

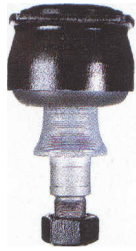


Clouth Rolling Rubber Spring

*assuring comfort
& economy*



- individual characteristic curves
- very long service life
- considerable operational economies owing to its replaceable rubber ring
- suitable for different axle loads
- certified to DIN EN ISO 9001:2000
- full service



Applications : Tramways and underground mining vehicles (for lower axle loads), e.g. with ring diameters of 80/116 - 80/130 - 95/135.



Applications: Locomotives, rail-grinding trains and as secondary spring for tramways (for medium axle loads), e.g. with ring diameters of 110/150 - 120/190 - 130/184.



Applications: Heavy locomotives and dumpers (for higher axle loads), e.g. with ring diameters of 150/236 - 150/300.



Rolling rubber spring with laminated springs: To obtain different radial deflections.

In connection with vehicles, one distinguishes in general between primary and secondary spring.

1. Principle of the rolling rubber spring

The Clouth rolling rubber spring was developed to provide a wear-resistant spring which not only acts as primary suspension but also performs the function of the axle guidance, thus dispensing with the need for complicated parts which are subject to wear, such as axle guides. An additional feature of the Clouth rolling rubber spring is that the characteristics are variable. The characteristics curve can be designed to be progressive, degressive or linear as the application requires. When damaged, the rolling rubber spring demonstrates excellent emergency operating properties.

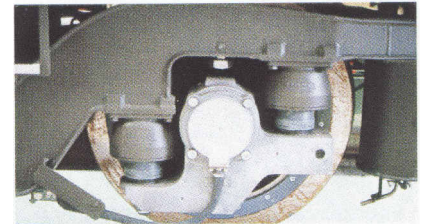
2. Proper frequency of the rolling rubber spring

The proper frequency of a primary rolling rubber spring is abt. 6 to 8 Hz and of a secondary rolling rubber spring abt. 1 to 2 Hz. The loss angle (damping) is abt. 4° (normal with rubber-metal parts).

3. Function of the rolling rubber spring

As the name "rolling rubber spring" implies, the rubber ring rolls within a precisely defined space between the housing which surrounds it and the spring mandrel. The space between these two metal parts grows smaller or larger according to the progressive or linear definition of the characteristic curve of the spring. Due to the roll contours of the spring housing and spring mandrel, loads are taken in compression, shear and tension as torsion-superposed components.

Under normal service conditions, the rolling rubber springs have an operational life of at least 10 to 12 years (depending on the size and the load of the spring). This corresponds to two general inspection periods in the case of conventional railways. The long life of the



Rolling rubber spring in a bogie.

rolling rubber spring is assured by the ring is enclosed by the spring housing which protects it against external influences. The characteristic curve of the spring should be checked at the latest after the second general inspection. If the rubber ring shows a too high settlement, then only the rubber ring of the spring needs to be changed. The metal parts can still be used.

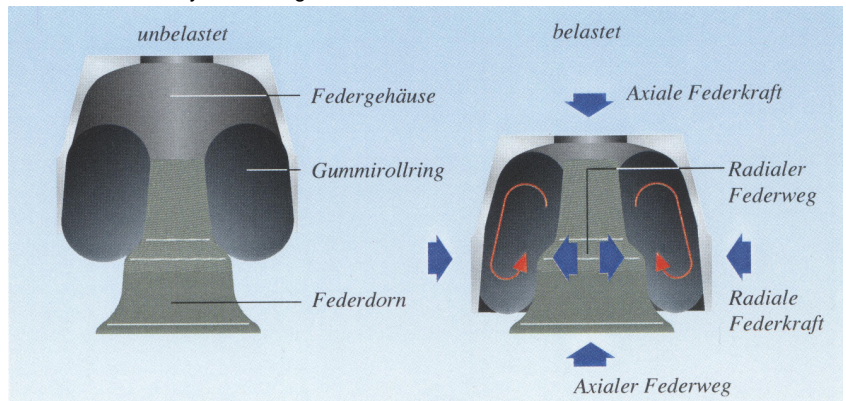
Since the rubber spring is in the form of a ring, horizontal deflection occurs evenly as well in the longitudinal as in the transverse direction. The amount of deflection varies, however, according to the load applied to the spring, as this causes the mandrel to penetrate into the spring housing and determines the extent to which the rubber ring is pre-stressed as the result. The characteristic curve and the height of the spring are set by means of a special assembly procedure.

As with all rubber springs, Clouth rolling rubber springs are subject to a certain amount of settlement; this, however, is very slight (15mm), due to the fact, as described above, that about 90% of the rubber ring is surrounded by metal components.

In view of the differences in bogie design, the rolling rubber spring must be adapted in each case fit the particular bogie construction.

4. Rubber ring

Only the highest quality natural rubber compounds with an internal damping property of about 10% are used in the manufacture of these springs.



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