Aug. 6, 1929. W. B. BRONANDER 1,723,327

VARIABLE DRIVE MECHANISM

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Fig. 1,

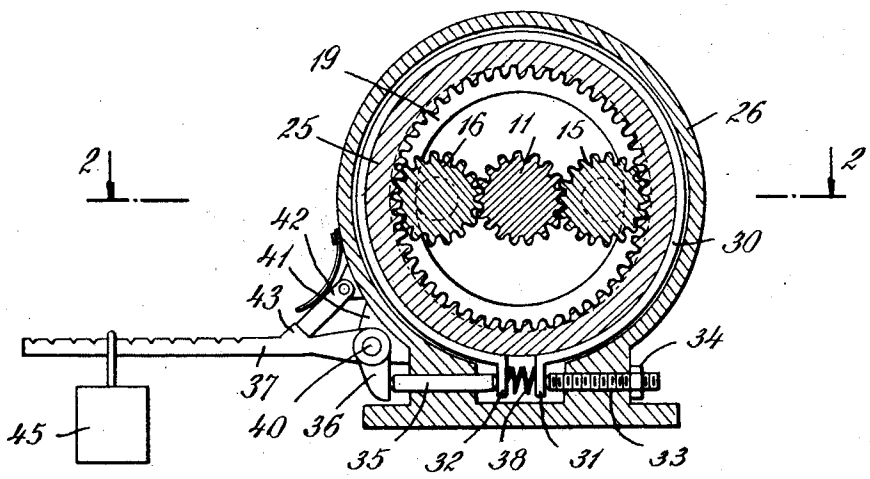


Fig. 2,

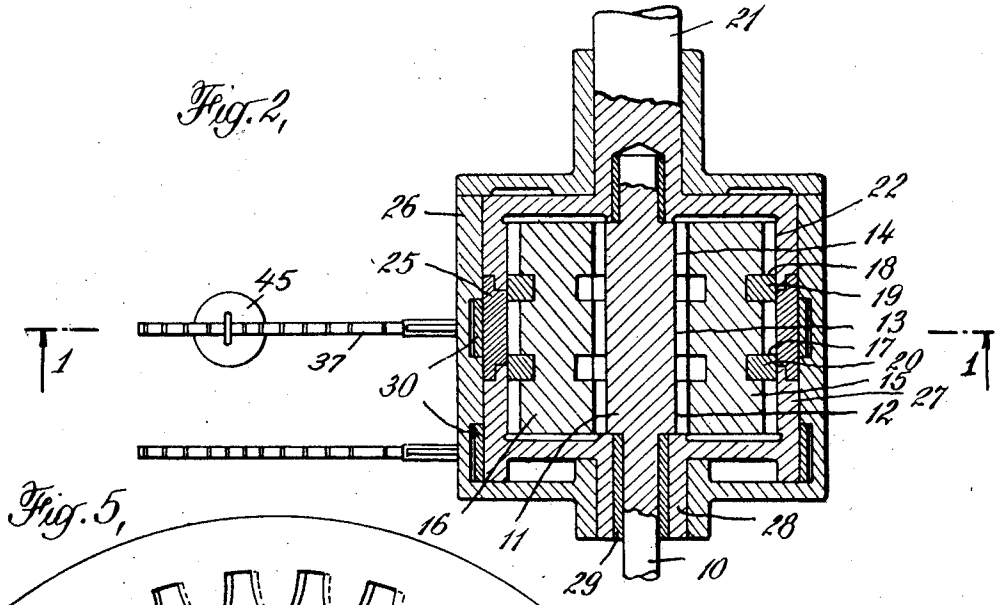
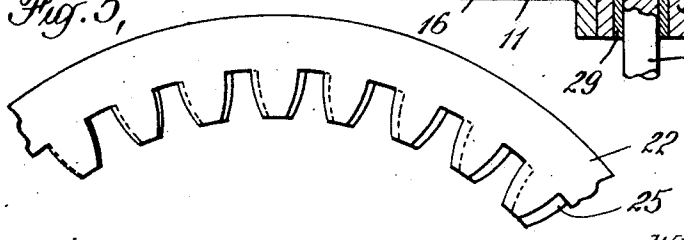


Fig. 5,



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Fig. 3,

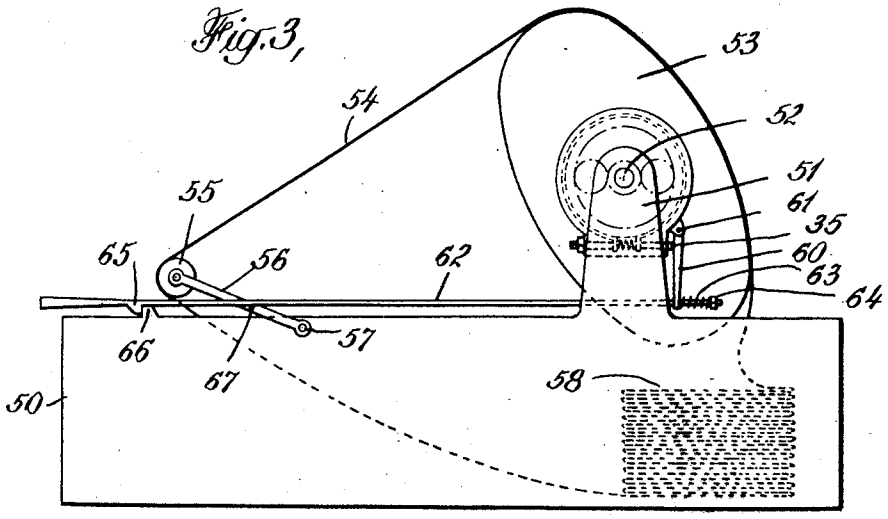
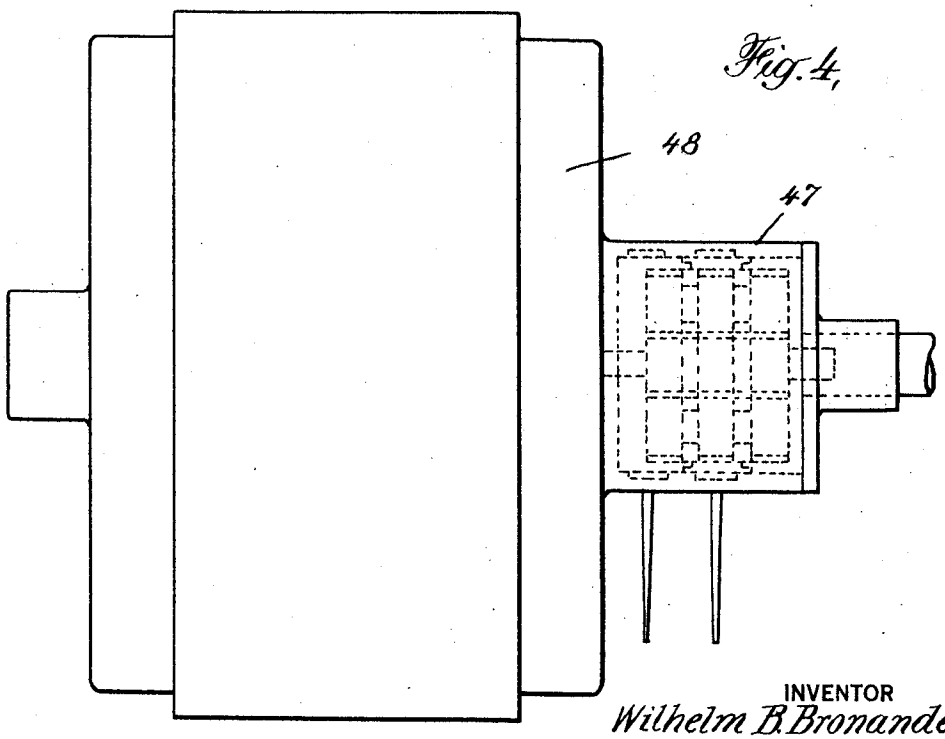


Fig. 4,



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UNITED STATES PATENT OFFICE.

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VARIABLE DRIVE MECHANISM.

Application filed June 6, 1925. Serial No. 35,472.

This invention relates to drive gearing and particularly to reduction gearing and control mechanism therefor.

The gearing to which the invention relates has many applications and can be applied directly to a motor shaft, turbine shaft or other shafts driven at high speeds.

In this application, the gearing is illustrated as connected to operate a fabric feed for dyeing apparatus. In such apparatus, as will be hereinafter described, the fabric is submerged in a dye vat and is withdrawn from the bottom of a pile and deposited in zigzag folds on the top of the pile. In such cases, if there is not sufficient dye liquor in the vat for the liquor to submerge the folds of material, there is a considerable tension placed on the material as it is withdrawn from the vat and such tension injures the material by warping or stretching the web and if the tension becomes great enough, the web may break.

In view of the foregoing conditions, it is desirable that the drive be so controlled that the feed will stop when the web becomes tangled or impeded or too great a tension is placed thereon.

The invention has for its salient object to provide a reduction gearing particularly adapted for a fabric feed and so controlled that the drive will be thrown out or stopped when the fabric is placed under tension.

Another object of the invention is to provide reduction gearing that is simple in construction, comprises few parts, can be easily controlled and will be efficient in operation.

Another object of the invention is to provide reduction gearing and control mechanism whereby a plurality of different speeds can be obtained and whereby the direction of the drive can be reversed.

Another object of the invention is to provide a drive for textile feeding mechanism and control mechanism so connected to the drive that any tangling or impedance of the material being fed will automatically throw out or stop the drive.

Another object of the invention is to provide a drive and control mechanism so constructed and arranged that overloading will be prevented and in the event of overloading the drive will slip.

Another object of the invention is to provide a drive and control mechanism so constructed and arranged that the torque or load transmitted can be limited.

Further objects of the invention will appear from the following specification taken in connection with the drawings, which form a part of this application, and in which

Fig. 1 is a sectional elevation illustrating gearing constructed in accordance with the invention;

Fig. 2 is a transverse sectional elevation taken substantially on line 2—2 of Fig. 1;

Fig. 3 is an elevational view showing the application of the drive to textile feeding mechanism;

Fig. 4 is a top plan view showing the gearing mounted on a motor; and

Fig. 5 is a fragmentary view showing the relative positions of teeth in the ring gears, due to the different number of teeth therein.

The invention briefly described comprises a drive shaft, a gear carried thereby and meshing with planetary gearing, a driven shaft having a gear connected thereto and also meshing with the planetary gearing and one or more freely rotatable ring gears meshing with planetary gearing and control means whereby the rotation of the ring gears can be controlled. The number of teeth in the ring gears is different from the number of teeth in the gear connected to the driven shaft and the speed of rotation and direction of rotation of the driven shaft can be controlled by the ratio of the teeth in the ring gears to the teeth in the gear connected to the driven shaft. Brake bands are mounted on the ring gears and these gears can be held against rotation thereby. The brake bands can be controlled by weights and levers which can be so adjusted as to limit the load transmitted through the gearing. The brake bands function as clutches and thus the drive can be controlled without further clutch mechanism.

In one specific application of the invention, the drive can be used for feeding textile material in connection with dyeing apparatus and the drive is so controlled that when the material becomes tangled or impeded, the brake band controlling the drive will be released, thereby stopping the drive.

Further details of the invention will appear from the following description.

In the embodiment of the invention illustrated, the gearing comprises a drive shaft 10 which may be driven in any suitable manner and, if desired, the armature shaft of an electric motor may be used directly as the drive shaft.

The shaft 10 has secured thereto a pinion 11 having a plurality of longitudinally

spaced sets of teeth 12, 13 and 14, each of these sections of the pinion having the same number of teeth.

Planet gears 15 and 16 mesh with the pinion sections 12, 13 and 14 and the planet gears have peripheral grooves 17 and 18 which receive retaining rings 19 and 20.

The driven shaft 21 has secured thereto or formed integral therewith a ring gear 22 which meshes with the planet gears 15 and 16.

The central section of the planet gears meshes with the teeth of a ring gear 25 which is freely rotatable within casing 26 which surrounds the gearing.

The end section of the planet gears opposite the end which meshes with the ring gear 22 meshes with a ring gear 27 carried by a hub 28 mounted in a bearing 29 which surrounds the shaft 10. The ring gear 27 is freely rotatable in the casing and on its bearing.

The ring gears 25 and 27 are surrounded respectively by brake bands 30 having laterally extending flanges 31 and 32 at the ends thereof. The flange 31 is engaged by an adjustable screw 33 having a lock nut 34 thereon. The flange 32 is engaged by a slidable pin 35 which is engaged at its outer end by one end 36 of a bell crank lever 37. A spring 38 is mounted between the flanges 31 and 32 to release the brake band from engagement with the outer surface of the ring gear 25 or 27 when the lever 37 is not in operation.

The bell crank lever 37 is pivoted at 40 to a lug 41 carried by the casing 26 and the lever may be held in operative position by means of a pawl 42 engageable with a lug or offset portion 43 formed on the lever. The lever may also, if desired, be held in operative position by means of a weight 45 which is adjustable on the lever to exert the desired force on the lever.

The grip of the brake band 30 on the ring gear can be regulated by the weight 45 so that slippage will take place between the ring and the brake in the event of overload on the drive.

It will be obvious that unless one or the other of the ring gears 25 or 27 is held against rotation, no drive of the driven shaft 21 will be effected by the rotation of the shaft 10. Furthermore, when one of these ring gears is held against rotation, the direction and speed of rotation of the driven shaft will be determined by the relative number of teeth in the ring gear 22 and in the ring gear which is being held from rotation. For instance, the ring gear 22 may have one hundred teeth, the ring gear 25 may have one hundred and two teeth and the ring gear 27 may have ninety-eight teeth. Under these conditions if the brake band on the ring gear 25 is operated to hold this gear against rotation, the direction of drive of the ring gear 22 and driven shaft 21 will be reversed. If the ring gear 27 is held against rotation, the gear 22 and shaft 21 will be driven in the same direction as the shaft 10. It will be evident to those skilled in the art that by varying the number of teeth in the gears 25 and 27, other drives can be obtained. The brake bands 30 operating on ring gears 25 and 27 act as clutches to connect the drive shaft to the driven shaft and unless the bands grip or clutch one of the gears no drive is transmitted.

Fig. 5 shows how one of the ring gears creeps ahead of the other, due to the difference in the number of teeth in the two gears.

The gearing control above described is particularly advantageous since the driven shaft can be brought gradually up to speed.

The gearing described is so compact that it may be enclosed in an extension 47 of the casing 48 of an electric motor, as shown in Fig. 4.

One specific application of the drive hereinbefore described is illustrated in Fig. 3. In this view there is illustrated a dye vat 50 having upwardly extending supports 51 in the upper ends of which there is supported a shaft 52. An oval or elliptical feeding member 53 is mounted on the shaft 52 and is driven by the gearing illustrated in Figs. 1 and 2.

The material or web 54 of material being dyed is submerged in and drawn through the dye liquor in the vat and is led around a roller 55 mounted at the ends of arms 56 pivoted at 57. From the roller 55, the material passes around the oval feeding member 53 and is deposited in zigzag folds 58 in the vat. The operation of withdrawing the material from the bottom of the pile of fabric and depositing the material in zigzag folds on the top of the pile can be continued until the material has been sufficiently acted upon by the dye liquor.

The brake band which controls the drive for the shaft 52 is in turn controlled in such a manner that the drive will be disconnected if the material becomes tangled or impeded. The lever arm 60 is pivoted at 61 to the casing and is adapted to engage the slidable pin 35 to cause this pin to tighten the brake band and grip the ring gear engaged thereby.

The lever arm 60 has a rod 62 extending through its lower end and a spring 63 is interposed between a nut 64 at the end of the rod and the arm 60. The opposite end of the rod 62 has a lug or tooth 65 extending downwardly therefrom and adapted to extend over a stationary lug 66.

The arms 56 are connected by a cross rod 67 which is positioned beneath the rod 62.

When the operator desires to start feeding the textile material through the vat, the rod 62 will be pulled longitudinally and the tooth 65 on the rod will be engaged over the lug 66. This will cause the brake band to grip the ring gear, thus causing the rotation of the

shaft 52 and the oval feeding member 53. Should the textile material become tangled or impeded, tension will be placed on the material and this tension will cause the roller 55 to be lifted, thus lifting the cross rod 67 and releasing the tooth 65 on the rod 62 from the lug 66. The brake band will then be released and the drive will stop. Too great a tension on the material might take place under various circumstances. For instance, if the dye liquor in the vat does not submerge the fabric, the fabric will not float on the liquor and a strong pull will be required to withdraw the fabric from the bottom of the pile. Such pull might be great enough to warp or pull the fabric out of shape and possibly tear it. Under such conditions, the control just described will slow up or stop the fabric feed.

It will be obvious that the weight and lever control shown in Fig. 1 could be used on the apparatus illustrated in Fig. 3 and the weight 45 could be so adjusted as to permit slippage of the brake band on the ring gear when too great a tension is placed on the fabric web.

Although certain specific embodiments of the invention have been particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claim.

What I claim is:

Drive mechanism comprising a drive shaft, a gear mounted thereon, a driven shaft, a ring gear carried thereby, planet gears meshing with said gears, said planet gears, each comprising a plurality of unitary sections equal in diameter and number of teeth, a second ring gear meshing with said planet gear, a third ring gear also meshing with said planet gears, all of said ring gears being of the same diameter but having a different number of teeth relative to each other, portions of said rings being arranged in overlapping relation, a friction band surrounding said second and third ring gears, means for spreading each band, a lever operatively connected to each band to tighten the same, an adjustable weight mounted on each lever and movable toward and away from the fulcrum thereof.

In witness whereof, I have hereunto set my hand this 28th day of May, 1925.

WILHELM B. BRONANDER.