

A DRIVE MECHANISM

This invention relates to a drive mechanism for transporting a load along an elongate flexible member.

According to the present invention there is provided

5 a drive mechanism for transporting a load along a vertically hanging elongate flexible member, the mechanism comprising a carrier supporting a wheel which has a peripheral circumferential groove for receiving the elongate flexible member, the mechanism

10 also comprising a sun pinion which is mounted on a shaft and is drivably connected to the wheel by planet gears which mesh with the sun pinion and with internal teeth of the wheel, and which are rotatable about axes which are fixed with respect to the carrier,

15 whereby the shaft, in operation of the drive mechanism, rotates when the drive mechanism travels along the elongate flexible member, the drive mechanism including a brake mechanism which comprises a ratchet wheel mounted rotationally freely on the shaft and a drivable

20 gear wheel, which cooperates with a screwthreaded portion of the shaft whereby relative rotation between the gear wheel and the shaft causes the gear wheel to move axially along the shaft, such axial movement in one direction causing the ratchet wheel to be fric-

25 tionally locked with respect to the shaft, pawl means being provided for permitting rotation of the ratchet wheel in one direction only.

For a better understanding of the present invention and to show how it may be carried into effect, reference

30 will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a sectional view of a drive mechanism for a lifting cradle;

Figure 2 is a sectional view taken along the line II-II in Figure 1; and

5 Figure 3 shows part of Figure 2 on an enlarged scale.

The mechanism shown in the drawings is supported from an elongate flexible member constituted by a wire rope 2 which is suspended, in use, from a fixed member. The rope 2 passes around a wheel 4 which is mounted for rotation in a carrier 6. Pressure applying means in the form of a flexible element or chain 8 made up of linked rollers extends around the wheel 4 over an arc of approximately 180° and acts, in use, to press the rope 2 into a tapered groove 10 formed around the periphery of the wheel 4.

10 One end 8A of the chain 8 is secured to the carrier 6 by a pin 12, and the other end 8B is connected to a shackle 14 by a lever 16. The lever 16 is pivotally mounted between two lugs 18 by a pin 19. A downward force applied to the shackle 14 causes the lever 16 to pivot about the pin 19 drawing the end 8B of the chain 8 towards the left as seen in Figure 1, so pressing the rollers of the chain 8 inwardly of the groove 10.

20 An electric drive motor, of which only an output pinion 20 is shown, is bolted to the carrier 6. The pinion 20 meshes with a gear wheel 22 mounted on a shaft 24 which also carries a pinion 26. At one end of the shaft 24 there is a square-section extension 28 by means of which the shaft 24 can be rotated manually to operate the drive mechanism, for example in the event of power failure. The pinion 26 meshes with a gear wheel 30 mounted on a shaft 31, on which a sun pinion 32 of a planetary gear arrangement is also mounted. This sun pinion 32 meshes with two planet gears 34 which are mounted for rotation on a planet carrier 36 which is

fixed relatively to the carrier 6. The wheel 4 is supported for rotation on the planet carrier 36 by means of rolling element bearings 37, and has internal teeth 38 with which the planet gears 34 mesh. The gear train from the pinion 20 to the wheel 4 constitutes a reduction gear.

The shaft 31, and some of the parts mounted on it, are shown in more detail in Figure 3.

The gear wheel 30 cooperates with a coarse screw-threaded portion 33 of the shaft 31. A ratchet wheel 29 and two friction discs 44 are mounted on the shaft 31, and are able to rotate relatively to the shaft 31. A sleeve 35 cooperates with a further screw-threaded portion of the shaft 31, and the sun pinion 32, which is not shown in Figure 3, is mounted on a portion 39 and is not rotatable relatively to the shaft 31.

A disc 46, having a projection 48, is mounted on a non-circular portion of the shaft 31. The projection 48 is positioned to obstruct a pin 50, fixed to the gear wheel 30, when the gear wheel 30 approaches the left-hand end of the shaft 31, as viewed in Figure 3. The parts to the left of the sleeve 35 are retained on the shaft 31 by a bolt 52. A spring washer 54 and a collar 56 are disposed between the head of the bolt 52 and the end of the shaft 31.

Two pawls 23, disposed on opposite sides of the shaft 31, engage the ratchet wheel 29 to allow rotation of the ratchet wheel 29 in one direction only. The pawls 23 are carried by bolts 58 which, with further bolts 60, serve to secure the planet carrier 36 to the carrier 6.

On the length of rope which, in use, falls below the mechanism, there is a stop member 40.

In use of the mechanism shown in Figures 1 and 2, a cradle, for example for receiving personnel, is connected to the shackle 14. The lifting mechanism is supported, preferably resiliently, on the cradle by means of a ring

42 fixed to the carrier 6. This measure provides a temporary support of the mechanism when it is not supported by the rope 2. Rotation of the wheel 4 in the appropriate direction by the motor causes the mechanism to travel up the rope as will be described in more detail below, the rope being frictionally engaged within the groove 10. As the weight of the cradle connected to the shackle 14 is taken by the lifting mechanism, the chain 8 is tensioned through the lever 16 and forces the rope firmly between the tapered side walls of the groove 10, so increasing the frictional engagement between the wheel 4 and the rope 2. Reversal of the motor causes the mechanism and the cradle to travel down the rope 2 at a controlled speed.

When the mechanism is to be raised, the gear wheel 30 is rotated in the direction to cause it to advance towards the ratchet wheel 29 along the screw-threaded portion 33. Eventually, the gear wheel 30 will compress the friction discs 44 and the rotation of the gear wheel 30 will be frictionally transmitted to the sleeve 35 and thence to the shaft 31 so causing the mechanism to climb the cable 2. At the same time, the ratchet wheel will also be rotated by virtue of the frictional engagement between it and the friction discs 44, this rotation being permitted by the pawls 23.

If the motor stops, the shaft 31 will be driven in the opposite direction by the weight of the lifting mechanism and the load attached to the shackle 14. However, the pawls 23 prevent the ratchet wheel from rotating in this direction, and, since the clamping pressure exerted by the gear wheel 30 is not released, the shaft 31 will be prevented from rotating because it is frictionally connected to the ratchet wheel 29. If there is any slip between the friction discs 44 and the adjacent parts, the resulting relative rotation between the shaft 31 and the gear wheel 30 will cause the gear wheel 30 to be forced even more firmly towards

26

the sun pinion 32 to increase the clamping effect until the mechanism comes to a standstill. It will be appreciated that, while the motor must be braked strongly enough to prevent rotation of the gear wheel 30, the resistance to rotation of the shaft 31 is applied by the pawls 23.

If the motor is reversed, so as to cause the mechanism to move down the cable 2, the gear wheel 30 is rotated to release the clamping force applied to the friction discs 44. The shaft 31 can then slip relatively to the ratchet wheel 29, which is still held stationary by the pawls 23. The projection 48 on the disc 46 limits the travel of the gear wheel 30 to the left as seen in Figure 3. In the limit position, the projection 48 is engaged by the pin 50 and further rotation of the gear wheel 30 relative to the shaft 31 is prevented.

The stop member 40 prevents the mechanism from accidentally running off the lower end of the rope.

The mechanism described can be used as a travelling lifting mechanism, for example for goods in a warehouse, or for example, for supporting personnel during the exterior maintenance of buildings. Where a large cradle is used, it may be desirable to support it from two or more lifting mechanisms on a corresponding number of ropes.

The drive mechanism disclosed herein is also disclosed and claimed in our patent No. 2041867.

30

35

27



CLAIMS

1. A drive mechanism for transporting a load along a vertically hanging elongate flexible member, the mechanism comprising a carrier supporting a wheel which has a peripheral circumferential groove for receiving the elongate flexible member, the mechanism also comprising a sun pinion which is mounted on a shaft and is drivably connected to the wheel by planet gears which mesh with the sun pinion and with internal teeth of the wheel, and which are rotatable about axes which are fixed with respect to the carrier, whereby the shaft, in operation of the drive mechanism, rotates when the drive mechanism travels along the elongate flexible member, the drive mechanism including a brake mechanism which comprises a ratchet wheel mounted rotationally freely on the shaft and a drivable gear wheel, which cooperates with a screwthreaded portion of the shaft whereby relative rotation between the gear wheel and the shaft causes the gear wheel to move axially along the shaft, such axial movement in one direction causing the ratchet wheel to be frictionally locked with respect to the shaft, pawl means being provided for permitting rotation of the ratchet wheel in one direction only.
2. A drive mechanism as claimed in claim 1, in which two friction discs are provided, one being disposed between the gear wheel and the ratchet wheel and the other being disposed between the ratchet wheel and a flange which is fixed with respect to the shaft.
3. A drive mechanism as claimed in claim 1 or 2, in which the pawl means comprises a pawl which is mounted on the carrier.

The text of the specification has been reproduced by photocopying the applicants original typescript. It may contain a few amendments which are difficult to read. The original typescript containing these amendments may be inspected on the premises of the Patent Office