

[54] PAPER MACHINE DRYING CYLINDER BLOCK

804,275 4/1951 Germany 192/55

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[57] ABSTRACT

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The drying cylinders of a paper machine drying cylinder block are provided with a joint driving system in which the pin of almost every drying cylinder is connected to a pin gear type reduction gear having a primary shaft positively connected to a drive shaft which is perpendicular to the cylinder pins and through a cone gear pair at one end of the primary shaft. In order to eliminate blind moments in the cylinder block there is provided an overload clutch in the form of a first flange fixed near the one end of the primary shaft, a second flange attached axially slidable at the one end of the primary shaft to define an annular recess with the first flange for receiving one cone gear of the cone gear pair, and means for pressing the one cone gear between the first and second flanges.

[30] Foreign Application Priority Data

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[51] Int. Cl. F16h 1/14, F16h 1/20, F16d 7/00

[58] Field of Search 192/55; 74/417, 423

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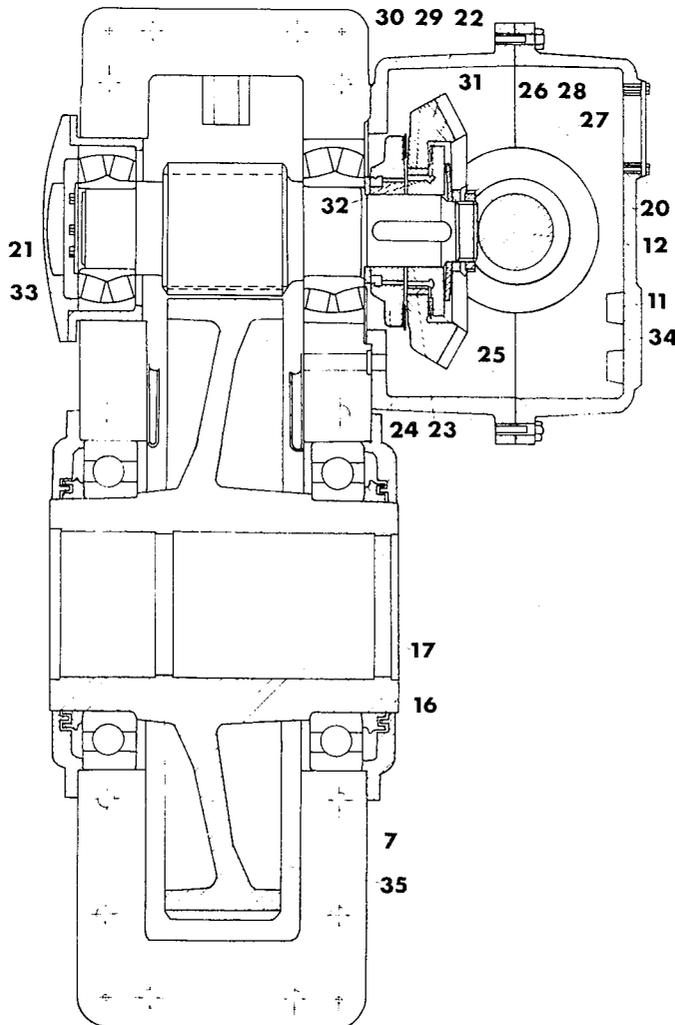
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7 Claims, 3 Drawing Figures



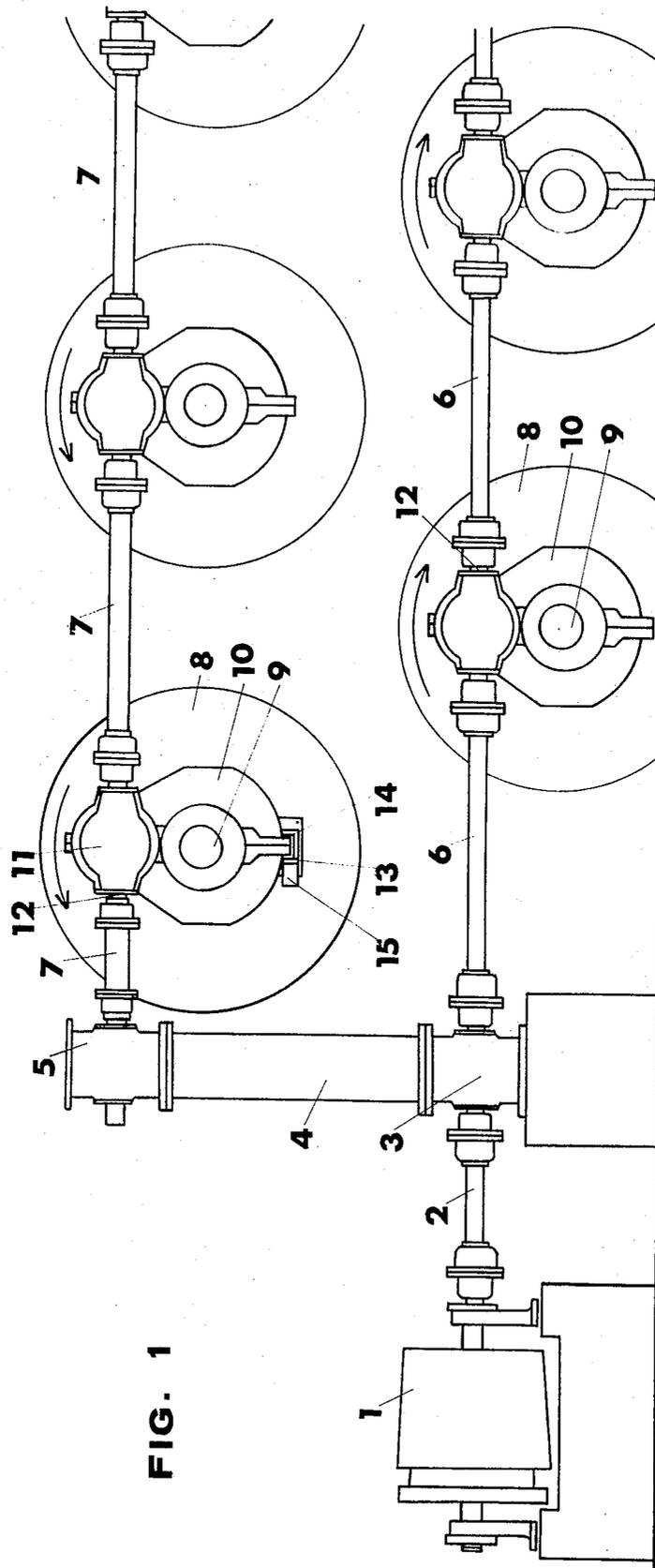


FIG. 1

3 Sheets-Sheet 2

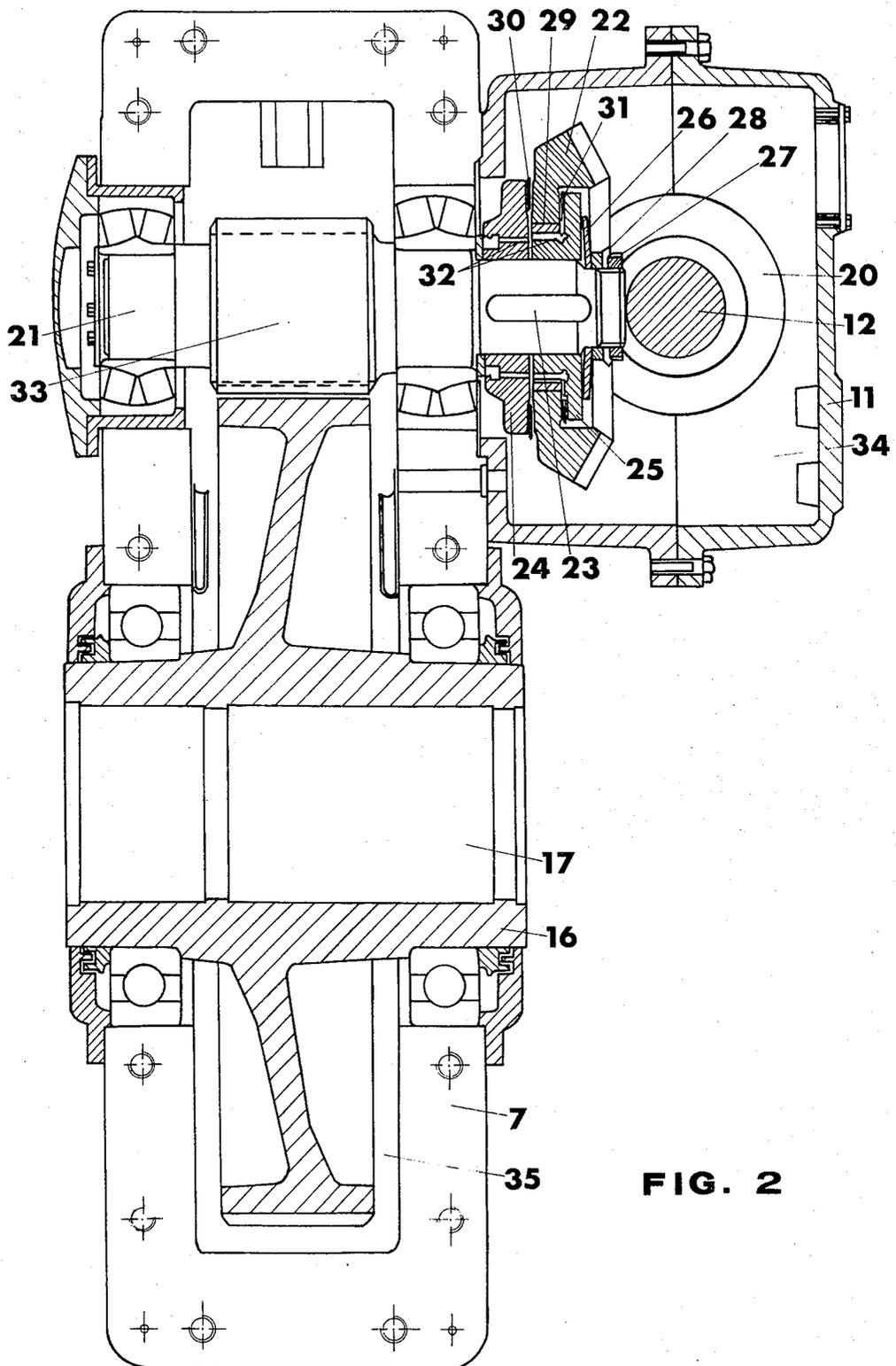


FIG. 2

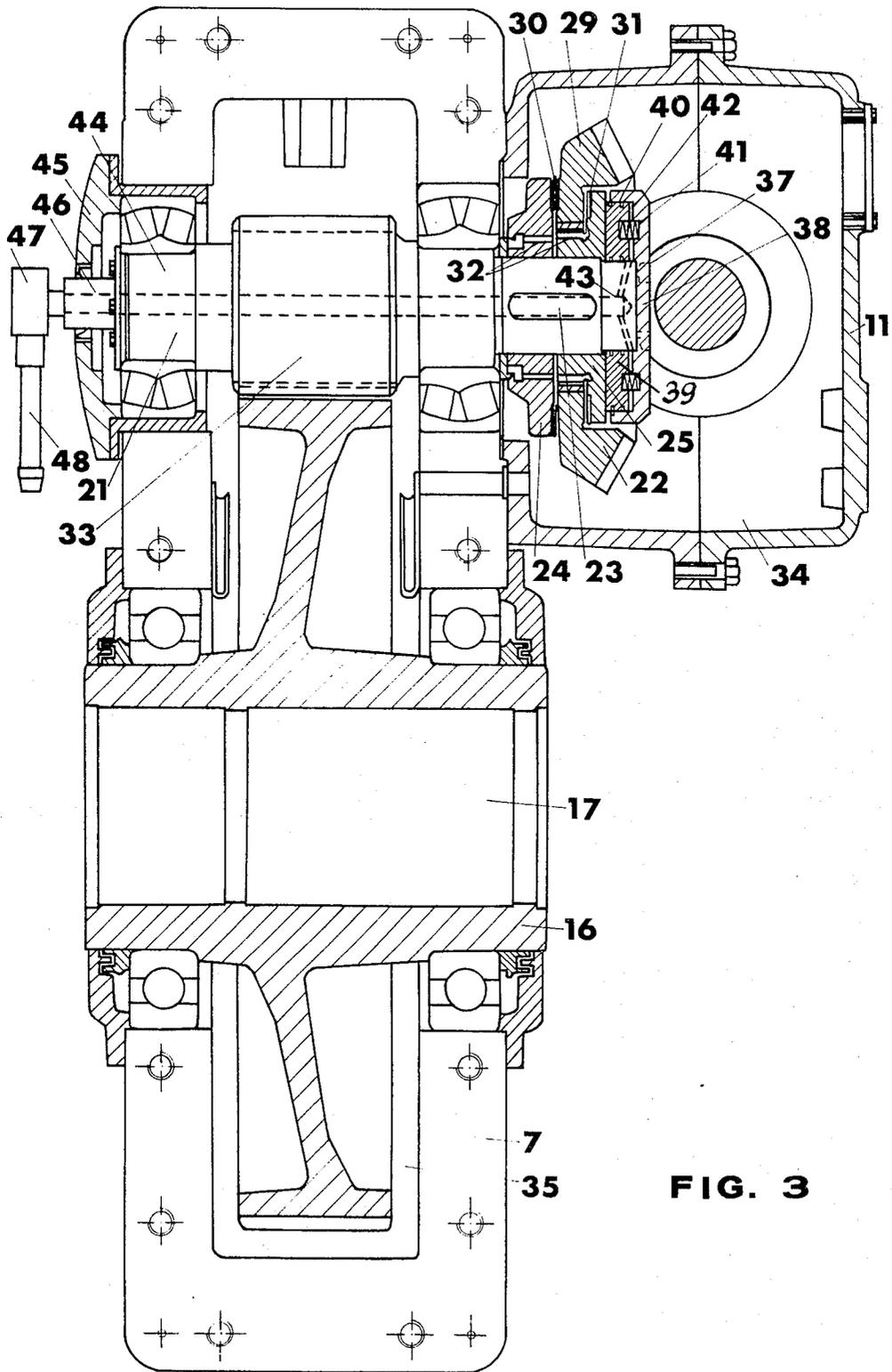


FIG. 3

PAPER MACHINE DRYING CYLINDER BLOCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the field of paper machine drying cylinder blocks and especially to joint driving systems therefore.

2. Description of the Prior Art

Paper machine drying cylinders are usually equipped with a driving apparatus. Several cylinders form a cylinder block with a joint drive which gives them the same peripheral velocity. The individual cylinders of a cylinder block are, furthermore, connected with each other by two endless drying felts, the upper felt and the lower felt. When the felts are wide and strong they can transmit powerful moments.

It is known that blind moments occur inside a paper machine drying block when the peripheral velocity of the cylinder produced by the driving apparatus differs from the local felt speed. Such a situation is created by a considerable difference in cylinder temperatures, which occurs, for example, when starting and stopping the machine, and in connection with disturbances in the cylinder heating apparatus. Such a situation is also a permanent phenomenon at some points of the machine owing to considerable variation in felt humidity. The elasticity of the felt is sufficient to eliminate the weakest moments. Powerful moments cause strains to the driving apparatuses which can multiply their normal loads. The felt is also subjected to strong tension which wears thin the felt and causes unnecessary forces which bend the felt guide rollers. This results in breakage of the roller and the roller pin, or requires their unreasonable overdimensioning.

It is known that interval blind moments can be restricted to a moderate level by individual drive, in other words, by equipping each cylinder with its own driving engine.

It is also known that the blind moments can be restricted by reducing the size of the cylinder blocks or by making some of the cylinders felt-drawn.

Machine damage caused by a blind moment can also be eliminated by overdimensioning the driving apparatus and other structures.

This invention relates to auxiliary devices for moderating the blind moments occurring in the mechanical joint drive of a paper machine drying cylinder block, taking into consideration the strength of the structure as well as the special requirements set by the paper track.

The term "paper machine" herein denotes a machine intended for producing paper, cellulose, or some other continuous weblike product, and employing several cylinders through which runs at least one endless felt, wire, or other organ capable of transmitting power.

SUMMARY OF THE INVENTION

In a driving apparatus according to the invention, the occurrence of peak loads caused by extreme blind moments is eliminated by providing the power transmission appliance of each cylinder with its own overload clutch which can be adjusted to comply with the dimensioning of the driving apparatus. The differences between the felt speed and the peripheral velocity of the cylinder caused by variations in felt length are eliminated partly by the elasticity of the felt and partly by overload clutch slide. The slide is produced either by

the felt pulling the cylinder at a velocity greater than that provided by the drive, or by the felt slowing down the cylinder, or by the felt pulling one cylinder and slowing down another in a single cylinder block.

In the driving apparatus according to the invention, the pins of the drying cylinders have been provided with pin gear type reduction gears. This makes it possible to measure from the outside the torsional moments inside the power transmission equipment by means of power measuring organs known as such and situated at the anchorage points of the pin gears. The overload clutches inside the pin gears are adjusted on the basis of the measured torsional moments.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a section of the drying cylinders of one cylinder block with its driving apparatus as seen from the driving side,

FIG. 2 shows a longitudinal section of a pin gear type lowering gear mounted on the pin of one drying cylinder, also showing a longitudinal section of the cone gear at the end of the primary shaft with its built-in spring-loaded overload clutch,

FIG. 3 is the same as FIG. 2, the only difference being that the overload clutch is driven by a hydraulic cylinder and is remote-controlled.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The paper machine driving apparatus shown in the figures works as follows: The entire drying cylinder block is started and stopped through release mechanism 1. The speed control between the separate drying blocks and the other components of the paper machine takes place before the release mechanism. From the release mechanism power is transmitted through connecting shaft 2 to cone gear 3, from which the drive proceeds directly to lower driving shaft 6 through the vertical shaft inside box 4 and upper cone gear 5 to upper driving shaft 7. In each driving cylinder 8, pin gear type lowering gear 10 has been mounted on pin 9. Cone gear 11 has been mounted on the primary shaft of lowering gear 10, and through the cone gear runs shaft 12 functioning as part of the driving shaft. The pin gear moment is received by supporting point 13 which is attached to the frame and also supports ear 14 of the gear. Attached to the ear is organ 15 which measures the force received by the supporting point, the torsional moment being calculated on the basis of this force. Pin gear wheel 16 is mounted on the pin of the drying cylinder by hole 17. Cone gear 20 on driving shaft 12 spins cone wheel 22 on primary shaft 21. A friction gear is built inside cone wheel 22. The following components can be distinguished in the friction gear: fixed flange 24 fastened with wedge 23, and flange 25 moving only axially in relation to primary shaft 21. Flange 25 is affected by the force of disk spring 26. The compressive force of the disk spring can be adjusted by nut 27 on which locking device 28 has been mounted. Cone gear 29 has been attached with bearings to the nave of flange 25 and it rests against fixed flange 24 with the help of sliding surfaces 30 and against moving flange 25 with the help of friction surfaces 31. Oil grooves 32 have been provided for lubricating the sliding and the friction surfaces. The torsional moment from the driving shaft to the primary shaft of the pin gear has been limited to the value speci-

fied for the overload clutch; if the moment is higher than this the clutch will slide. Gear 33 mounted on the primary shaft spins the drying cylinder through gear 16. Cylinder gears and cone gears with overload clutches are incorporated in a single revolving lubricating system from which oil accumulates into oil spaces 34 and 35.

FIG. 3 shows a different structure in that the overload clutch compressed with hydraulic power instead of spring force. In this construction flange-like piece 38 has been fastened with screws 37 at the end of the primary shaft. Ring-like piston 39 functions inside piece 38, and on the inner and outer cylindrical surfaces of the piston there are gaskets 40 and 41. Ring piston 39 compresses moving flange 25 creating the frictional force of the overload clutch. Hydraulic pressure is produced in area 42 behind the ring piston through bores 43 and 44. The hydraulic pressure is conducted from the pump through the pressure control valve into main shaft bore 44 with the help of gasket box 47 of shaft extension 46 reaching through bearing cover 45, and also with the help of fixed pipes 48.

When an overload using spring force is employed, the clutch can be adjusted only when the machine has been switched off, and even then the cover of the gear box must be opened.

When hydraulic overload clutch is used, the adjustment can be made while the machine is in operation. The adjustment can then be made on each clutch individually or on several clutches simultaneously. The clutches can also be released and coupled in groups, for example the upper cylinders as one and the lower cylinders as another, both by means of the closing valves. The adjustment is made by means of pressure control valves, e.g. on the basis of the measured moments of the pin gears. Furthermore, instead of measuring organ 15, a pressure control valve can be installed which is controlled by the force affecting supporting point 13 and which automatically restricts the maximum moment to the desired level.

The overload clutch can also be installed at another point of the main shaft, e.g. in connection with gear 33.

Even though the wear of the friction surfaces is very low because the relative movement between the components is slight, the friction surfaces are replaceable. Residue from wearing, and heat, both present on the friction surfaces, are carried by the lubricating oil circulation to a filter and, if necessary, to a cooler.

What is claimed 15:

1. In a paper machine drying cylinder block an improved joint driving system for the drying cylinders and of the type in which the pin of at least one drying cylin-

der is connected to a pin gear type reduction gear having a primary shaft positively connected with a drive shaft perpendicular to the cylinder through a cone gear pair at one end of the primary shaft, the improvement comprising:

a first flange fixed near the one end of the primary shaft;

a second flange attached axially slidable at the one end of the primary shaft and defining an annular recess with the first flange for receiving one cone gear of the cone gear pair; and

means for pressing the one cone gear between the first and second flanges in order to obtain an overload clutch contact between the cone gear pair and the primary shaft.

2. The improvement of claim 1, further comprising means for automatical adjustment of the compression between the first and second flanges in order to control the maximum torsional moment transmitted by the pin gear.

3. The improvement of claim 1, further comprising a support fixed to the paper machine, an ear fixed to the pin gear, and means connected between the ear and the support for measuring the torsional moment transmitted by the pin gear.

4. The improvement of claim 1, in which the means for compressing the one cone gear between the first and second flange comprises a disk spring adapted to force the second flange towards the first flange.

5. The improvement of claim 1, in which the means for compressing the one cone gear between the first and second flanges comprise :

a flange-like piece attached to the one end of the primary shaft and defining an annular cavity with the second flange, which cavity encompasses an annular piston; and

means for introducing hydraulic pressure into the cavity between the flange-like piece and the piston to press the piston against the second flange.

6. The improvement of claim 5, in which the means for introducing hydraulic pressure comprise a bore through the primary shaft from the other end thereof to the cavity between the piston and the flange-like piece, and inlet means for connecting the bore with an external fluid pressure source.

7. The improvement of claim 5, further comprising a support fixed to the paper machine, an ear on the pin gear, and, on the support, a pressure control valve operatively connected to the ear for automatical adjustment of the maximum torsional moment to a desired level.

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