Oct. 16, 1962 J. RASCHLE 3,058,289

TWISTING DEVICE

Filed Oct. 31, 1961 2 Sheets-Sheet 1

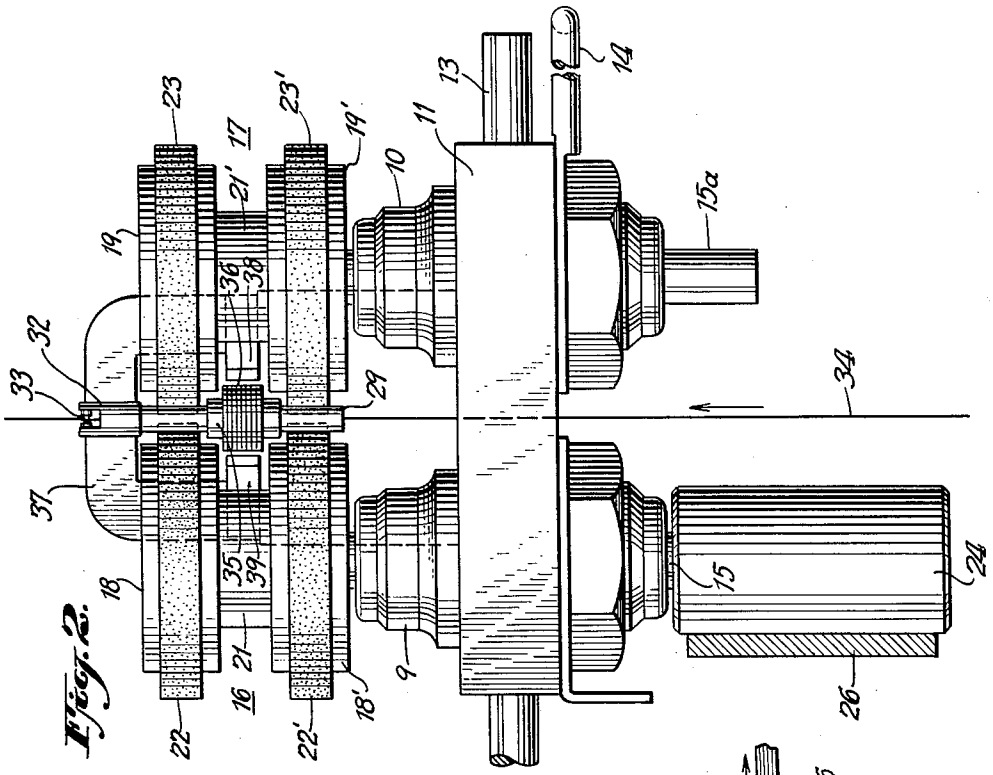


Fig. 2.

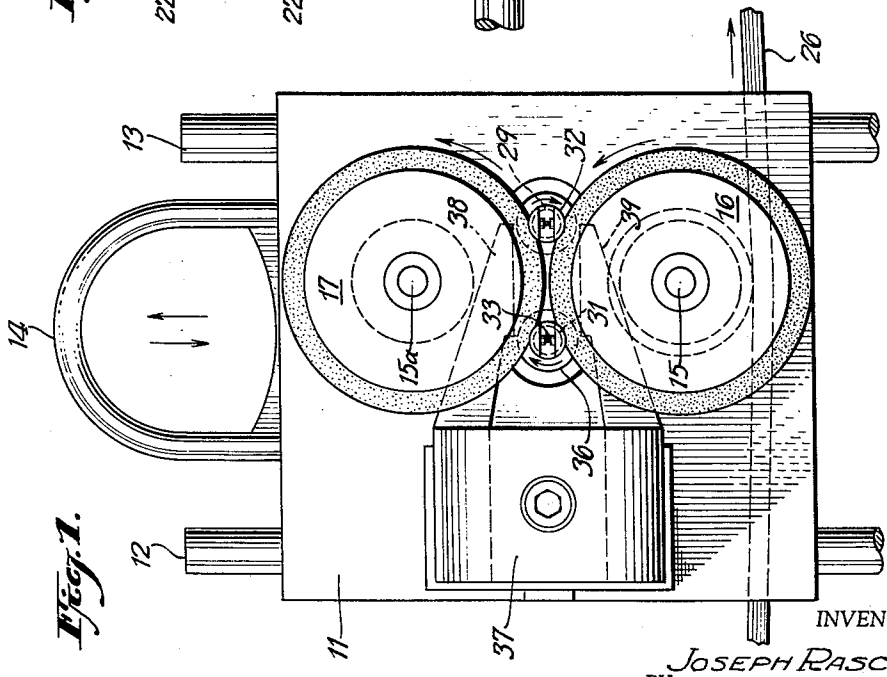


Fig. 1.

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Oct. 16, 1962 J. RASCHLE 3,058,289

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Filed Oct. 31, 1961 2 Sheets-Sheet 2

Fig. 3.

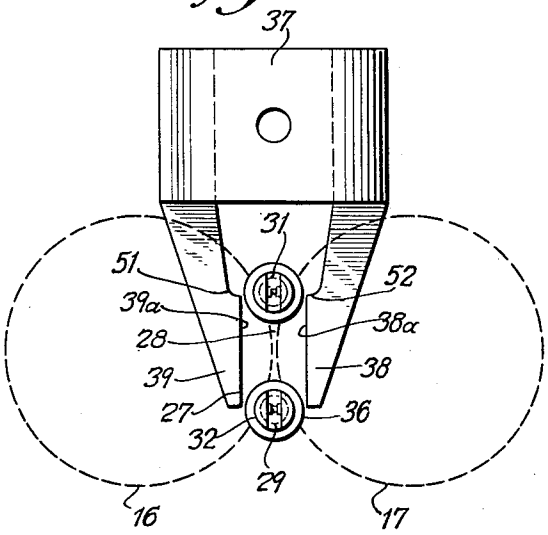


Fig. 4.

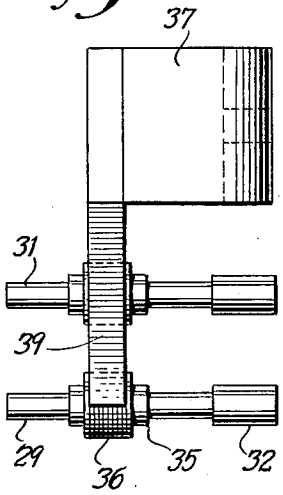


Fig. 5.

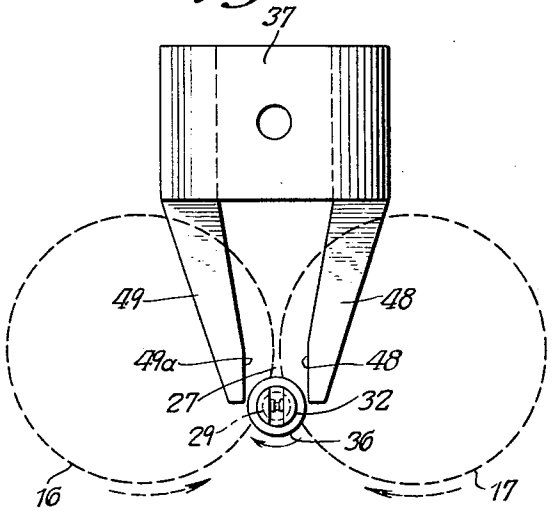
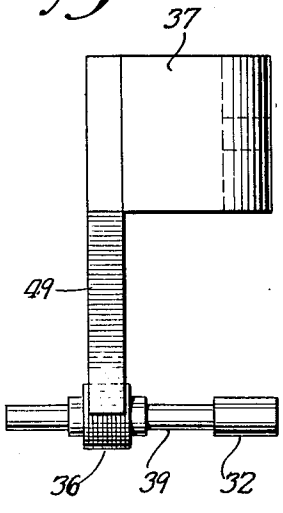


Fig. 6.



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TWISTING DEVICE

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8 Claims. (Cl. 57—77.3)

This invention relates to apparatus for imparting rotary motion to a twisting element. The device is especially useful for imparting a twist to a running length of textile yarn, referred to in the art as false twisting, and the present invention will be further described as it relates to an apparatus for false twisting textile yarns.

In a related copending application of August Kunzle and Willy Roth, Serial No. 850,908, filed November 4, 1959, there is described and illustrated a false twisting device comprising a pair of axially parallel rollers, one of which is driven, which are spaced one from the other to form a crotch or throat therebetween. A twisting tube is positioned in this crotch in frictional engagement with the peripheral edges of the rollers. The roller edges comprise outwardly extending flange pairs which may be in aligned or staggered relationship. Magnetic means are provided for acting upon a magnetically permeable portion of the twisting tube thereby maintaining the tube in the crotch or throat between rollers in close frictional engagement with the roller edges.

The magnetic means illustrated in said Kunzle et al. application is either a bar magnet or a horseshoe magnet, and in both instances the pole pieces are so positioned that the twisting tube is attracted toward the end or an effective end thereof, with provision for an air gap between twisting tube and pole piece. Experience directs that this air gap not exceed about 0.5 mm. in order to assure the attainment of maximum rotary speeds by the twisting tube.

It will be appreciated that such a small air gap is subject to change upon expansion and/or contraction of certain parts of the apparatus as a result of temperature changes, and the gap will definitely be reduced through wear of the bearings supporting the rollers as well as wear on the peripheral edges of these rollers. As a result of wear the air gap between the twisting tube and the pole pieces of the magnet will ultimately be reduced to the point where virtually no gap exists, with resulting point friction between the pole pieces and the twisting tube which will appreciably slow down the rotary motion of the tube. It will then be necessary to adjust the position of the pole pieces to re-establish the desired air gap.

It is an object of the present invention to provide an improved apparatus of the general type illustrated in the aforementioned Kunzle et al. application wherein adjustment of the pole pieces to compensate for the aforementioned expansion, contraction and wear is unnecessary. It is a further object of the present invention to provide improved magnetic pole piece configuration, positioning and arrangement in an apparatus employing magnet means to position a high speed twisting element in frictional engagement with a rotating driving roller. It is a still further object of the present invention to provide an apparatus as above generally described which is capable of imparting rotary motion to one or a pair of twisting elements.

The apparatus in accordance with the present invention broadly comprises a pair of rollers, one driven and one idler, which are so spaced from one another to form a crotch or throat between them. An elongated twisting element which has a magnetically permeable portion is positioned in the crotch in frictional engagement with

the peripheral edges of the rollers by means of a magnet acting upon the magnetically permeable portion of the twisting element. The magnetic means employed comprises a pair of pole pieces the opposed faces of which are planar and substantially parallel. The parallel faces of the pole pieces are spaced from one another a distance at least equal to the maximum thickness of the magnetically permeable portion of the twisting element plus the sum of the desired air gaps between said portion and each respective pole face.

The rollers are arranged so that their axes are substantially parallel. Each roller preferably is made up of two spaced discs or flanges and the flanges of each roller or the rollers are so arranged that the flanges are in aligned relationship. The crotch or throat above referred to between the effective outer edges of the rollers is of a length defined by the distance between the spaced flanges of each roller. Two such crotches in fact exist as will be described in detail hereinafter.

The opposed parallel faces of the pole pieces extend from a point adjacent the axis of the twisting element, which point is preferably the end of each pole piece, in the direction of narrowing of the crotch. Where the apparatus is employed to impart rotary motion to a single twisting element, the spaced parallel surfaces of the pole faces extend in the direction of the narrowing of the crotch a distance at least equal to the radius of the twisting element at its magnetically permeable portion, and preferably to a plane passing through the roller axes. In the embodiment of the present invention wherein two twisting elements are caused to rotate, one in each crotch between the rollers, the length of the spaced parallel faces of the pole pieces is preferably substantially equal to the distance between the axes of the respective twisting elements.

For a further complete description of two preferred embodiments of the present invention, reference will now be had to the accompanying drawings wherein:

FIG. 1 is a plan view of one embodiment of a false twisting device in accordance with the present invention;

FIG. 2 is an elevation of the apparatus of FIG. 1;

FIG. 3 is a partial plan view of the apparatus of FIG. 1 illustrating the relationship between magnet, pole pieces and twisting elements;

FIG. 4 is a side elevation of the apparatus of FIG. 3;

FIG. 5 is a plan view of another embodiment of the apparatus of the present invention illustrating the relative positions of magnet, pole pieces and a single twisting element, and

FIG. 6 is a side elevation of the apparatus of FIG. 5.

Referring now to a preferred embodiment of the present invention illustrated in FIGS. 1–4, a carrier plate **11** is mounted on suitable carrier means, for example bars **12** and **13** and provided with a suitable handle **14** for engaging or disengaging movement as indicated by the arrows in FIG. 1. Locking means, not shown, secure plate **11** in the desired engaging or disengaging position. Carrier plate **11** is provided with a pair of openings, through which pass shafts **15** and **15***a* which are rotatably mounted in bearing assemblies indicated generally at **9** and **10**, respectively, in FIG. 2. Roller assemblies indicated generally at **16** and **17** are suitably secured to the upper end of each of the respective shafts. The roller assemblies each comprise a pair of discs or flanges **18**, **18′** and **19**, **19′**, which are maintained in spaced apart relationship on each assembly by means of spacer elements **21** and **21′**. Each flange is provided with a tire or rim **22**, **22′**, **23**, **23′** which is constructed of a material having a high coefficient of friction with respect to the material of the twisting element in contact therewith. The rims are preferably a modified natural or synthetic rubber.

The lower end of shaft **15** is provided with a friction collar **24** which engages a moving belt **26** when the apparatus is in the engaging or operating position illustrated in FIGS. 1 and 2.

The roller assemblies are so arranged that the flanges of each are in aligned relationship with those of the other roller. Roller assemblies **16** and **17** are so positioned and spaced apart as to provide an inner and an outer crotch or throat therebetween. The outer crotch **27** is on one side and the inner crotch **28** on the other side of a plane passing through the roller assembly axes. See FIG. 3. The edges of crotches **27** and **28** are defined by the peripheries or rims of the aligned roller flanges, with the effective length of the crotches being limited by the upper and lower extremities of rims **22**, **23** and **22'**, **23'**, respectively.

In the embodiment of FIGS. 1–4 a pair of twisting elements **29** and **31** are disposed in crotches **27** and **28**, respectively, in peripheral contact with the rims of roller assemblies **16** and **17**. The axes of twisting elements **29** and **31** are substantially parallel and also parallel to the axes of the roller assemblies. In the embodiment illustrated twisting elements **29** and **31** are textile yarn false twisting tubes. The tubes are identical and each is provided with a forked upper end or head **32** into which is inserted a pin **33** of a hard material, e.g. sapphire, which is disposed transversely of the axis of rotation of the tube. A textile filament **34** which is to be treated is drawn from a supply device, not shown, passed through an aperture in plate **11** and then conducted through rotating tube **29**, wound once around pin **33** and thence to a take-up device, not shown. A similar filament, not shown, is lead through tube **31**.

The twisting element or rotating tubes **29** and **31** are each provided with a generally centrally disposed portion of high magnetic permeability. Each tube is provided with a portion **35** of increased diameter upon which is mounted a mass of high permeability, low loss magnetic material **36**. This magnetically permeable portion **36** is preferably formed of a plurality of juxtaposed discs of low loss sheet iron.

The twisting tubes are maintained in the crotches in the positions indicated in FIGS. 1–4 under the influence of magnetic means indicated as a horseshoe magnet **37**. The tubes rotate in response to rotation of the driven roller **16** in the directions indicated by the arrows in FIG. 1. Magnet **37** is provided with pole pieces **38** and **39** which extend into the space between rimmed flanges **18**, **18'** and **19**, **19'** of roller assemblies **16** and **17**, respectively. It will be observed from FIGS. 1 and 3 that pole pieces **38** and **39** most closely approach each other in the area of crotches **27** and **28**. Attention is particularly directed to FIGS. 2 and 3 where it is seen that in the aforesaid area between crotches the pole pieces possess planar surfaces or faces **38***a* and **39***a*, respectively, which are parallel to one another. The parallel planar faces **38***a* and **39***a* are of length substantially equal to the distance between the axes of twisting tubes **29** and **31**, as clearly shown in FIG. 3. From FIGS. 2 and 4 it will be seen that the highly magnetically permeable portion **36** of each twisting tube is substantially aligned with pole pieces **38** and **39**, and an air gap is provided between each pole face and the magnetically permeable portion of the twisting tube. The distance between pole faces **38***a* and **39***a* is equal to the maximum thickness or diameter of the magnetically permeable portion of the twisting tube plus the desired air gap between portion **36** and each pole face. In a preferred embodiment of the present apparatus the air gap between each pole face and the magnetically permeable portion **36** of the twisting tube is about 0.3 mm.

While a permanent horseshoe magnet is shown disposed at right angles to extending pole pieces, this arrangement is in the interest of conserving space. Electromagnetic means may be employed to induce the desired magnetic field between the parallel pole faces, if desired.

Referring now to the embodiment of FIGS. 5 and 6, it will be seen that rotary motion is imported to only one twisting element, namely twisting tube **29**, which is positioned in the outer crotch **27** between roller assemblies **16** and **17** in close frictional engagement therewith. In this embodiment the parallel planar faces **48***a* and **49***a* of pole pieces **48** and **49**, respectively, are of foreshortened length, extending from a point adjacent the axis of the twisting tube **29**, that is from the effective end of the respective pole pieces, in the direction of the plane passing through the axes of roller assemblies **16** and **17**. Preferably they extend back into the crotch a distance equal to the depth thereof or in other words to this plane. Their parallel length should be at least equal to the radius of portion **36** of the twisting element. Pole faces **48***a* and **49***a* are spaced apart as in the embodiment of FIGS. 1–4, that is a ditance at least equal to the diameter of magnetically permeable portion **36** of the twisting tube plus the desired air gap between each pole and that portion of the twisting tube.

In order to assure that maximum force may be employed to position the twisting tube most securely in the crotch or crotches between rollers, it is important that the maximum field existing between the pole pieces extend not substantially beyond the axis of the twisting element, that is to say, the field beyound the axis in the direction of widening of the crotch should be of lower strength than the magnetic field between the twisting element axis and the narrowest portion of the crotch. To this end it will be observed that in both embodiments illustrated the pole pieces do not extend beyond the axis of the twisting element in the outer crotch. In the embodiment of FIGS. 1–4 the pole pieces are cut back as at **51** and **52** just inside the axis of twisting tube **31** in inner crotch **28** to produce a magnetic field of lower intensity toward the outer end of the crotch.

By reason of the fact that the pole faces are substantially planar, spaced from one another and arranged in parallel relationship in the apparatus of the present invention, it will be seen that as wear occurs upon the bearings or upon the rims of rollers **16** and **17** thus causing the crotches to widen slightly and the spindles to move toward one another the same air gap will be maintained between each face and the magnetically permeable portion of the twisting element.

I claim:

1. Apparatus for imparting rotary motion to a twisting element, which comprises a pair of rollers, at least one of which is driven, spaced one from the other to form a crotch therebetween, an elongated twisting element, having a magnetically permeable portion, positioned in said crotch in frictional engagement with the peripheral edges of said rollers, and magnetic means comprising a pair of opposed pole pieces the opposed faces of which are substantially parallel to each other and to the longitudinal axis of said twisting element, said opposed faces being spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, said opposed pole pieces acting magentically upon said twisting element maintaining the same in said position and frictional engagement.

2. Apparatus for imparting rotary motion to a twisting element, which comprises a pair of bi-flanged rollers, at least one of which is driven, spaced one from the other to form a narrowing crotch therebetween, an elongated twisting element, having a magnetically permeable portion, positioned in said crotch in frictional engagement with the peripheral edges of the flanges of said rollers, and magnetic means comprising a pair of opposed pole pieces positioned intermediate said rollers, the opposed faces of which pieces are substantially parallel and spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion

of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, the spaced parallel faces of said pole pieces extending in the direction of narrowing of said crotch, said opposed pole pieces acting magnetically upon said twisting element maintaining the same in said position and frictional engagement.

3. Apparatus for imparting rotary motion to a twisting element which comprises a pair of rollers, at least one of which is driven, each comprising a pair of spaced flanges, said rollers being spaced one from the other with the flanges of each roller in aligned relationship to form a narrowing crotch therebetween, an elongated twisting element, having a magnetically permeable portion, positioned in said crotch in frictional engagement with the peripheral edges of the roller flanges, and magnetic means comprising a pair of opposed pole pieces positioned intermediate the aligned flange pairs, the opposed faces of which pieces are substantially parallel and spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, the spaced parallel faces of said pole pieces extending from a point adjacent the axis of the twisting element in the direction of narrowing of said crotch, said opposed pole pieces acting magnetically upon said twisting element maintaining the same in said position and frictional engagement.

4. Apparatus for imparting rotary motion to a twisting element which comprises a pair of axially parallel rollers, at least one of which is driven, each comprising a pair of spaced flanges, said rollers being spaced one from the other with the flanges of each in aligned relationship to form a narrowing crotch therebetween, a substantially cylindrical twisting element, having a magnetically permeable portion, positioned in said crotch in frictional engagement with the peripheral edges of said roller flanges and in axially substantially parallel relation with said rollers, and magnetic means comprising a pair of opposed pole pieces positioned intermediate the aligned flange pairs, the opposed faces of which pieces are substantially parallel and spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, the spaced parallel faces of said pole pieces extending from a point adjacent the axis of the twisting element in the direction of narrowing of said crotch a distance at least equal to the radius of the twisting element at its magnetically permeable portion, said opposed pole pieces acting magnetically upon said twisting element maintaining the same in said position and frictional engagement.

5. Apparatus for imparting rotary motion to twisting elements, which comprises a pair of rollers, at least one of which is driven, spaced one from the other to form a pair of crotches therebetween, a twisting element having a magnetically permeable portion, positioned in each of said crotches in frictional engagement with the peripheral edges of said rollers, and magnetic means comprising a pair of opposed pole pieces the opposed faces of which are substantially parallel to each other and to a plane including the longitudinal axes of said twisting elements, said opposed faces being spaced one from the other a distance at least equal to the maximum thickness

of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, said opposed pole pieces acting magnetically upon said twisting elements maintaining the same in said positions and frictional engagement.

6. Apparatus for imparting rotary motion to twisting elements, which comprises a pair of rollers, at least one of which is driven, each comprising a pair of spaced flanges, said rollers being spaced one from the other with the flanges of each roller in aligned relationship to form a pair of opposed crotches between the rollers, an elongated twisting element, having a magnetically permeable portion, positioned in each of said crotches in frictional engagement with the peripheral edges of the roller flanges, and magnetic means comprising a pair of opposed pole pieces positioned intermediate the aligned flange pairs, the opposed faces of which pieces are substantially parallel and spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, the spaced parallel faces of said pole pieces extending from a point adjacent the axis of one twisting element to a point adjacent the axis of the other twisting element, said opposed pole pieces acting magnetically upon said twisting elements maintaining the same in said positions and frictional engagement.

7. Apparatus as set forth in claim 6 wherein the length of the spaced parallel faces of said pole pieces is less than the distance between the axes of the twisting elements.

8. Apparatus for imparting rotary motion to twisting elements, which comprises a pair of axially parallel rollers, at least one of which is driven, each comprising a pair of spaced flanges, said rollers being spaced one from the other with flanges of each roller in aligned relationship to form a pair of opposed crotches between the rollers, a substantially cylindrical twisting element, having a magnetically permeable portion, positioned in each of said crotches in frictional engagement with the peripheral edges of the roller flanges and in axially substantially parallel relation with said rollers, and magnetic means comprising a pair of opposed pole pieces positioned intermediate the aligned flange pairs, the opposed faces of which pieces are substantially parallel and spaced one from the other a distance at least equal to the maximum thickness of the magnetically permeable portion of said twisting element plus the sum of the desired air gaps between said portion of the twisting element and each respective pole face, the spaced parallel faces of said pole pieces being of a length at least substantially equal to the distance between the axes of the twisting elements and substantially spanning the distance between said elements in their aforesaid positions, said opposed pole pieces acting magnetically upon said twisting elements maintaining the same in said positions and frictional engagement.

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