

Aug. 17, 1965

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3,200,918

OVERRUNNING CLUTCH

Filed April 3, 1963

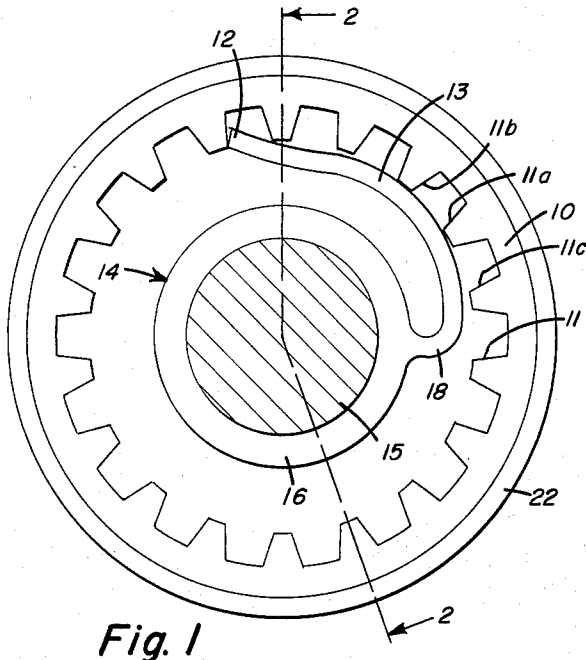


Fig. 1

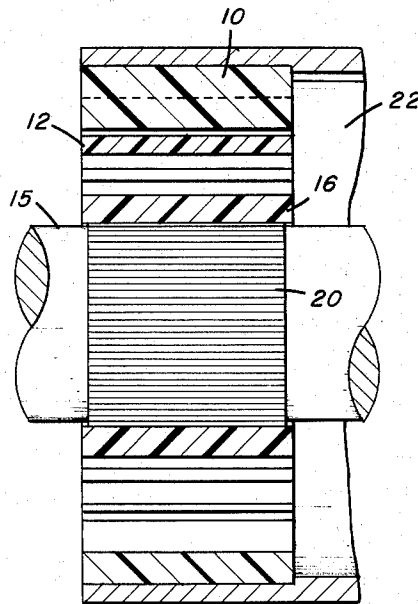


Fig. 2

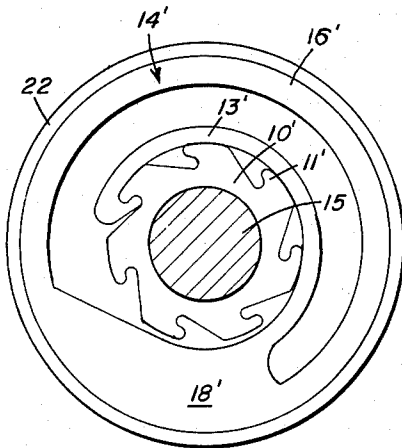


Fig. 3

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3,200,918 OVERRUNNING CLUTCH

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Filed Apr. 3, 1963, Ser. No. 270,364
1 Claim. (Cl. 192-46)

This invention relates to an overrunning clutch and, more particularly, to a unidirectional ratchet and pawl clutch.

In the art of unidirectional overrunning clutches, many devices use friction or ratchet drive arrangements, wherein the parts are made of metal which will withstand repeated and substantial flexing. However, with the present economic trends and technological improvements, it is feasible to use substantially different materials, such as plastics. Moreover, certain environments, such as acids or other chemicals, are destructive of metals suitable for this use but ineffective against certain plastics. Such environments may be found in many chemical processing equipments including photographic film processors. On the other hand, plastics usually will not withstand equivalent flexing and will not provide similar drive characteristics compared to a metal, whereby substantially different arrangements are most feasible.

Therefore, an object of my invention is to provide a simple and reliable overrunning clutch.

In accordance with one embodiment of my invention, a pawl is provided with a drive arm having a substantial length and being formed so that a major portion of the length thereof is supported by the ratchet teeth drivable by the pawl. The added length results in a distributed flexing with a resultant decrease in fatigue, while the auxiliary support by the ratchet teeth enhances the effective drive force attainable.

The subject matter which is regarded as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. The invention, however, as to its organization and operation together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawing in which:

FIG. 1 is a plan view of one embodiment of the present invention;

FIG. 2 is a cross-sectional view taken along line 2-2 of FIG. 1; and

FIG. 3 is a plan view of another embodiment of the present invention.

I have shown in FIG. 1 a gear shown as a ring gear ratchet 10 having inwardly projecting teeth 11 engageable by the tip 12 of a drive arm 13. The drive arm 13 is a portion of a pawl arrangement 14 secured to a drivable shaft 15 by a sleeve portion 16. Because of the sharp bend in an arm support region 18 of the drive arm 13, I prefer that the pawl be formed by a process such as injection molding with a configuration, wherein a bend in the arm support region 18 is provided initially so that a major portion of the drive arm 13 is closely adjacent to the ratchet teeth 11 when the tip 12 is in the driving position. Thus, the drive arm 13 obtains substantially auxiliary support from the ring gear ratchet 10.

As illustrated in FIG. 1, the ratchet tooth 11b is presently supporting the central section of the drive arm 13. Increased driving pressure tends to result in additional sup-

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port from the ratchet teeth 11a and 11c. By this interdependence of support, the drive arm 13 may be substantially longer than its thickness would dictate if it were unsupported. A shorter length allowing a self-supporting drive arm increases fatigue problems, especially when using plastics as are suitable for reliable operations within solutions which tend to dissolve or oxidize metals.

Referring now to FIG. 2, the pawl sleeve 16 is drivingly coupled to the shaft 15 by a press fit over a knurled region, as indicated at 20. Thus, rotation of the shaft 15 in a counterclockwise direction (FIG. 1) drives the ring gear ratchet 10 and thereby drives an outer shaft or roller 22 secured thereto. It should be noted that the roller 22 overlaps the shaft 15 in the region of the pawl 14. At such time as the outer roller 22 tends to rotate faster than the shaft 15, the driving connection between the tip 12 and one of the ratchet teeth 11 is released, whereby the tip 12 slides over consecutive teeth with the length of the drive arm 13 enhancing a relatively soft and quiet operation and resulting in a lower overdrive torque. The low overdrive torque is a particularly valuable characteristic when the roller 22 is used to transport films and the like during a developing process. It should also be noted that the ratchet teeth 11 are individually symmetrical so that the pawl 14 may drive the ring gear ratchet 10 and its roller 22 in either direction in accordance with placement of the pawl 14 on the shaft 15.

While FIGS. 1 and 2 illustrate an arrangement wherein the central portion of the drive arm 13 is supported by gear teeth which prevent its outward deflection, the present invention is also usable in constructions where the ratchet lies inside the pawl sleeve 16.

Referring now to FIG. 3, one such arrangement is shown wherein a sleeve 16' of a pawl 14' is supported within the roller 22. An elongated drive arm 13' couples a drive tip 12' to an arm support region 18'. During driving of the roller 22 by the shaft 15, a major portion of the drive arm 13' is supported by gear teeth 11'.

In this arrangement, since the drive arm 13' is under tension during use, the drive tip 12' and the gear teeth 11' are provided with an interlocking configuration. Also, to alleviate stress concentration problems, sharp corners of the driving elements have been eliminated by use of an S-shaped mating surface. As in FIG. 1, when the shaft 15 is rotated counterclockwise, a driving connection is established between the gear 10' and the sleeve 16'. Similarly, when the torsional forces are reversed, the tip 12' moves from tooth to tooth without developing substantial driving force because of the length of the arm 13' and the distribution of the flexing thereover. Another feature of the illustrated embodiment of FIG. 3 is the substantial increase of the thickness of the arm support region 18' to alleviate any problem of the portion of the sleeve thereunder being pulled loose from the roller 22 by the driving force developed therebetween.

While I have shown and described particular embodiments of the present invention, other modifications may occur to those skilled in this art. I intend, therefore, to have the appended claim cover all modifications which fall within the true spirit and scope of my invention.

I claim:

An overrunning ratchet drive clutch, for selectively coupling two coaxial shafts having an overlapping region comprising:

a pawl sleeve removably secured to the inner shaft within the overlapping region;

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a ratchet gear secured to the other shaft concentric with said pawl sleeve, with teeth thereof extending inward toward and spaced from said pawl sleeve; and

a drive arm of resilient material and of generally uniform thickness in the radial direction along its length in the region of its tip, said arm being of unitary construction with and extending from said pawl sleeve across said space and being of sufficient length and resiliency to lie along and substantially in sliding contact with at least one of said teeth and said arm being provided with a reverse bend so that its tip engages a single tooth to impart driving force from

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one shaft to the other in one direction of rotation of the driving shaft.

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