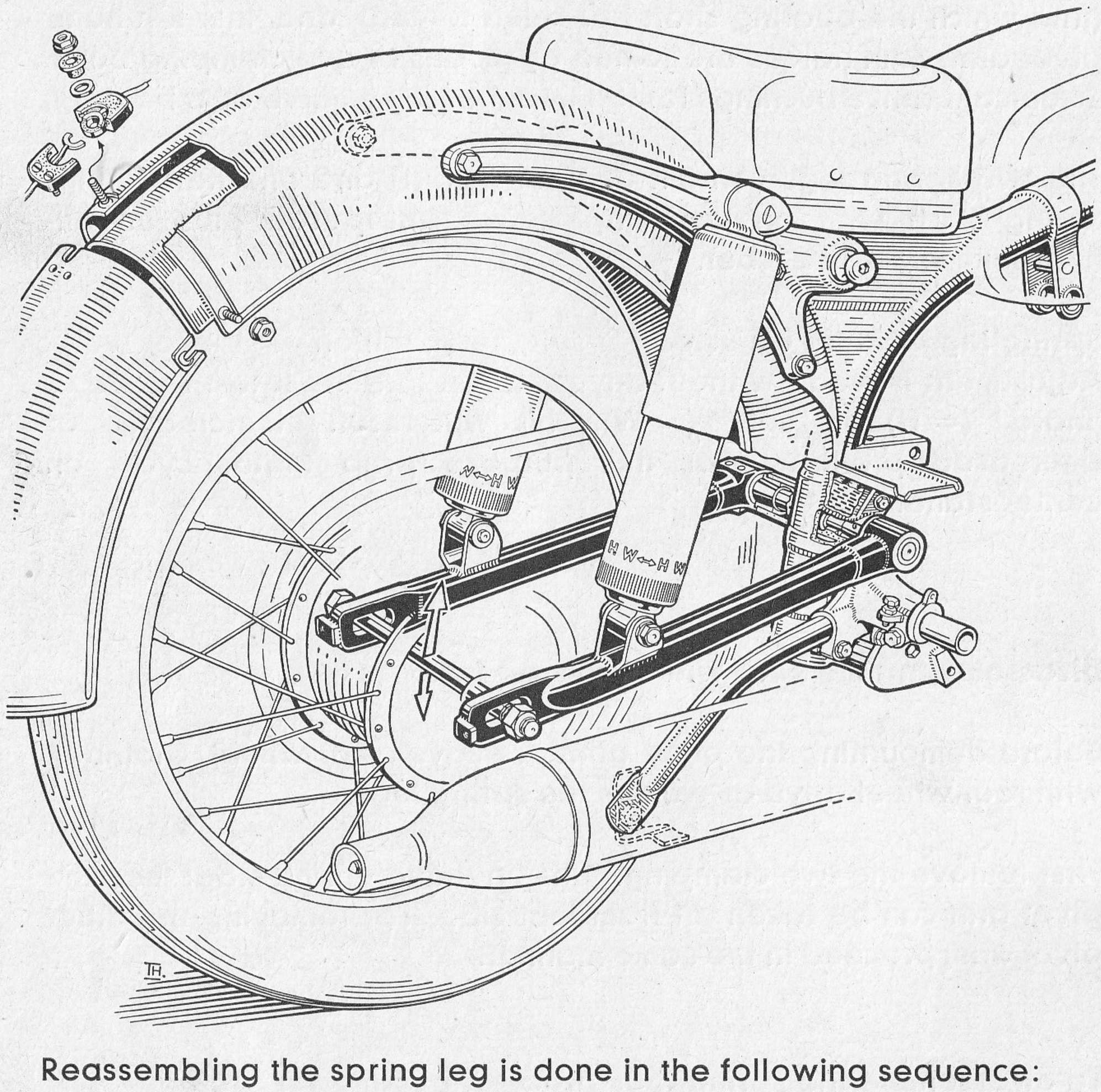
To disassemble the spring legs proceed as follows:

First loosen the two slot screws at the upper bar head and take off the latter. The hex nut now visible must be removed. Then remove the upper protective sleeve and the long pressure spring.

The safety split pin which must now be removed is located inside the lower bar head. Now the shock absorber bottom part can be unscrewed and the lower protective sleeve removed. (Caution: 3 balls and three springs are released!) Now detach adjusting sleeve and small pressure spring.

Reassembling

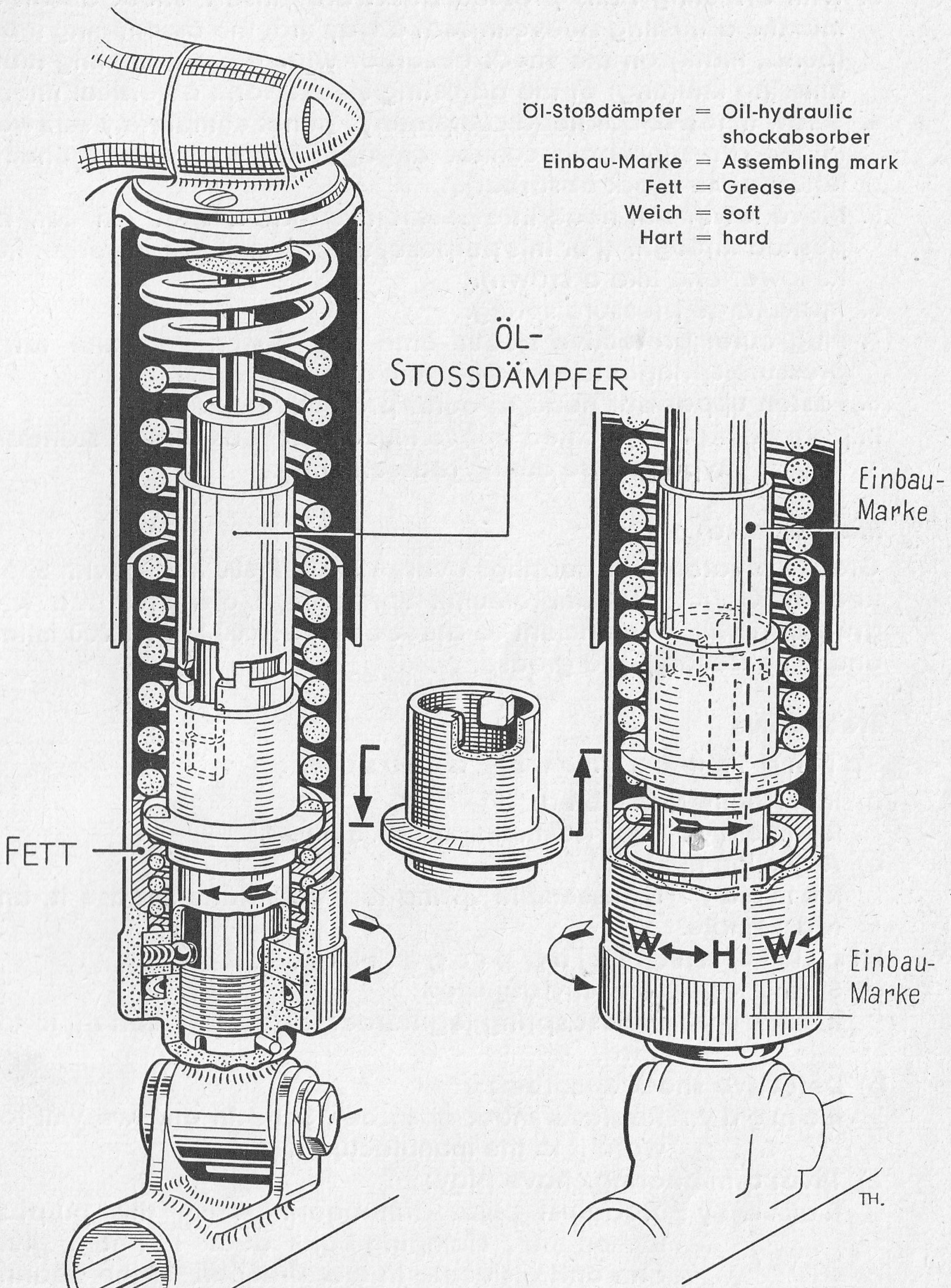
When reassembling the pivoted-fork suspension make sure that the rear axle is exactly parallel in relation to the cantilever (pivot arm) axle.



Reassembling the spring leg is done in the following sequence:

1. Piston bar of oil-hydraulic shock absorber is pulled out as far as possible.
2. Insert small pressure spring, spring carrier, 3 retainer springs and 3 arresting balls into adjusting sleeve.

Öl-Stoßdämpfer = Oil-hydraulic shockabsorber
Einbau-Marke = Assembling mark
Fett = Grease
Weich = soft
Hart = hard



WEICH **HART**

3. With arresting balls pressed backward, insert shock absorber into the adjusting sleeve in such a way that the assembling mark (punch mark) on the shock absorber with the assembling mark (missing knurling) of the adjusting sleeve form a vertical line.
4. Screw in lower bar head completely. (If not completely screwed in, the arresting balls cannot engage into the corresponding holes in the shock absorber).
5. Move lower bar head into position so that a split pin can be pushed through. (For this purpose, the lower shock absorber has its lower end like a crown).
6. Insert large pressure spring.
7. Plug outer protective sleeve onto big piston rod and large pressure spring and screw hex nut onto the former.
8. Fasten upper bar head to outer protective sleeve.

Important: Parts specified above must be greased with standard type grease during reassembling.

Maintenance

Grease pivoted-fork bearings every 1000 km (600 miles) with Shell-Retinax G (= Shell-Ambroleum). Spring legs are provided with grease. It will be sufficient to check every 25,000 km (15,000 miles) and, if necessary, add grease.

Breakdown

Spring leg cannot be adjusted:

a) Incorrectly assembled:
   Remedy: See Assembling para. 3 and 4.
b) Adjusting nut rusty:
   Remedy: Disassemble spring leg, clean and grease it, and reassemble.

Insufficient riding properties:

a) Spring leg incorrectly adjusted:
   Remedy: Adjust spring leg harder, if too soft; softer, if too hard.
b) Defective shock absorber:
   Remedy: Replace shock absorber. Send in and we will forward it to the manufacturer.
c) Pivot arm bearings have play:
   Remedy: Readjust pivot arm bearings. For this purpose loosen the 2 clamping bolts at the left hand pivot arm and dislocate in the direction of the bearing bushing until the play has been eliminated. Then retighten clamping bolt. Replace bearing bushings if necessary.

5. The Rear Wheel Pivoted-Fork for 175 S and 200 S

Rear Wheel Pivoted-Fork Design

The rear wheel suspension consists of a long-stroke rear wheel pivoted-fork with oil-damped spring legs and has a spring stroke of 80 mm. The amply dimensioned pivoted-fork mounting which guarantees excellent wheel alignment and at minimal inherent friction is adjustable.

The pivoted-fork consists of two parts, the right-hand pivot arm (into which the bearing shaft has been forced) and the left-hand pivot arm. Both halves are joined by means of a clamping bolt.

The shaft rests in two cylindric bronze bushings forced into the frame.

The two spring legs contain one soft (short) and one hard (long) pressure spring each with intermediate sleeve and an oil-hydraulic shock absorber.

Disassembling the Rear Wheel Pivoted-Fork

Before removing the pivot arms proper, demount rear wheel, chain-box, rear wheel drive as well as the spring legs. Then the clamping bolt in the left-hand pivot arm which joins both pivot arms together can be loosened.

Disassembling the spring leg is done in the following sequence:

The spring leg is held together with the fitting pin which is arranged at its upper end. Knock it through towards its thicker end with the notches. Then the upper bar head, the upper protective sleeve, and the long pressure spring can be removed.

For access to the other parts clamp the oil-hydraulic shock absorber, at its thick end, into a vise, and from it unscrew the so-called lower bar head and, subsequently, the lower protective sleeve. Thus the small pressure spring and the intermediate sleeve is released.

Reassembling

Reassembling the pivoted-fork is done in reversed sequence. Make sure the rear axle is exactly parallel in relation to the pivot arm shaft. Only then retighten clamping bolt.

When reassembling the spring leg, screw the oil-hydraulic shock absorber entirely into the lower bar head (strong lock washer!). Before putting on the upper protective sleeve and the upper bar head pull out the piston rod of the shock absorber as far as it will go.

Maintenance

Grease pivoted-fork bearings every 1000 km (600 miles) with Shell-Retinax G (= Shell Ambroleum). Spring legs are provided with grease. It will be sufficient to check every 25,000 km (15,000 miles) and, if necessary, add grease.

Breakdown

Suspension kicks through:

Remedy: Build in stronger springs 321 z' 583 for extraordinarily high loads.

Unsatisfactory riding properties:

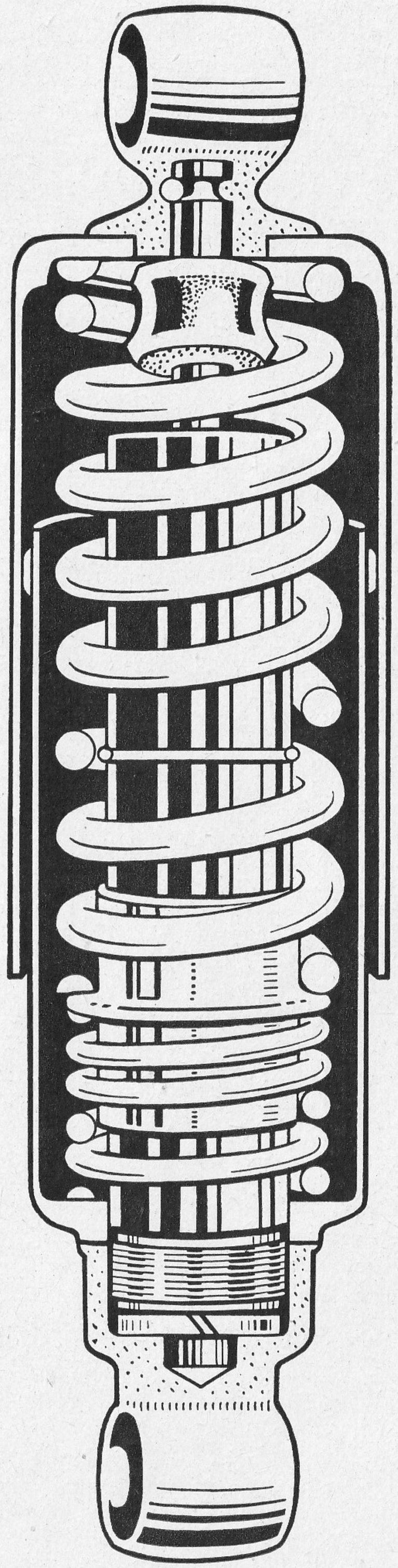
a) Defective oil-hydraulic shock absorber. Send shock absorber in and we will forward it to the manufacturer.

b) Pivoted-fork bearings show play:

Remedy: Readjust pivot arm bearings or replace bearing bushings.

c) Incorrect tire pressure:

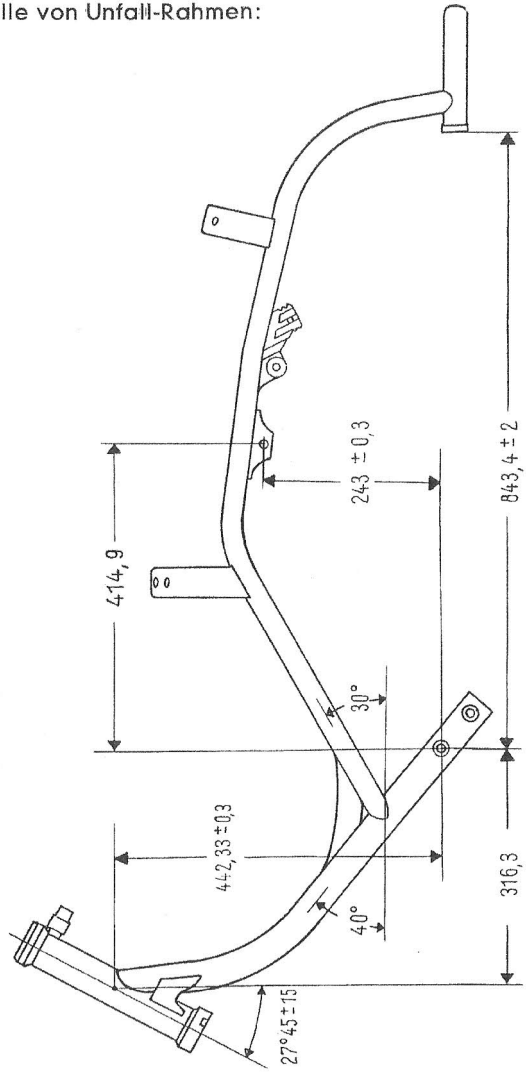
Remedy: Inflate according to instructions.



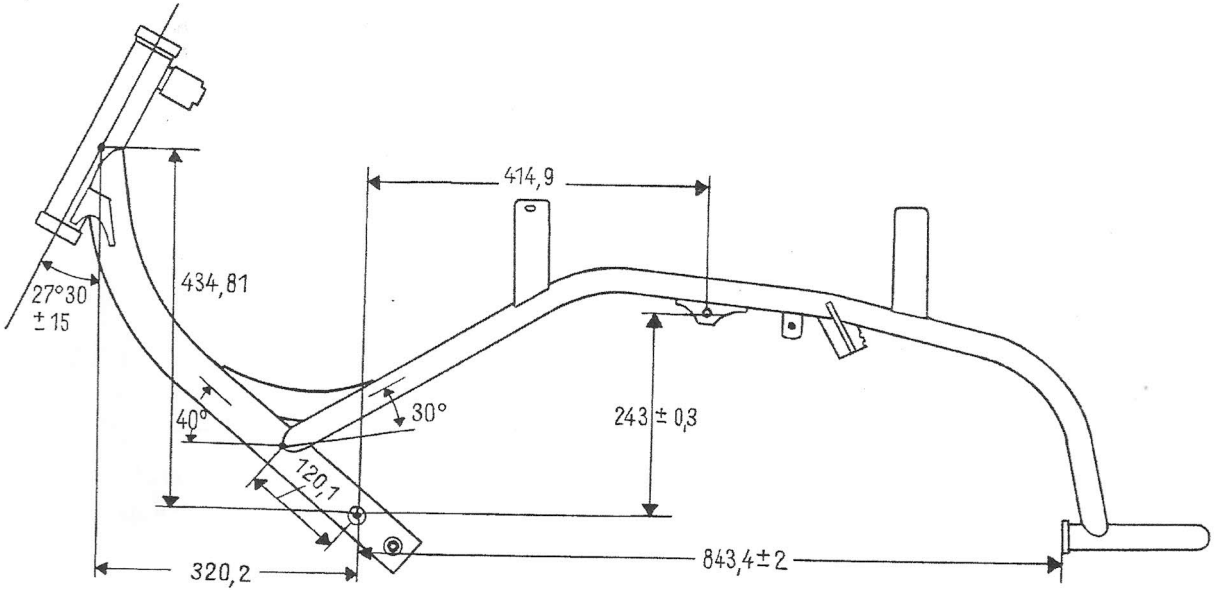
C) Anhang

Rahmen-Kontrolle

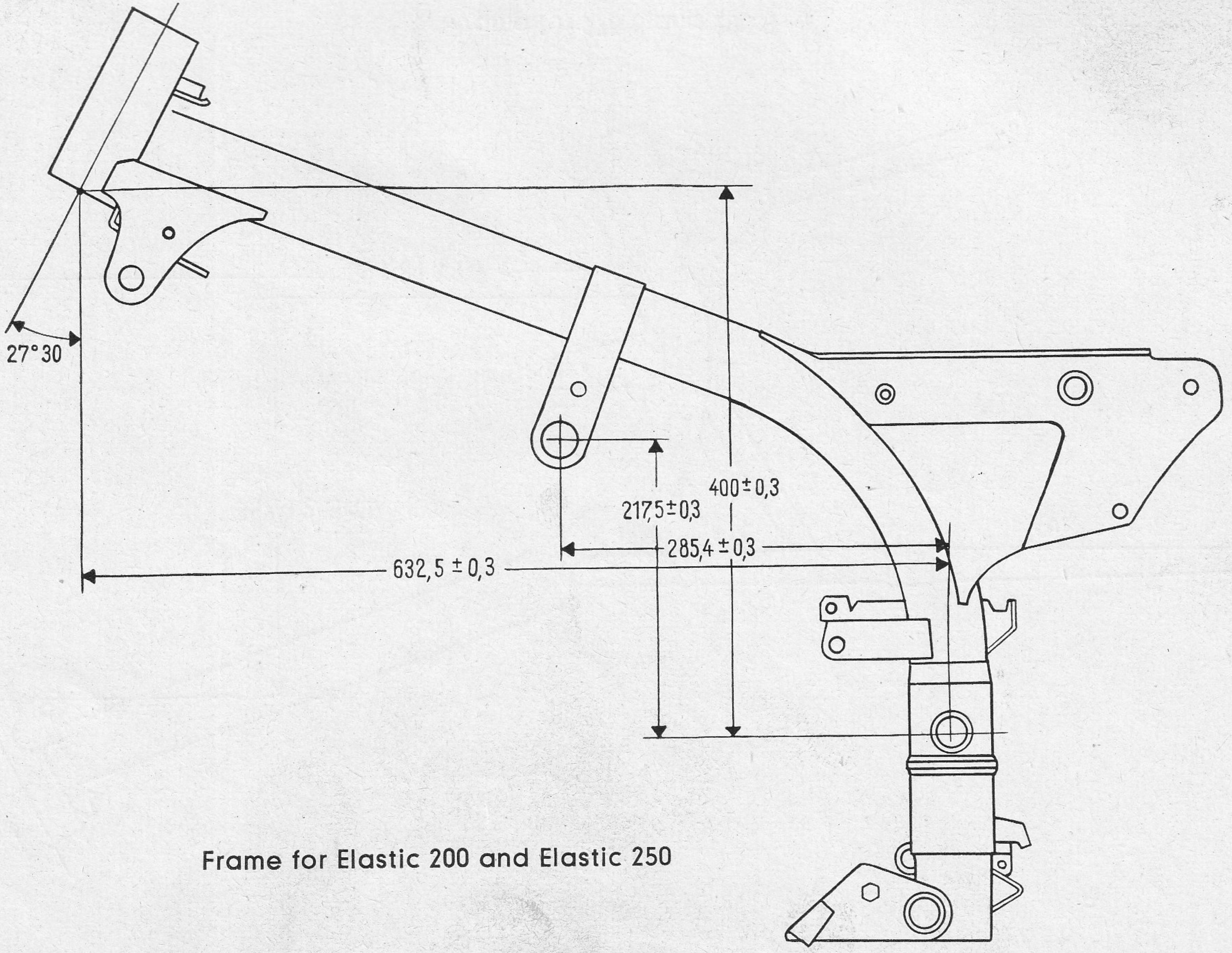
Die wichtigsten Rahmenabmessungen
zur Kontrolle von Unfall-Rahmen:



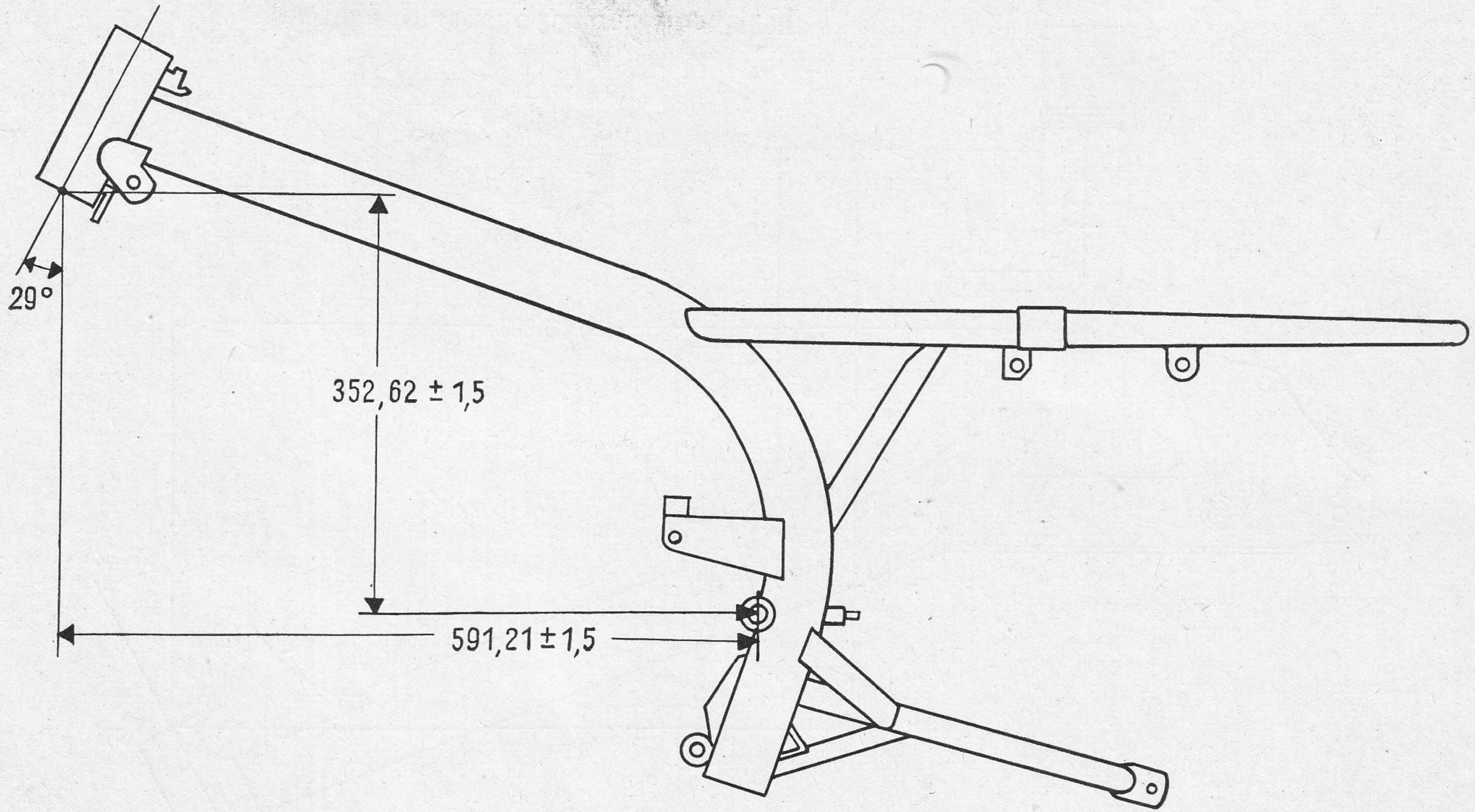
Rahmen für Bella R 150 und Bella R 200



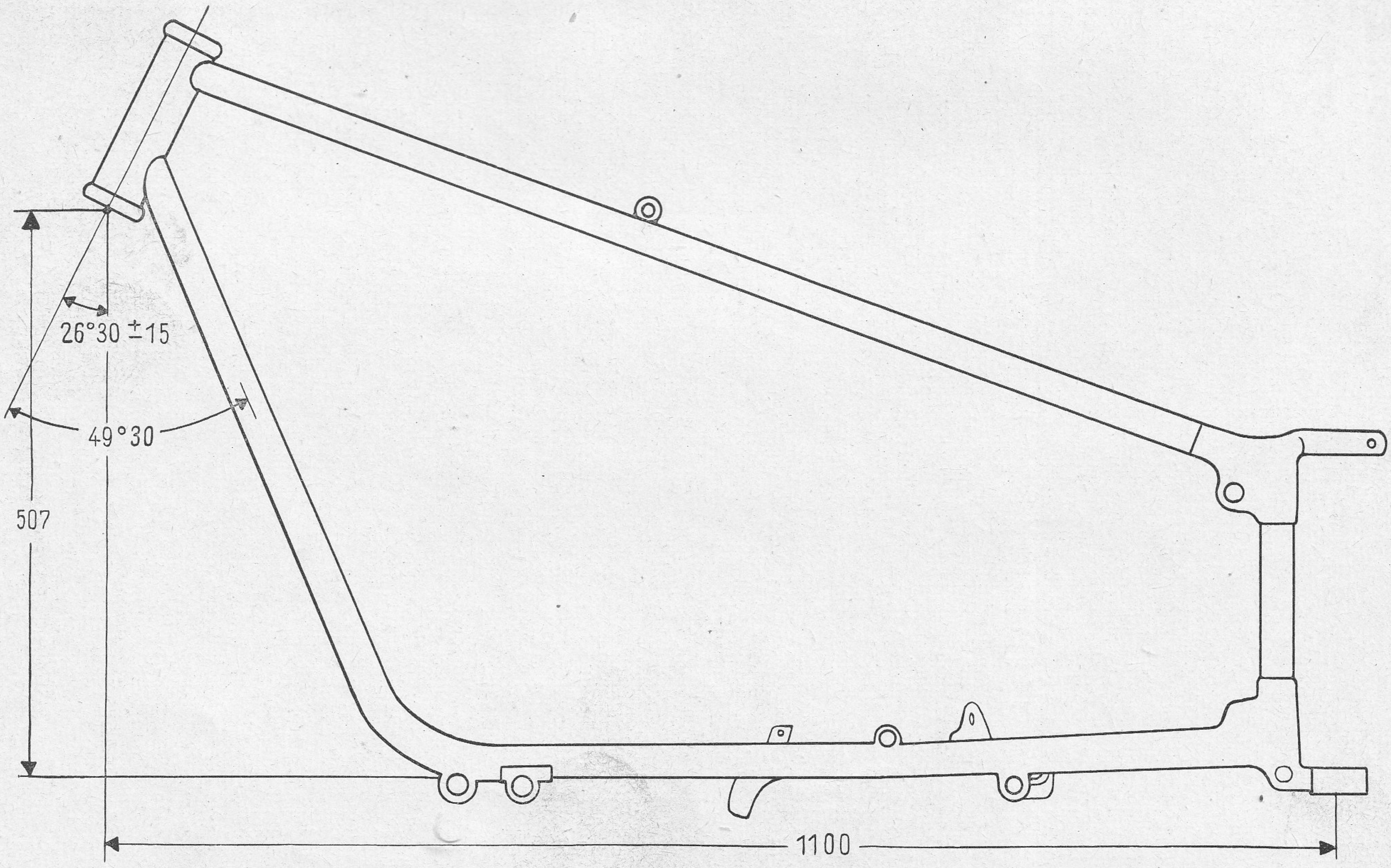
Rahmen für Bella R 151, Bella R 153 und Bella R 201



Frame for Elastic 200 and Elastic 250



Frame for 175 S and 200 S



Frame for KS 601

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