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PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO TRANSMISSION ASSEMBLIES

(71) We, LOHR & BROMKAMP G.m.b.H., a Company organised and existing under the laws of the Federal German Republic, of 6050 Offenbach/Main 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns an assembly (hereinafter called of the kind specified), particularly for transmission of drive from a power source to a machine, comprising a transmission shaft and a pair of constant velocity ratio universal joints with the transmission shaft therebetween and wherein each of said constant velocity ratio universal joints comprises an outer and an inner joint member with torque transmitting or like elements guided into the homokinetic plane.

German Patent No. 1,914,275 discloses a transmission shaft which is associated with a pair of plunging constant velocity ratio universal joints. However, this arrangement has the drawback that if a shaft of this kind is to be used for auxiliary drives, e.g. as applied to weaving looms and other textile machinery, locally prevailing conditions may require the shaft to be cut down to the right length on site, with the result that either the shaft must have a longitudinal profile which is adapted drivingly to receive a joint member, or a drive pin must be welded to the shaft.

Other prior proposals include cardanshafts associated with a pair of universal joints of the cruciform or cardan type, and separate means for longitudinal compensation through splined engagement. Such longitudinal compensation is necessary to take up length variations between the two joints arising from the kinetics of the assembly. Intermediate shafts of different length between the two joints are required however for different lengths between the assemblies to be drivingly connected. Such arrangements present the same disadvantage, namely that the connecting shaft has to be trimmed on the site. Moreover, transmissions of this kind have the further drawback that the connector flanges must be in precise parallel alignment failing which there can be no constant velocity ratio output. Such shaft alignment is an extremely laborious and time-taking operation. Length compensation is obtained by splined engagement. This, however, gives rise to considerable thrust forces and correspondingly heavy wear. Also, in normal service such cruciform joint bearings require regular lubrication.

It is an object of the present invention to provide a new or improved transmission assembly of the kind specified which is readily adaptable to varying lengths between apparatus to be drivingly connected and, on the other hand is capable of taking up small amounts of relative axial movement during service.

According to the present invention we provide an assembly of the kind specified wherein the transmission shaft comprises a pair of shaft parts telescopically slidably engaged to permit of relative axial adjustment and positively to prevent relative rotation and the constant velocity ratio universal joints are constructed to provide plunging movement of the inner joint member within the outer joint member.

The assembly has the advantage that no additional work whatsoever will be required for the connecting of a machine to a power source in any given location because the assembly has to be screwed or bolted in place between connector flanges, associated with the power source and machines respectively.

Any inaccuracies with regard to length adjustment occurring during positioning of the assembly are fully taken up by relative axial positioning between the shaft parts. The relative positions of the two connector flanges are no longer critical because the constant velocity ratio universal joints preclude uneven running. Another very favourable aspect of the assembly is that of dynamic length compensation, that is to say, length variations of the assembly due to relative movement of the two joints or arising from an association with either vibrating, oscillating or floatingly mounted machinery, will be fully absorbed by the plunging of the constant velocity ratio universal joints.

One preferred embodiment of the invention will now be described by way of example only with reference to the accompanying drawing wherein:—

FIGURE 1 is a section of a transmission shaft of the kind specified with two sliding joints, and

FIGURE 2 is a section through the connecting shaft.

The transmission arrangement represented in Figure 1 consists of a pair of slidable constant velocity ratio joints 1, 2 and a connecting shaft comprising a pair of end portions 3 and 4, and a pair of relatively telescopically slidable hollow sections 5 and 6.

The constant velocity ratio joints 1 and 2 are basically identical and for the sake of simplicity, only one of these will be hereinafter described. It comprises an outer joint member 7, with grooves 8 formed in the surface of an interior cavity thereof for the accommodation of torque-transmitting elements which comprise balls 9. The said interior cavity also receive the end portion 3 or 4 of an associated shaft part which carries an inner joint member 10. The outer circumferential surface of the inner joint member 10 is provided with grooves 11 which correspond to, and through the balls 9 cooperate with, the grooves 8 provided in the outer joint member 7. In each case, one groove 8 of the inner joint member 10 crosses or intersects with one groove 11 of the outer joint member 7 and between each of these pair of grooves is a torque-transmitting ball 9. The grooves are of a design such as to allow for plunging movement of the joint. Each of the balls 9 is guided by and supported in the associated windows of a cage 12 arranged between the inner joint member 10 and outer joint member 7. In the case of this particular joint, the cage 12 is supported by virtue of contact engagement between its inner spherical surface and the outer spherical surface of the inner joint member 10, whilst its exterior surface is axially slidable in contact with the inner surface of the cavity of the outer joint member 7. The end portion 3 is provided with a tapered profile at the end thereof nearest the joint and is engaged, for example, through cooperative splines in a corresponding bore provided in the inner joint member 10. A concertina boot 13 is provided at one end of the joint, and an end cap 14 at the other end, to prevent ingress of dirt, dust or water.

The mutually facing ends of the shaft end portions 3 and 4 are each provided with a weld nipple. The exterior diameters of these nipples correspond to the internal diameters of the hollow sections 5 and 6 of the shaft parts at the ends thereof nearest the nipples. The hollow sections 5, 6 are telescopically slidably engaged with each other and have either a cross-sectional form as shown in Figure 2 or any other suitable, non-circular cross-sectional form effective to establish the transmission of driving torque. Moreover, the outer diameter of the hollow section 5 and the internal diameter of the cooperaitng hollow section 6 are such that the former fits slidably in the latter.

After initial assembly of the joints as such, each end portion 3 or 4 is associated with the corresponding hollow section 5 or 6 to form the two shaft parts and is rigidly joined thereto by welding or similar method. The resulting assembly may then be fitted on site between the machine to be driven and the driving unit, simply by trimming the hollow sections 5 or 6 to the required length. It is not necessary for the axes of the outer joint members 7 to be in precise parallel alignment, because the parallel, or constant velocity universal joints automatically give a constant velocity drive output. Relative length variations between the two joints during service will be taken up by plunging between the inner and outer members of the individual joints. Likewise, if certain parts of the grooves forming the ball tracks become worn, it is merely necessary to make a relative axial adjustment in the positions of the hollow sections 5 and 6 by effecting sliding of one relatively to the other so that the balls may then work in, as yet, unworn regions of the grooves, thereby providing a longer overall service life.

It will be appreciated that it is of course also possible to fit constant velocity ratio universal joints of a different construction to those shown in the accompanying drawings.

WHAT WE CLAIM IS:—

1. An assembly of the kind specified

wherein the transmission shaft comprises a pair of shaft parts telescopically slidably engaged to permit of relative axial adjustment and positively to prevent relative rotation and the constant velocity ratio universal joints are each constructed to provide plunging movement of the inner joint member with the outer joint member.

2. An assembly of transmission shaft and constant velocity universal joints substantially as hereinbefore described with reference to and as shown in the accompanying drawing.

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1567230 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

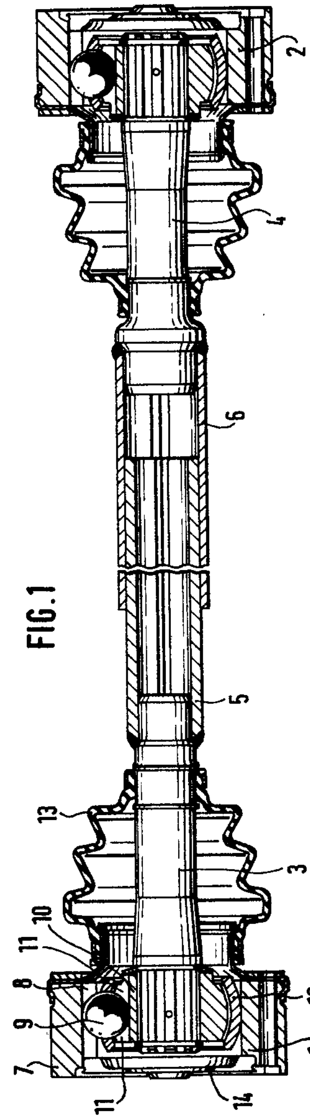

FIG. 1

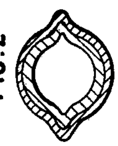

FIG. 2