Oct. 22, 1940. E. E. HARPER 2,219,040

SPEED CHANGER MECHANISM

Filed Dec. 24, 1938

Fig. 1.

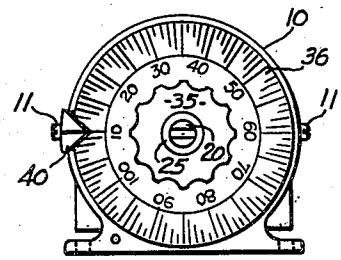


Fig. 2.

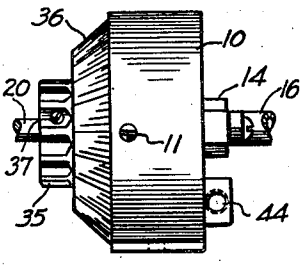


Fig. 3.

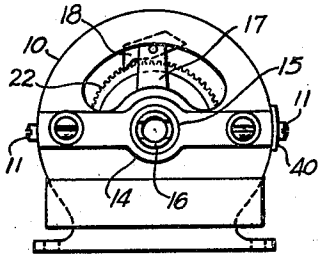


Fig. 5.

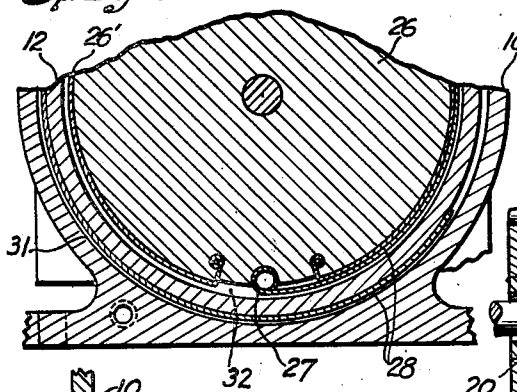


Fig. 4.

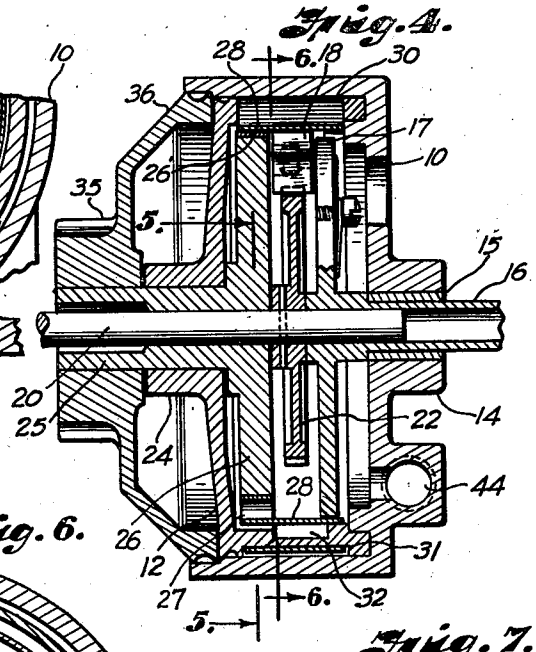


Fig. 8.

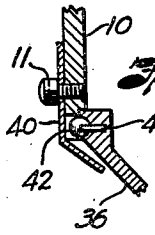


Fig. 6.

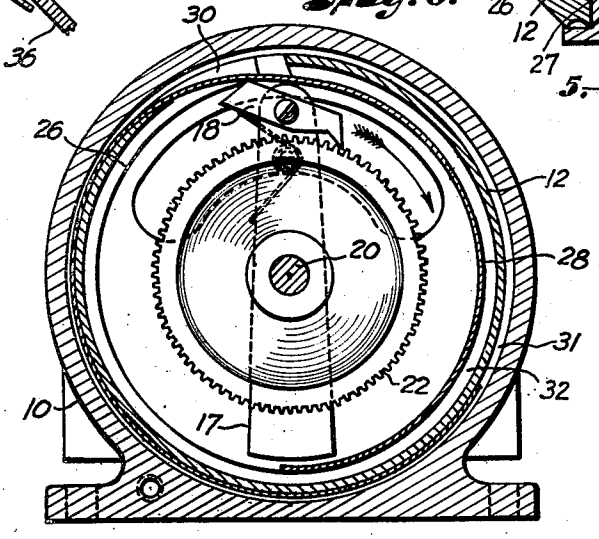
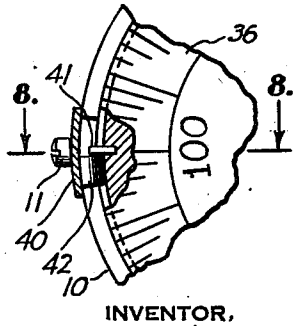


Fig. 7.



INVENTOR,
Elmer E. Harper,
BY Chas. W. Gerard.
ATTORNEY

Patented Oct. 22, 1940

2,219,040

UNITED STATES PATENT OFFICE

2,219,040

SPEED CHANGER MECHANISM

Elmer E. Harper, Kansas City, Mo.

Application December 24, 1938, Serial No. 247,560

1 Claim. (Cl. 74—125.5)

The present invention relates to speed changer mechanisms, and an important object in view is to devise improvements in the means for controlling or varying the rate of transmission so as to preserve and carry out the speed-changing function uniformly throughout the range of the drive afforded by the driving member.

For this purpose I have devised a speed changer construction having driving and driven members connected by drive transmission elements which are intermittently engageable for the drive transmitting function and provided with improved control means adapted to vary the drive relation between the elements for obtaining a range of speed ratios varying from a zero, or no-drive relation, to a full speed or direct-drive relation between said driving and driven members.

As one preferred form of construction, I employ a ratchet drive arrangement with a novel control means for controlling the drive or operative interval of the ratcheting action so as to eliminate any period of lost motion in the operation of the drive member when said operation is being carried out at or near the maximum rate of output speed.

With the foregoing general objects in view, the invention will now be described with reference to the accompanying drawing illustrating one of such preferred forms of the improved construction, after which those features deemed to be novel and patentable will be particularly set forth and claimed.

In the drawing:

Figures 1, 2, and 3 are front, side, and rear elevations, respectively, showing a speed changer device constructed in accordance with the present invention;

Figure 4 is a central vertical view of the same on an enlarged scale;

Figures 5 and 6 are other sectional views representing sections taken on the lines 5—5 and 6—6, respectively, of Figure 4;

Figure 7 is a fragmentary detail view (on a still larger scale) of a portion of the regulating member; and

Figure 8 represents a section taken on the line 8—8 of Figure 7.

Referring to the said drawing in detail, the improved construction is illustrated as comprising a main outer housing member 10, within which is fitted an inner housing member 12, held in place by screws 11. The housing 10 is formed with a bearing 14 fitted with a bushing 15 for journalling the input drive member comprising a hollow shaft connection 16 provided with a pawl-carrying arm 17 on which is mounted a pawl or driving element 18. The output or driven member comprises a shaft connection 20, one end of which is journaled in the bore of the shaft connection 16 and carries a ratchet wheel 22 arranged in the path of movement of the pawl 18.

The central hub portion 24 of the housing 12 provides a bearing for a hollow stem or journal 25, which in turn provides a bearing for the outer end of the shaft connection 20 and also a rotary mounting for a disk 26 forming part of the means for controlling the period of the drive relation between the pawl 18 and said ratchet wheel 22. For this purpose, the disk 26 has attached thereto, at 27, one end of a ribbon or shield 28 which is coiled around the periphery of the disk (encircled by a smooth finishing band 26' attached to said periphery) and also through an opening 30 into a channel 31 formed in the outer side of the cylindrical portion of the housing 12, as clearly illustrated in Figures 4–6. The disk 26 is slightly smaller in diameter than the inside of the housing 12 and the construction is therefore such that by rotation of the disk the ribbon 28 may be fed to different extents through said opening into the path of the tail of the pawl 18 for disengagement of the latter from the ratchet wheel 22, as represented in Figure 6. The interior of the cylindrical portion of the housing 12 is also formed with a groove or channel 32 surrounding the path of travel of the pawl 18 for providing clearance for the pawl's movements for making operative or driving engagement with the wheel 22, when permitted to do so according to the adjustment of said ribbon 28. The length of said ribbon is sufficient to extend into operative or pawl-engaging position throughout the complete travel of the pawl, as will be apparent from Figure 6.

The adjusting movement for changing the position of said ribbon 28, as required for controlling the action of the driving pawl, is effected by means of a knob 35 on a dial member 36 attached by suitable screws 37 upon the outer end of the stem or journal 25, said dial member fitting in the cylindrical portion of the housing 10.

It will be apparent from the illustrated construction, as described in the foregoing, that upon connection of the drive shaft 16 with an appropriate source of power, the rate of drive transmitted therefrom through the pawl 18 to

the ratchet gear **22** will depend upon the setting of the ribbon or shield **28** and the extent of said ribbon which is located in position for operative engagement with the tail of the pawl element **18**, as represented in Figure 6. It will be understood that the pawl **18** remains in operative driving engagement with relation to the gear or wheel **22** so long as the tail of the pawl is unaffected by or entirely out of engagement with the ribbon **28**; therefore as represented in Figure 6, the pawl remains out of driving engagement with the wheel **22** during the interval of travel, in the direction of the arrow, from the position shown in said Figure 6 until the tail of the pawl passes out of engagement with the end of the ribbon **28** (shown near the bottom of Figure 6), after which for the remainder of the pawl's travel, or until it again becomes engaged with the ribbon or shield (as at the top of Figure 6) it will be permitted to engage in driving relation with the wheel **22**, and thereby drive the shaft element **20** during the same interval of said pawl's engagement with the wheel **22**. It is furthermore obvious from the construction, as illustrated, that the ribbon or shield **28** may be adjusted for the purpose of varying the extent of the operative period or interval of the pawl's engagement with the wheel **22** for obtaining any fractional interval of operation, from zero or no-drive relation, as represented by the position of the ribbon **28** in which it is extended entirely around the disk **26** or throughout the path of the pawl **18**, up to and including the position in which the ribbon is entirely retracted from the path of the pawl's travel, as obtained by the reverse adjustment in which the ribbon is withdrawn substantially completely within the channel **31**, for excluding all engagement with the tail of the pawl, and allowing the latter to remain continuously in operative engagement with the ratchet wheel **22**,—such position representing the adjustment for maximum full-speed or direct-drive relation between the input and output drive shaft connections.

It is of course apparent that the principle of the speed changing function, employing a ratcheting arrangement, is not in itself novel, but all prior constructions so far as known to applicant have involved some period of lost output motion when operating at the maximum rate of output speed, due to the fact that the necessary provisions were not made for obtaining the maximum or full-speed or direct-drive relation between the driving and driven members.

As a means for guiding the operator in obtaining the desired ratio of input and output speeds, the face of the dial member **36** may be appropriately calibrated for use with an index element **40** carried by one of the screws **11**, in connection with which suitable limiting stop means may be provided, such as a pin **41** engaging a spacer **42** retained in place by the index **40** with relation to the margin of the disk **36**, for denoting an initial position as represented by the number **100** on the dial, and which may conveniently be made to correspond to the maximum output speed operation of the device, wherein the pawl **18** is maintained continuously in engagement with the ratchet wheel **22**. Other settings of the device for regulating the ratio of the output speed with relation to the input speed will then correspond to the other markings of the dial when it is turned into various positions as, for example, in a range between zero and **100** and corresponding to as many intermediate speed ratios which are to be obtained by the setting of the dial, and the corresponding adjustment of the ribbon or shield **28**, as above explained.

A suitable lubricating passage **44** may be provided in the housing member **10**, as represented in Figures 2 and 4, for the attachment of any desired form of lubricating device for feeding a lubricant into the chamber inside housing member, for obvious purposes.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction, combination and arrangement of parts may be made without departing from the spirit and scope of my invention, as defined by the following claim.

Having described my invention, what I claim is:

A speed changer device comprising a driving member and a driven member, a ratchet wheel in driving relation to said driven member and having external outwardly projecting ratchet teeth, a ratchet pawl actuated from said driving member and traveling in a path outside the periphery of said ratchet wheel and adapted for engagement with said teeth, and control means comprising a smooth flexible and continuous ribbon mounted for adjusting movement in a helical path outside the path of said pawl and adapted to be projected various extents into the path of the tail portion of the pawl for intercepting said tail portion and retracting the pawl from engagement with the ratchet teeth and thereby interrupting the drive to said driven member during such periods of disengagement of said pawl.

ELMER E. HARPER.