

Filed Aug. 17, 1949

GRINDING MACHINE

3 Sheets-Sheet 2

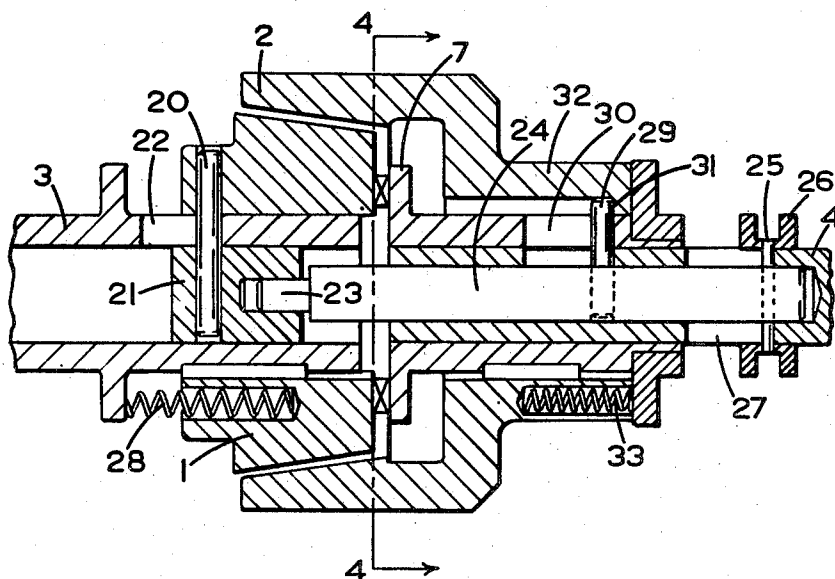


FIG. 3.

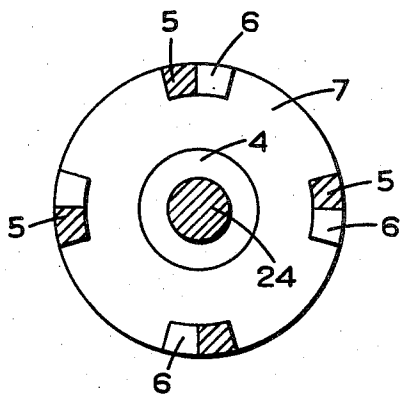


FIG. 4.

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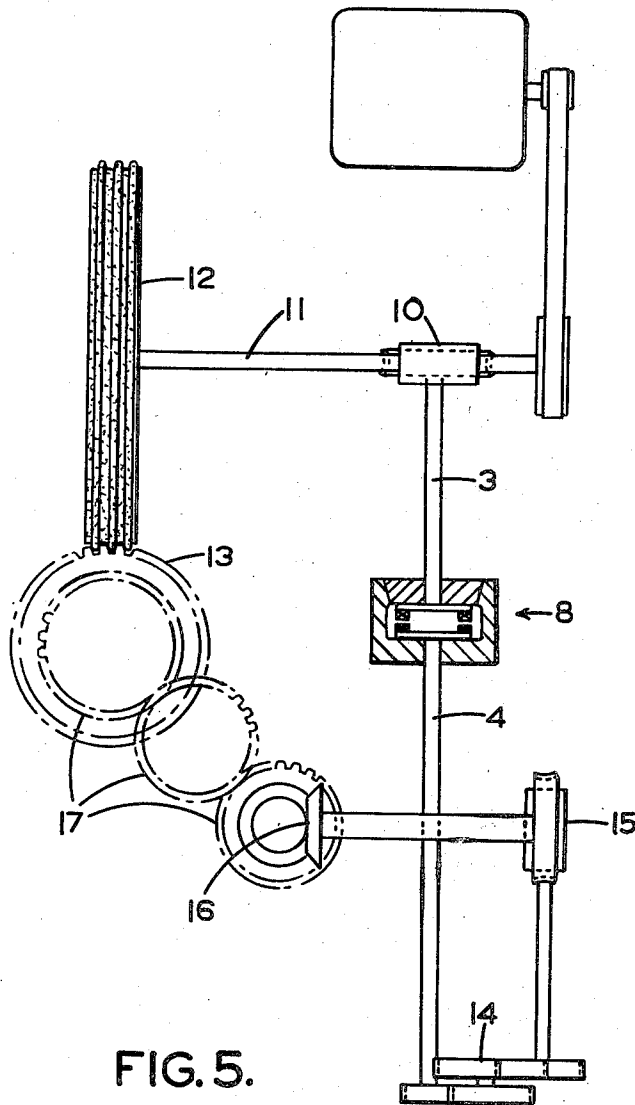


FIG. 5.

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GRINDING MACHINE

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3 Claims. (Cl. 51—105)

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This invention relates to grinding machines particularly gear grinding machines of the type wherein a gear, splined member, or like workpiece to be ground is rotated in geared relationship with a helically ribbed grinding wheel.

In grinding machines of this type it is necessary to periodically remove the gear or workpiece from the machine for inspection and the practice hitherto has been to stop the whole machine for this purpose.

In order to avoid stopping the rotation of the grinding wheel the present invention has for its object to provide clutch means whereby the drive to the gear or workpiece may be disconnected at will and connected so that the grinding wheel remains in pitch with the gear or workpiece.

The present invention is characterized by clutch means interposed in the drive to the workpiece which clutch means consists of friction means adapted to be initially engaged to gradually take up the drive to the workpiece, and means adapted to positively take up said drive after engagement of said friction means, said positive means being such that the grinding wheel and workpiece connected by the clutch means are positively re-coupled only when the grinding wheel is in pitch with the workpiece.

In the accompanying drawings,

Figures 1, 2, and 3 are axial plane sections of a clutch according to this invention in the fully disengaged, frictionally engaged and positively engaged conditions respectively,

Figure 4 is a detail view on the line 4—4 of Figure 3 showing the arrangement of the dogs of the positive clutch means, and

Figure 5 is a diagram showing the geared relationship of the workpiece grinding wheel and clutch.

Referring to Figures 1 to 3 of the drawings there is shown a clutch comprising conical male and female friction members 1, 2 mounted on driving and driven shafts 3, 4 for rotation therewith and limited sliding movement thereon.

The male member 1 has dogs 5 for engagement with similar dogs 6 on a member 7 fixedly mounted on the shaft 4.

In the clutch shown the conical male member 1 and the member 7 each have four dogs symmetrically disposed as shown in Figure 4.

Referring to Figure 5 the clutch is indicated at 8 for connecting the shafts 3, 4, the shaft 3 being driven through worm gearing 10 off the shaft 11 of the helically ribbed grinding wheel 12. The shaft 4 is in geared relationship with the workpiece or gear blank 13 through change

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gears 14, worm gearing 15, bevel gearing 16 and gear train 17.

In the example given the worm gearing 10 between the grinding wheel 12 and clutch is 4:1 so that regardless of the manner in which the dogs 5, 6 of the clutch mate, the grinding wheel 12 remains in pitch with the workpiece 13, since one revolution of the grinding wheel corresponds to an angular displacement of the clutch dogs 10 relative to one another through 90° or a quarter of a revolution.

Thus the workpiece 13 can only be connected or reconnected in geared relationship with the grinding wheel 12 after the latter has done a whole number of complete revolutions so that the said grinding wheel remains in pitch with the workpiece.

It is to be understood that if desired the ratio between the grinding wheel and clutch and number of dogs of the latter may be varied from that herein stated by way of example, and furthermore, the said ratio may be a whole multiple of the number of clutch dogs.

The construction and operation of the clutch shown in Figures 1 to 3 is as follows:

The conical male member 1 is slidable on the hollow driving shaft 3 and is connected by a transverse pin 20 to a member 21 slidable within the bore of the driving shaft 3, said pin 20 passing through a slot 22 in said shaft 3.

The member 21 slidably engages the reduced end 23 of a rod 24 which latter extends along the bore of the hollow driven shaft 4, the other end of said rod 24 being connected by a transverse pin 25 to a grooved collar 26 adapted for axial actuation by an operating fork (not shown), said pin 25 passing through a slot 27 in the shaft 4.

It will be seen therefore that on the collar 26 (Figure 1) being moved towards the right the male conical member 1 is likewise permitted to move to the right under the action of the spring 28 to cause said male member 1 to engage the female conical member 2 to frictionally take up the drive between the shafts 3, 4 (Figure 2).

The rod 24 carries a further transverse pin 29 passing through a slot 30 in the shaft 4 and member 7 fixed on the latter. The said pin 29 is adapted to contact an internal shoulder 31 of an extension 32 of the female conical member 2.

When the clutch has been frictionally engaged as shown in Figure 2 the pin 29 has just commenced to contact the shoulder 31.

Further movement of the collar 26 to the right and hence the rod 24 causes the female conical member 2 to be moved to the right to disengage

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same from the male conical member 1 just as the dogs 5 of the latter engage the dogs 6 of the member 7 due to further action of the spring 28. Thus the drive is positively taken up by the dogs 5, 6 whilst the friction drive is disengaged (Figure 3).

Movement of the collar 26 to the left causes the conical male member 1 to be moved to the left owing to the shoulder on the end of the rod 24 formed by the reduced portion 23 abutting the member 21. This left hand movement causes the dogs 5, 6 to be disengaged and the drive disconnected. The spring 33 urges the female conical member 2 to the left to cause same to resume the position shown in Figure 1 when the clutch is disengaged.

Owing to the gradual manner in which the drive is taken up to the gear to be ground no undue strain is imposed on the gears, shaft bearings or the like constituting the drive, so that the introduction of errors due to the effects of transmission shocks is minimised.

The friction members of the clutch may be of a form other than the conical members herein described and may consist of plate members.

We claim:

1. A grinding machine of the character described including a grinding wheel; a drive to said grinding wheel; a work piece drive in geared relationship with said grinding wheel and grinding wheel drive; and a clutch in said work piece drive for effecting disconnection of the geared relationship between the grinding wheel and a work piece, said clutch comprising a driving clutch member; a driven clutch member; friction members in driven relationship with said driving and driven members and adapted to be initially engaged to gradually effect driving connection between said driving and driven clutch members; symmetrically disposed dogs driven by the driving and driven clutch members and adapted to positively engage said driving and driven clutch members after engagement of said friction members, the number of dogs to one clutch member being a whole multiple of the gear ratio between the grinding wheel and clutch so that the grinding wheel and a workpiece are positively re-coupled in pitch with one another.

2. A grinding machine of the character described including a grinding wheel; a drive to said grinding wheel; a work piece drive in geared relationship with said grinding wheel and grinding wheel drive; and a clutch in said work piece drive for effecting disconnection of the geared relationship between the grinding wheel and a work piece, said clutch comprising a driving clutch member; a driven clutch member; male

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and female conical friction members in driven relationship with said driving and driven members and adapted to be initially engaged to gradually effect driving connection between said driving and driven clutch members; symmetrically disposed dogs driven by the driving and driven clutch members and adapted to positively engage said driving and driven clutch members after engagement of said friction members, the number of dogs to one clutch member being equal to the gear ratio between the grinding wheel and clutch so that the grinding wheel and a workpiece are positively re-coupled in pitch with one another.

3. A grinding machine of the character described including a grinding wheel; a drive to said grinding wheel; a work piece drive in geared relationship with said grinding wheel and grinding wheel drive; and a clutch in said work piece drive for effecting disconnection of the geared relationship between the grinding wheel and a work piece, said clutch comprising a driving shaft; a driven shaft; a conical friction member slidable on said driving shaft and rotatable therewith; a complementary conical friction member slidable on said driven shaft and rotatable therewith, said complementary conical friction member being adapted to receive the conical member of the driving shaft for frictionally transmitting a drive between said shafts; symmetrically disposed dogs carried at one end of the conical member of said driving shaft; symmetrically disposed dogs on the end of the driven shaft for mating with the dogs of said conical member to positively transmit a drive between said shafts; a member movable axially with respect to said shafts and engaging said conical friction members to first permit the driving shaft conical member to frictionally engage the complementary conical member, and then further permit said dogs to mate whilst simultaneously disengaging the conical members from frictional engagement with one another; and resilient means urging said conical members axially towards one another.

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