TC2 TECNIDEA CIDUE S.r.l.

...ideas in motion...

NEWS

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

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ARCO WITH COVERING GAITER = controlled vibrations.

Tecnidea Cidue, worldwide leader in the construction of chain and belt tensioners, has extended its range of production **ARCO** with a new line. The traditional elastic elements are increased by the insertion of a new series that includes three substantial innovations:

1-Spring covering with elastic gaiter;

2-Spring isolation;

3-Use of rough oiled springs.

The first innovation, that is the spring covering, entails a functional improvement; the spring is covered from the external environment, preventing, in this way, that the dirt can accumulate inside

Fig. 01 ARCO **ABG**

(and this is an important feature in the food industry) or other materials can insert between the turns of the spring, like dust or aggregates of small dimensions produced during the processing of marble or granite.

The casing permits to realize a "protective room" where the metallic components, that determine the rotation of elastic elements, can maintain themselves in shelter from external pollutant factors.

The use of a covering gaiter allows to use rough springs lubricated inside instead of galvanized like the traditional elastic elements **ARCO**.

The second innovation in these new products, is the isolation of the spring through rubber inserts, allows to reduce vibrations and noises that spread through metallic parts in contact with them. It is known that chain and belt tensioners don't have only the function to regain the loosening of the chain and belt, but they also have the function to dissolve the vibrations coming from the eccentricity of the transmission.

For this reason, the increase of the rubber elements in the new products Arco improves the damping of the vibrations dissipating, in this way, the energy of the vibration wave in heat. The new **ARCO** with gaiter maintains the same dimensional and mechanic features of the traditional elastic elements but also permits to improve the quality, the functionality and aesthetic design of a product that for several years spotted excellent results on the national and international market. The galvanizing treatment gives to the treated product a better resistance against atmospheric agents and a higher level of the finish, but also it reduces the elastic factor along with possible situations (even if very rare) of dehydrogenation.

The third innovation allows, for this reason, the use of rough oiled steel springs; this situation improves the elasticity of the spring and its vibrated reaction in the time unit. Moreover, the continual lubrication improves also the average length of the work time.

ARCO with sheath is available in every sizes: from 10 to 60 and in two dimensions ± 40° and ± 90°.

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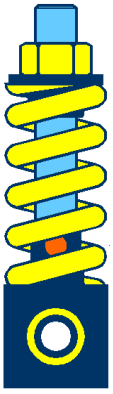
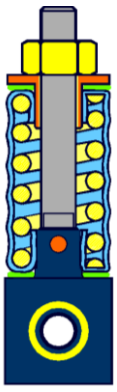
Fig. 02 ARCO **AFGV**

Fig. 03 ARCO **ARGV**



ARCO type **AR**



ARCO type **ARG**
With isolating gaiter

DISCOVERING TECNIDEA CIDUE...

LA CATENA.

History-advancement and innovation of the chain from Leonardo Da Vinci to Tecnidea Cidue.

HISTORICAL MENTIONS

The concept of chain transmission starts to be developed at the time of Leonardo Da Vinci (1453-1519). Leonardo draws some drafts during his studies about kinematic motions and mechanisms between 1478 and 1518. These drafts and its related notes belong, today, to the Atlantic Code, a collection of 12 volumes that contains a part of Da Vinci's studies about math, geometry, astronomy, botany, zoology and military arts. The name "Atlantic Code" comes from papers used in that collection that have big dimensions like papers in the geographic Atlas.

TYPE OF CHAINS

1- Simple roller chain.

Thanks to its high resistance features against wear and fatigue, the simple roller chain is the most widespread between the steel chains. The following model and image (Image 1 and Fig. 1) highlighted the structure of roller chain:

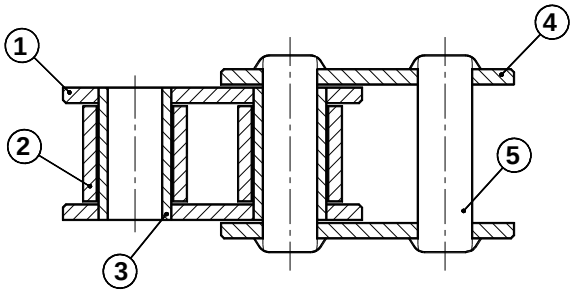


Fig. 1

1= internal plates
2= roller
3= bush
4= external plates
5= pivot

The internal mesh is made up of bushes, plaques of internal mesh and rollers. Inside the bushes are located the pivots that, with the external plaques, arrange the external mesh. The bushes are pressed in the internal plaques and the pivots are pressed in the external ones. The riveting of the pivots guarantee the block of the external mesh. The radial backlash between pivot and bush (articulation of the chain), bush and roller like the end float between the internal and external mesh guarantees, also in critical conditions, the chain mobility. The rolling of the roller on the tooth flank reduces to minimal values the chain and gear's wear because the roller is loaded uniformly on the entire perimeter. The oil lubricant situated between the roller and the bush and the one situated between the bush and the pivot produces a soundproofing effect.

2- Multiple roller chains.

The multiple chains (Fig. 2 and Fig. 3) allow greater transmissible power with greater number of revolutions. In the multiple roller chain the components are connected themselves with through pivots. The structure is equal to simple chain. The multiple roller chain are built with greatest precision to guarantee the uniform load of every components. These chains are in compliance with norms DIN 8187-8188. The applications with quadruple roller chains are frequent and it is possible to have chains until to 12 elements.

Double roller chain:

Fig. 2

Triple roller chain:

Fig. 3

Double pitch roller chain

Fig.4

3- Double pitch roller chains.

In the double pitch roller chains (Fig. 4), the general dimensions are in compliance with norms DIN 8187-8188, whereas the plaques have double pitch. Double pitch roller chain has the same ultimate strength and the same joint surface of the standard roller chain. It is lighter, the main application field of the double pitch roller chain is the field of chain conveyor, in particular with long interaxis distance. Due to the halved number of plates, it is less elastic, so it must be less prone to the tearing slipping. As far as the pitch is longer, it can be placet a driving roller (stick out rollers) that reduces the slippage of the chain. It usually be used in the transmission of low load, gears with big dimension and low linear speed. Those chains can be produced multiple "with more lines of rollers".

Roller chains for agricultural machines.

They are designed for the heavy-duty on farm machines, building plants, elevators and/or similar.
It is presupposed a lot of dirt and humidity during their use. For this reason the construction norms presupposed remarkable radial and axial plays. The maintenance requested is very low.

Bush chains.

The bush chains are equivalent to the traditional chains, regarding the structure, but without rollers. During the winding on the gear, the bush collides directly the tooth, undergoing a high wear. The bush chains can have a multiple structure.

Fleyer chains.

Fleyer chains are different from the other types of chain both in structure and in function. They are made by plates and pivots. The external plates and pivots present a stable joint (pressure blocked and riveted). The intermediate plates articulate freely on the pivot. Fleyer chains are made with different plates combinations. In comparison with rolled and bushes chains, they have a major wear resistance. They are normally used like chains for hoisting, anchorage and for counter-weight.

EXECUTION OF COMPONENTS.

Plates construction.

Normally to have a product with a good quality, for the construction of the links are used hardened steel of high quality.
The roll type decoilers and alignment devices, bring the tape, by which are obtained the links, to the automatic presses.
The links for chain with small pitch are made by tools for follow dies, while the links with higher pitch are first of all marked and following holed.
The hardening and tempering gives to the links the necessary resistance.
The surface is cleaned by a shot-peening process, pickling, smooth and then burnished

Pivots construction.

Normally for the construction of the chain pivots is used the casehardening steel cold-drawn; in specific cases they are made with hardened and tempered steel.
The pivots of standard type are cut with high speed devices.
The sharp edges, which are formed during the cut process, are rounded by the cold molding or by tumbling.
The special pivots are made by automatic turning.
With the casehardening of the pivots, it is possible to obtain an high resistance to the wear
The final tempering gives the necessary elasticity.
At the end of this working processes it is possible to do a grinding process to further improve the resistance of the chain to the wear.

Bushings contruction.

The bushings are made in casehardening steel cold alloyed and rolled, they are winded with special devices.
By the lamina that constitutes the material, is cut a section, bended in different stages, gauged in order that the bushing has a good smoothness and uniformity of closure.
The bushings are degreased and casehardened.
In this manner you can obtain a surface resistant top the wear, further improved by a tumbling process.

Rollers construction.

The rollers can be realized with the followings processes:

- Cold extrusion;
- Drawing;
- Winding;
- Turning;
- Parting tube.

The cold extrusion is the more use process for the construction of the rollers for chains.
In the extrusion are cut to measure cylinders dimensioned with precision, that subsequently will became rollers through cold gouging in various stages.
Through these processes it is possible to obtain rollers with roundness and concentricity more precise.
In addition to these important geometric features, it is possible to give to the roller also a high resistance.
In this manner you grant to chain a long lifetime.
The material used is the casehardening steel or hardened and tempered steel.
After the cold extrusion, the rollers are degreased, casehardened and tempered (or hardened and tempered).
The rollers made in hardened and tempered steel are plastic and insensitive to shocks.
During the drawing of the rollers, on a press are formed the caps starting from the tape.
The hardening of the material is delated by the recrystallization.
In the next working step, the cap is tightened and heated for all its length, while the bottom is cut and deleted.
After the roughing, the rollers are subjected to tumbling to remove burrs, finally they are casehardened and.

Assembly of the chain.

The assembly is realized by completely automatic systems. A continuous cycle the assembly automatisms assemble the single components, they form the chain and they rivet it.
At the bottom line of the hydraulic systems, they pre-stretch the chain with a pull equal to 1/3 the breaking load; in this manner the components of the chain undergo a static bedding.
At the same time the elasticity and the control on the linear development is detected.
Exceeded subsequent checks, the chains are greased according to the use to which they are destined.

CHAIN TRANSMISSION

Feature of the chain transmissions.

- Efficiency:
  According to the number of teeth, the linear speed of the chain and the lubrication, the efficiency reaches normally the value of 0,98.

- Reduction ratio:
  Contrary to the transmission belt, the chain transmission has no slipping; that means that the number of turns is constant, independent by the load and the linear speed of the same chain, but depend only by the number of teeth of the motor sprocket and by the number of teeth of driven sprockets.
  The reduction ratios are:
  - Normal until 5 times;
  - Possible until 7 times and over (in particularly cases).

- Number of teeth:
  In the choice of the number of teeth you must keep in consideration the following recommendations:

  - Z<11 : must be avoid with power transmission (problem of the polygonality);
  - 11<Z<13 : for linear speeds of the chain lower to 4 m/s;
  - 14<Z<16 : for linear speeds of the chain lower to 7 m/s;
  - 17<Z<25 : preferred number of teeth for sprocket;
  - 38<Z<76 : advantageous number of teeth for the crowns;
  - Z>120 : only in extraordinary cases.

  The distance between the centers of the chain is between 30 and 50 times the pitch of the same chain, it must allow, however, possibly a minimum winding angle equal to 120°.

- Load capacity:
  The load capacity depends on the quality of the linear speed, the breaking load of the chain, the extent and frequency of the shocks during the working, the number of teeth and the required duration of the operation.

  - Until 3000 [N/(cm^2)] : NORMAL;
  - Until 6000 [N/(cm^2)] :HIGH;
  - Until 12000 [N/(cm^2)] : VERY HIGH (only for peak of load rare or of short duration).

In case of insufficient lubrication should not be exceeded, the following values of compression of joint:

- 1500 [N/(cm^2)] : for all the uses in which is made surely a second intervention of lubrication;
- 700 [N/(cm^2)] : admissible in presence of dirty, without further lubrication:
- 400 [N/(cm^2)] : in working with presence of dirty, without further lubrication.

If you make working the roller chains at very low linear velocity or as load chains at standstill machine, it is not crucial the compression of articulation, but the security dynamics of the chain "S_d".
According the rule DIN 8195, the dynamic traction force of the chain "F_d" must not be higher 0,15 times the minimum breaking load "F_{bmin}".
So the dynamic security of the chain is:

$$S_d \geq \frac{F_{bmin}}{F_d} = \frac{1}{0{,}15} = 6{,}7$$

- Linear speed:
The admissible linear speed of the chain depend on the load, the number of teeth, the pitch of the chain, the lubrication, the working temperature and desired duration.
This linear speed can change from 3 m/s to 25 m/s.

- Duration:
The duration of the chain is determined, according the load, both by the resistance to wear, and to the resistance to fatigue of its components.
In the most cases, the wear determines the duration of the chain, when it is excessive, it limit it.
In general, in the choice of the chain transmission, it is assumed a duration of 15,000 hours of working, with an elongation, due to the wear, of the chain equal to 3%.

- Elastic limit:
The elastic limit for roller and bushes chains is higher to 0,4 times "F_{bmin}".
The approximate value for the rate elastic elongation of the (δ) with load "F", is equal to:

$$\delta = \frac{2{,}2 \cdot F}{F_{bmin}} (\%)$$

F = Traction force of the chain
F_{bmin} = minimum breaking load of the chain

DETERMINATE FACTOR FOR THE DURATION OF THE CHAIN TRANSMISSION.

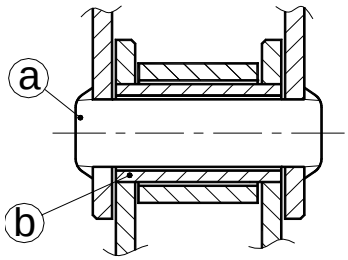
Lubrification.

The lifetime of the chain transmission depend on the way the chain is lubricated.

The wear between the pivot (a) and the bush (b) (picture 2) is the main reason of the elongation of the chain, so these parts must be good lubricated.

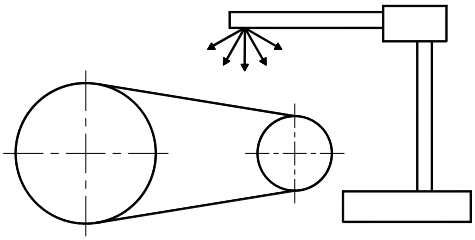
There are 5 main typologies of lubrications:

1- "Rain" lubrication (Dis. 3):
- It is necessary for heavy loads, high powers and speeds;
- The oil must flow around 4 [l/min];
- The system should not run short of oil.

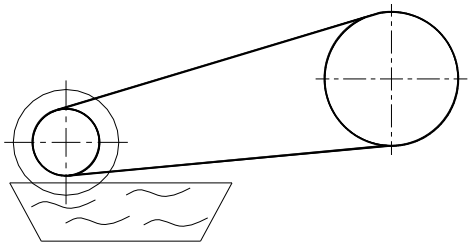


Dis. 2

Dis. 3

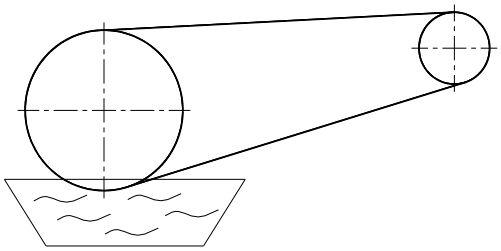


Dis. 4

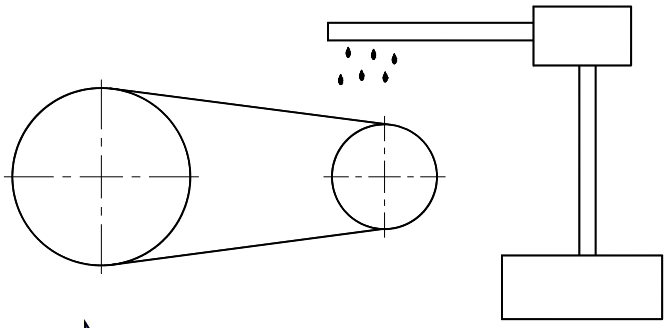


2- "disk" lubrication (Dis. 4):
- The chain must function at around 3 m/s;
- The plate must be submerged for 12/25mm

Dis. 5



3- <u>Bath lubrication</u> (Dis. 5):
- Valid at medium and low speeds;
- The line of the chain must be submerged for 6/12 mm.



Dis. 6

4- Drip-feed lubrication (Dis. 6):

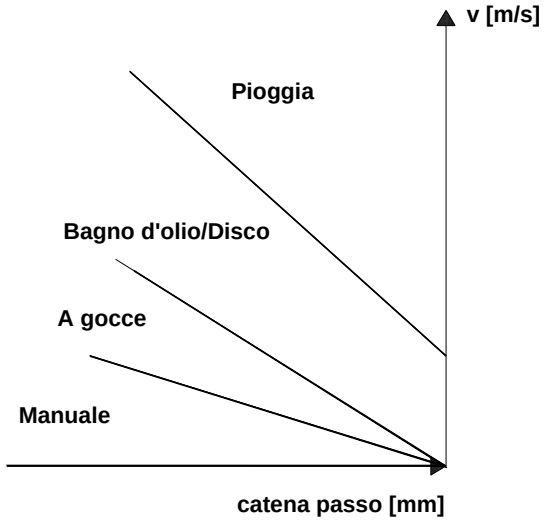
- from 4 to 10 oil drops each minute, between the plates of each row of the chain.

Ing. Marco Canova

5- Manuale lubrication:

- Perically in 8 hours of work

Herewith the diagram (Dis. 7) of the speeds that a mechanical transmission with chain can reaches according to the different type of lubrications used:



Dis. 7

Next Fair of Tecnidea Cidue : **SAMOTER 2014 VERONA – ITALY 8-11 MAGGIO**

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