(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 522 690 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92304285.7**

(22) Date of filing : **12.05.92**

(51) Int. Cl.[5] : **E06B 9/72**

(30) Priority : **16.05.91 GB 9110575**

(43) Date of publication of application :
13.01.93 Bulletin 93/02

(84) Designated Contracting States :
DE FR NL

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(54) Drive system.

(57) A drive system is particularly suited to operating a roller about which an article has been wound such as a shutter, door or screen. The drive system has a cylindrical housing (10) in which a drive motor (11) is located and at one end of the housing is located the drive output shaft (14) from the motor (11). A brake or other holding means (25, 26) is located towards the opposite end of the housing (10) to the drive shaft (14) so that the motor housing can be operated to a braked condition. Control means actuate the motor and the brake in the operational sequence desired.

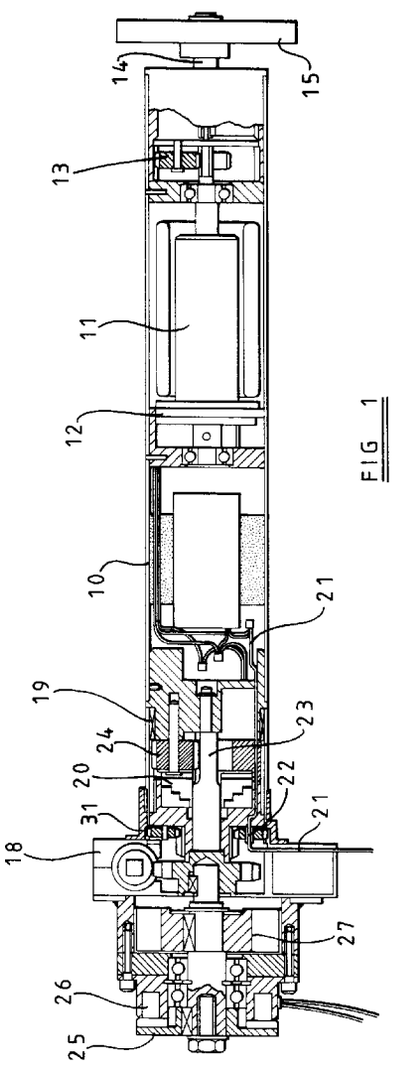

FIG 1

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This invention relates to drive systems, in particular, but not exclusively, to drive systems operable to drive a roller on which an article is wound, such as a rolling shutter, a rolling door, screen, smoke curtain, fire partition curtain or the like.

Hitherto drive systems have been employed which comprise a motor external to a roller or a motor located within a roller and which include brake means for holding the roller in a selected position whilst power supply is maintained. Systems in which the motor is located in a roller have required that a differential gear be located between the motor and roller and the motor and the brake have been located at opposite ends of the roller thereby imposing restrictions on the construction.

An object of the invention is to provide a system in which the motor is located within the roller and is associated with a brake.

According to the invention a drive system comprises a cylindrical housing, a drive motor located within the housing and having at one end an output drive shaft, a holding device located towards the end of the housing opposite to the drive shaft whereby the motor housing can be selectively operated to a braked condition, and a control means for actuating the motor and the holding device in the desired sequence of operation.

Preferably the drive motor includes a brake which brakes the motor when the motor is de-energised.

Conveniently the housing is located within a cylindrical roller driven by the motor output shaft and extending in a direction away from the holding device for rotation of the roller independently of the housing.

The motor may be coupled to the output drive shaft through reduction gearing.

Preferably the roller encloses and is coaxial with the motor housing and is rotatable relative to the housing through bearing means between the housing and the roller.

The system may comprise a fixed mounting rotatably supporting the housing and power supply means for the motor passing from the mounting to the motor through rotatable connections.

Preferably the housing is drivably connected to shaft means extending in the opposite direction to the motor output shaft and through the mounting, the holding device being associated with said shaft means.

In one arrangement the holding device includes a keep plate on said shaft means and an electromagnetic brake on said fixed mounting, the keep plate and the brake being operatively associated to actuate the holding means.

As a further feature the shaft means may carry a governing device for controlling the rate of rotation of the housing and the shaft means.

The end of the roller remote from the motor may be associated with counter balancing means whereby, when the holding means is inoperative and the motor de-energised, the roller may be rotated in opposition to the counter balance means. The counter balance means may be located within the roller and in the form of spring means.

Further features of the invention will appear from the following description of an embodiment of the invention given by way of example only and with reference to the drawings, in which:-

Fig. 1 shows a drive arrangement in longitudinal section, and

Fig. 2 shows the drive arrangement of Fig. 1 associated with a roller, a counter balance arrangement and fitted for use as a shutter.

Referring to the drawings the drive arrangement illustrated includes a cylindrical housing 10 for a drive motor 11 located internally of the housing, the housing also containing a motor brake 12 which operates to brake the motor when the motor is de-energised. Reduction gearing 13 is located between the motor and an output shaft 14 whereby the output from the motor 11 is reduced in speed before being transmitted to the output shaft 14. The output shaft 14 is provided with a coupling 15 to transmit drive to, for example, a roller, not shown in Fig. 1. The coupling 15 is shown in Fig. 2 secured to a roller 16 acting as driven means.

The roller 16 encloses the housing, is coaxial thereto and is carried at one end on a bearing 31 on a mounting 18 and on a bearing 17 at the opposite end to the mounting 18.

The motor 11 and associated housing 10 are rotatable relative to the mounting 18 through a bearing 19. The mounting 18 also incorporates slip rings 20 and associated electrical connections 21 and 22 whereby power is rotatably transmitted to the motor 11.

The end of the housing 10 is adapted to drive a shaft 23 through a planetary gear 24 or may be connected directly to the shaft 23 according to any requirement to increase the speed of the shaft 23 relative to the motor housing 10. The shaft 23 extends through the mounting 18 and on the end of the shaft 23 is carried a keep plate 25. Interposed between the keep plate 25 and the mounting 18 is located a holding device 26, usually in the form of an electro magnet, energisation of which causes the magnet 26 to act as a brake preventing rotation of the motor housing 10 relative to the mounting 18.

The mounting shaft 23 is also adapted to carry a speed governing device 27 comprising expanding shoes which act against the mounting 18 and provide a speed governing function.

In an application of the drive arrangement of Fig. 1 the roller 16 extends away from the mounting 18 and the opposite end of the roller 16 to the mounting 18 locates a counter balance arrangement 28, in the form of a counter balance spring. At the end of the roller 16 is a pin 29 which is supported fixedly in a support

plate (not shown). The spring 28 is connected at one end to the roller 16 and at the other end to the pin 29.

In this arrangement the roller 16 acts as a support for a weighted curtain 30 which may be the slats of a roller shutter hinged together in known manner, to enable the shutter to be wound on and off the roller 16. The sides of the curtain 30 may be located in vertical guides (not shown) or may be unguided. Such a curtain can act as a door, a security shutter, a fire or smoke partition, or the like.

The drive arrangement described can operate in various modes according to the application. Thus the motor can be operated to drive the associated roller 16 to raise or lower the associated curtain 30, the motor housing 10 being fixed against rotation by the keep plate 25 and the electro magnet 26. When the motor has moved the curtain to the desired position the motor brake 12 serves to maintain the curtain in that position.

If the power supply to the motor and the holding magnet should fail, the arrangement may be such that the curtain will automatically wind on or off the roller 16 upon release of the holding magnet 26 by the action of the counter balance means and the weight of the curtain according to the balance of forces between the two devices. Thus in the case of a shutter it may be made to open automatically on loss of power or in the case of a fire partition curtain it may be made to close automatically on loss of power. In both of these cases the governing device 27 acts to control the speed of operation.

The governing means 27 is driven by the roller 16 through the motor housing 10 acting on the planet gear 24 and the drive shaft 23. Alternatively the shaft 23 can be coupled directly to the housing 10. Thus the speed of operation in the event of power loss can be adjusted through the gearing 24 and is quite independent of the speed of operation of the curtain when driven by the motor through the reduction gear.

Alternatively, if the power supply should fail, the arrangement may be such that the curtain 30 will remain in the same position but may be capable of being freely manually moved with the assistance of the counter balance spring 28. In this arrangement the drive provides for manual operation without the requirement of separate manual operation means.

Because of the freedom to fit the counter balance spring at the end of the roller 16 remote from the motor 11 due to the motor and associated holding magnet 26 being located at one end of the roller 16 such manual operation means becomes possible. However, if desired, separate manual drive means can be employed at one or other end of the roller 16.

The motor arrangement described is relatively compact, provides little frictional resistance when operating without power and is thereby capable of manual operation with little effort when the curtain is fully counter balanced. It also provides independently adjustable controlled speed of operation in power loss conditions when used with an out of balance system such as might be needed in an emergency to attract or deploy a shutter or fire protection curtain.

The drive system described is shown operating directly on the roller but can also be arranged to transmit the power indirectly to an associated roller or other driven arrangement. Similarly the roller can be used to drive other mechanisms than the weighted curtain described.

The drive arrangement can incorporate limit switches whereby the motor will be stopped in selected raised and/or lowered positions, such limit switches can be arranged to be actuated during operation of the motor 11 or to control the actuation of the holding magnet 26. Such limit switches (not shown) can be incorporated into the drive arrangement in any convenient manner. The drive arrangement will include control means whereby the selected mode of operation of the drive motor 11, the holding magnet 26 and the limit switches can be effected.

The holding device 26 may also be mechanically, pneumatically or hydraulically operated. Similarly the motors 11 and slip rings 20 may be replaced by pneumatic or hydraulic drives and rotating unions.

Claims

1. A drive system characterised by a cylindrical housing (10), a drive motor (11) located within the housing (10) and having at one end an output drive shaft (14), a holding device (26) located towards the end of the housing (10) opposite to the drive shaft (14) whereby the motor housing can be selectively operated to a braked condition, and control means for actuating the motor (11) and the holding device (24) in the desired sequence of operation.

2. A drive system according to claim 1 characterised in that the drive motor (11) includes a brake (12) which brakes the motor when the motor is de-energised.

3. A drive system according to claim 1 or 2 characterised in that the housing (10) is located within a cylindrical roller (16) driven by the motor output shaft (14) and extending in the direction away from the holding device (26) for rotation of the roller (16) independently of the housing (10).

4. A drive system according to any one of the preceding claims characterised in that the motor (11) is coupled to the output drive shaft (14) through reduction gearing (13).

5. A drive system according to claim 3 characterised

in that the roller (16) encloses and is coaxial with the motor housing (10) and is rotatable relative to the housing (10) through bearing means (31) between the housing and the roller.

6. A drive system according to any one of the preceding claims characterised by a fixed mounting (18) rotatably supporting the housing (10), and power supply means (21, 22) for the motor passing from the mounting to the motor through rotatable connections (22).

7. A drive system according to claim 6 characterised in that the housing (10) is drivably connected to shaft means (23) extending in the opposite direction to the motor output shaft (14) and through the mounting (18), the holding device (26) being mounted on said shaft means (23).

8. A drive system according to claim 7 characterised by governor means (27) associated with said shaft means (23) and for limiting the speed of rotation of the housing (10) relative to the mounting (18).

9. A drive system according to claim 3 and any claim appendant thereto characterised in that the opposite end of the roller (16) from the drive motor (11) is associated with counter balance means (28).

10. A drive system according to any one of the preceding claims characterised in that the motor (11) is an electric motor supplied with an electrical power supply through the mounting (18) and through slip rings (22).

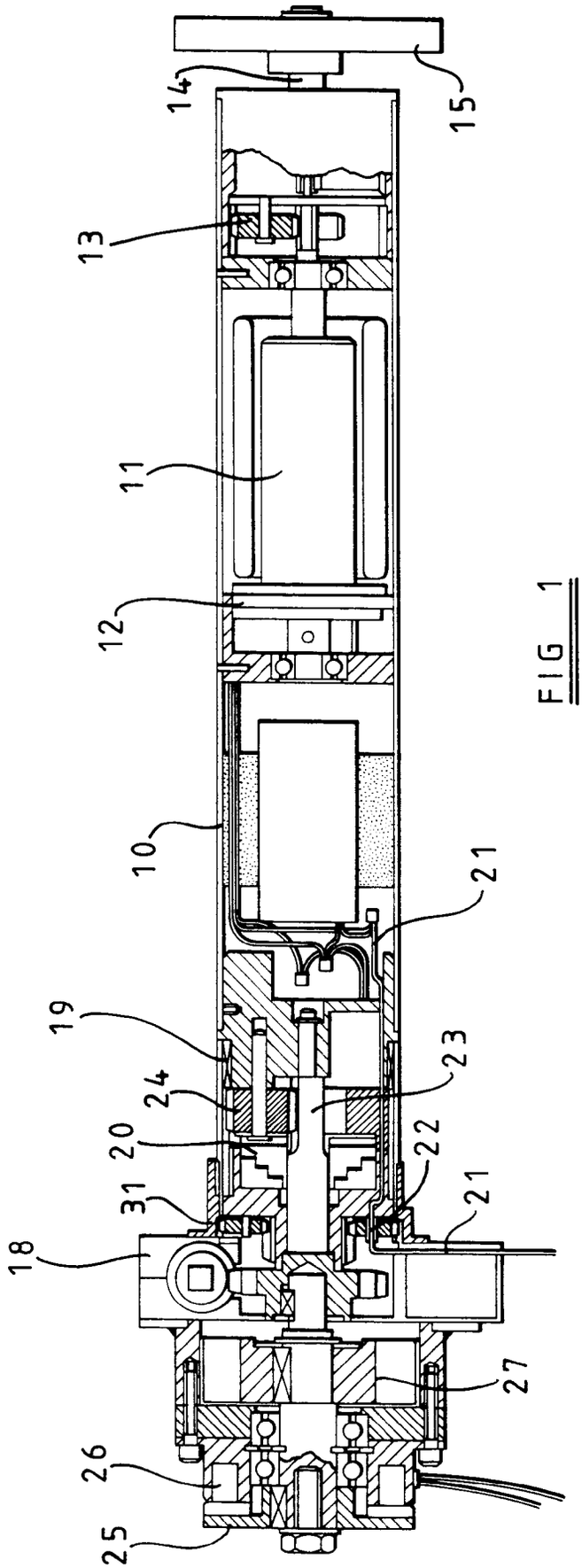

FIG 1

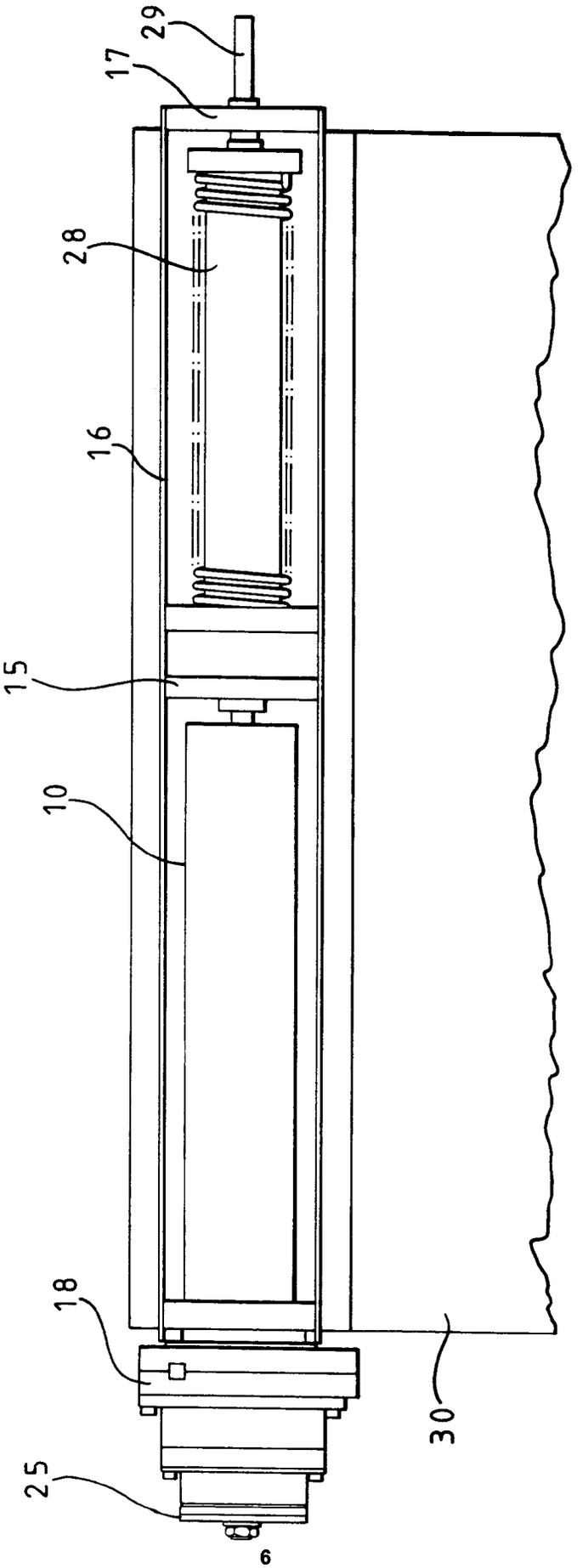

FIG 2