

PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Gear Transmission for Incorporation in a Constructional Toy.

I, ARTUR FISCHER, a German citizen, of Tumlingen, Kreis Freudenstadt, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a gear transmission for incorporation in a constructional toy.

Variable toothed gear transmissions are known in which the gears can be replaced by others, in order to vary the overall transmission ratio. Depending upon the toothed gears employed, the distances between shafts must then be changed accordingly. In transmissions of known type this is usually done by suitable compensating elements which receive the shafts supporting the gears. However, in the case of small transmissions and especially those intended for toy models it is not always easy to fit such compensating elements. Above all, in transmissions employed for toy models it is almost impossible to design these compensating elements with such dimensions and stability that they are capable of absorbing the forces generated in operation.

The present invention provides a gear transmission for incorporation in a constructional toy, said transmission consisting of a gear train including a plurality of transmission stages each of which comprises a driven and a driving gear coaxially mounted for common rotation, at least all the driving gears or all the driven gears of the transmission stages having the same external diameter, and each stage of the transmission being interchangeably mounted so that by removing any number of intermediate transmission stages and moving the output transmission stage so that its axis occupies the same predetermined position as a removed

intermediate stage, the overall transmission ratio of the gear transmission can be varied. 45

Such an arrangement provides a transmission system in which different transmission ratios can be obtained without the need for a compensation of the distances between shafts, in view of the fact that all the driving or all the driven gears are of identical size. Compensating elements thus become entirely superfluous, and this makes for a considerable simplification of the transmission system and its manufacture. All that has to be done to vary a given transmission ratio is to remove the toothed gears of one intermediate stage and replace them with the toothed gear associated with the output stage. Thus, the transmission system may comprise a different number of stages, depending upon the chosen transmission ratio. It is true that the position of the transmission output stage must vary according to the selected transmission ratio. However, in cases where the transmission is used in toy models this is of no practical importance because connecting parts can easily be adapted to the altered position of the output stage of the transmission. Since this transmission system is not a gear-shift mechanism, the transmission ratio once chosen for a certain model remains unaltered. When another toy model is built, the same transmission can easily be incorporated with a different transmission ratio. 75

According to one embodiment of the invention, the gears of each transmission stage are fixed to a common mounting shaft interchangeably arranged in a bore in a supporting frame, each bore having a radial projection or projections for making snap engagement with a circumferential groove in the shaft. This provides a very simple support for the shafts in the supporting frame, 85

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so that the shafts cannot escape from these bores even in arrangements where they point downwards.

To facilitate the snap-engagement of the projections in the corresponding recesses, the bores receiving the shafts may, be provided in hub elements axially slotted in the region of the radial projection or projections to promote resilient radial deformation of the bore.

The invention is illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a side elevation of a gear transmission according to the invention;

Fig. 2 is a plan view of the transmission system shown in Fig. 1; and

Fig. 3 a part sectional view of an example of a shaft-locking arrangement for use in a gear transmission as shown in Fig. 1.

In Figs. 1 and 2 a supporting frame for the gear transmission is indicated at 1. On one side thereof are provided bores 2 which receive shafts for supporting toothed gears 3 and 4. The input torque is conveyed to the gear train via a toothed gear 5 and is thus transmitted to the toothed gear 4 provided on the same shaft. The latter gear drives the gear 3 which is mounted on a common shaft with a gear 6. This gear 6 drives another gear 3 which has the same dimensions as the first-mentioned gear 3 and is mounted on a common shaft with a further gear 7. Finally, a last gear 3 connected to an output drive shaft 8 of the transmission system is driven by way of the gear 7.

In order to vary the transmission ratio, the stage comprising the driving gear 7, and the gear 3 associated therewith, may be removed. It is then replaced by the output stage comprising the drive shaft 8 together with the gear 3, so that the latter gear can mesh with the gear 6. The output stage 3, 8 may also replace the gear 6, so that the gear 3 of the output stage meshes directly with the driving gear 4 at the input of the transmission.

Since all toothed gears 3 have the same diameter, the distances between shafts need not be altered in any way when the various stages of the transmission system are changed.

Fig. 3 shows how, for example, the drive shaft 8 of the output stage of the transmission is mounted in the supporting frame 1. The bore 2 is provided in a hub element 9 positively connected to the frame 1. At the end of this hub element are provided internal projections 10 which engage a circumferential groove 11 on the shaft 8. This illustration also shows how the shaft 8 is connected to the toothed gear 3 by means of a pin 12. The non-hatched cross-sectional surfaces of the hub element 9 show that the

hub is slotted in the axial direction. This facilitates the snap-engagement of the projections 10 and the groove 11.

According to a modification of the above described embodiment of the invention (not shown), the input stage rather than the output stage of the transmission, together the toothed gear associated therewith, may be rendered interchangeable with the various other stages of the transmission, in order to obtain variations of the transmission ratio. Moreover, the transmission input and/or output may be of different design from that illustrated, and also the shape of the supporting frame may be altered to suit constructional requirements. It would be possible, for example, to arrange the toothed gear between two walls of the supporting frame. If desired, instead of the gears being fixed to shafts that are interchangeably mounted in the supporting frame, they may be interchangeably mounted upon shafts that are fixed in the supporting frame.

WHAT I CLAIM IS:—

1. A gear transmission for incorporation in a constructional toy, said transmission consisting of a gear train including a plurality of transmission stages each of which comprises a driven and a driving gear coaxially mounted for common rotation, at least all the driving gears or all the driven gears of the transmission stages having the same external diameter, and each stage of the transmission being interchangeably mounted so that by removing any number of intermediate transmission stages and moving the output transmission stage so that its axis occupies the same pre-determined position as a removed intermediate stage, the overall transmission ratio of the gear transmission can be varied.

2. A gear transmission as claimed in claim 1, in which the gears of each transmission stage are fixed to a common mounting shaft interchangeably arranged in a bore in a supporting frame, each bore having a radial projection or projections for making snap engagement with a circumferential groove in the shaft.

3. A gear transmission as claimed in claim 2, in which the said bores in the supporting frame are provided in hub elements axially slotted in the region of the radial projection or projections to promote resilient radial deformation of the bore.

4. A gear transmission for incorporation in a constructional toy, substantially as described herein with reference to the accompanying drawing.

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