Dec. 23, 1930. J. DRONSFIELD 1,785,731

DIFFERENTIAL MOTION FOR TRAVERSING CARD GRINDING ROLLERS

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FIG. 1.

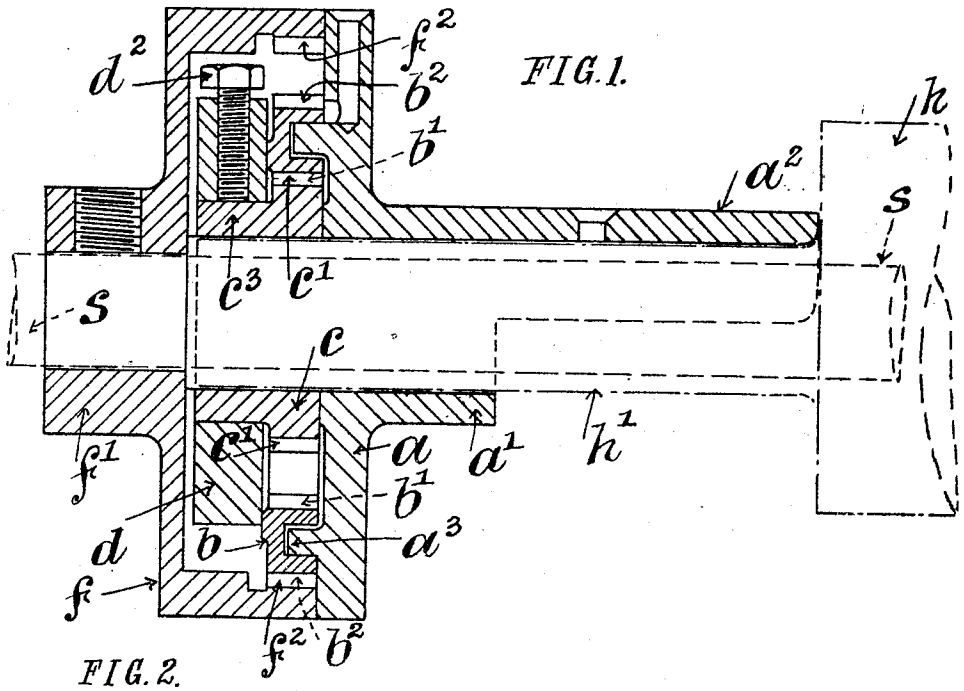
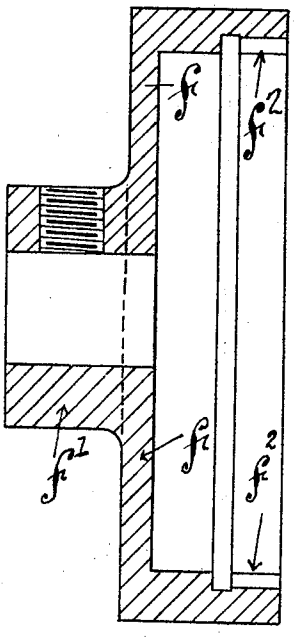


FIG. 2.

FIG. 3.



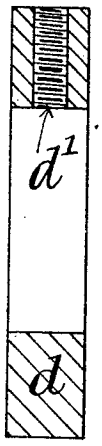


FIG. 4.

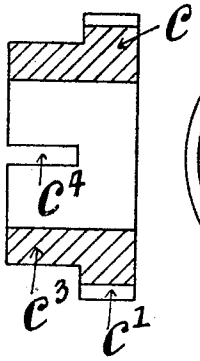


FIG. 5.

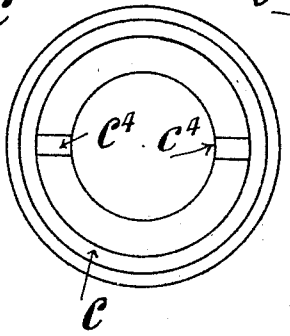
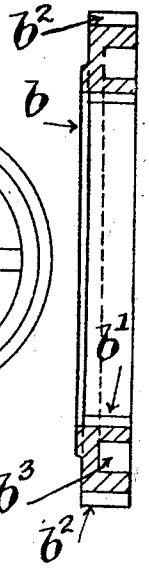


FIG. 6.



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FIG. 7.

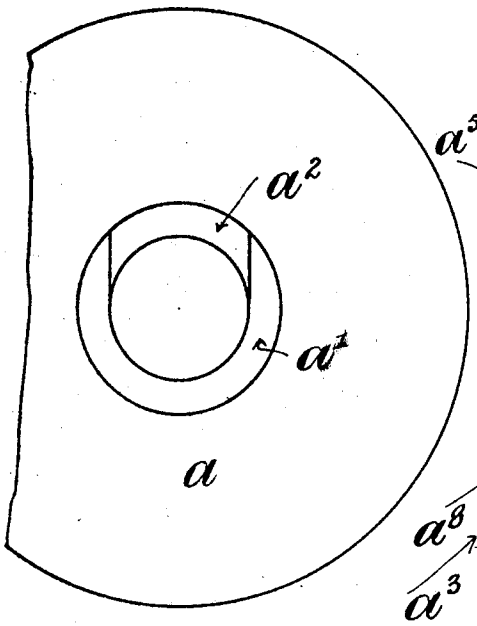


FIG. 8.

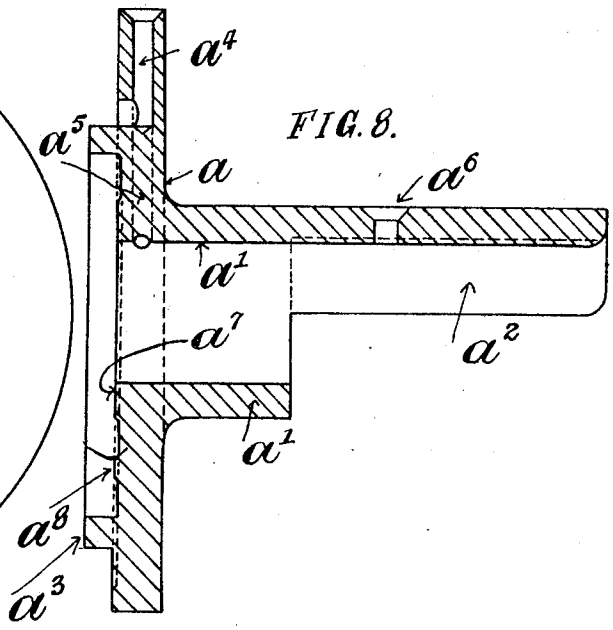
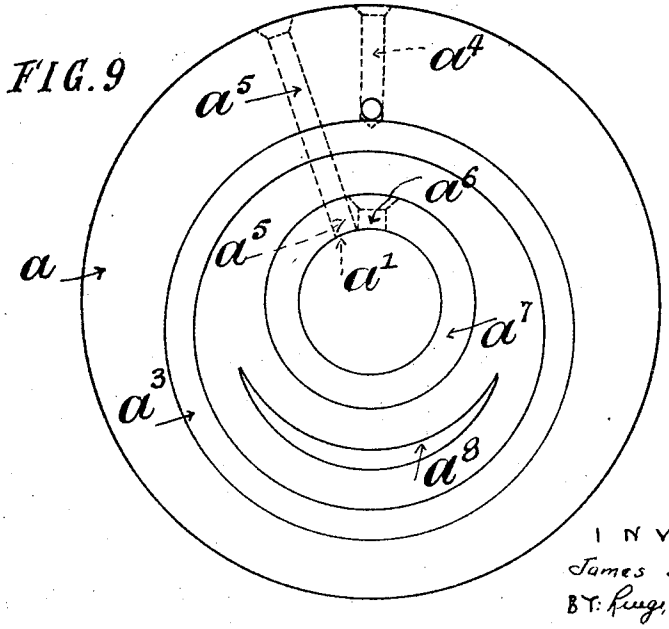


FIG. 9



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UNITED STATES PATENT OFFICE

JAMES DRONSFIELD, OF OLDHAM, ENGLAND

DIFFERENTIAL MOTION FOR TRAVERSING CARD GRINDING ROLLERS

Application filed January 5, 1929, Serial No. 330,553, and in Great Britain March 24, 1928.

This invention relates to a differential motion for card grinding rollers of the type wherein the said card grinding roller is traversed backwards and forwards along a revolvable slotted tube or cylinder by the action of an enclosed right and left handed screw-threaded shaft which acts on an engaging "butterfly," in connection with the card grinding roller, such principle of traversing a card grinding roller being well known. Enclosed differential motions for obtaining the differential speed of rotation of the right and left handed screw-threaded shaft are also well known.

A motion of this kind was described in a prior United States patent granted to me, No. 500,322. In this former patent, use was made of an enclosing casing with internal teeth, an externally toothed wheel, two eccentrics, one of half the eccentricity of the other, a driver, and a transmitter.

This differential motion has had a considerable vogue, but I now find it desirable to improve upon the same, as with developments in grinding, it is necessary to arrange for quicker speeds or greater ranges or relative variations in speed, which, with the hitherto known arrangements, has not been so convenient. If the wheel size be increased to get greater variations in speed then the length of grooves in the driver and transmitter have necessarily to be increased and it has been found that the swivel studs on the transmitter are apt to wear the grooves unduly in practice. There are other difficulties encountered.

The object of my invention is to produce an enclosed differential gear for the particular purpose related and which is akin to the former United States patent but wherein all sliding parts are done away with, there is only one eccentricity, and wherein there are no swivel studs or grooves, the variable speeds desired being obtained by a combination including an externally toothed driver (located on the boss or sleeve of the enclosing tube or cylinder of the Horsfall grinder) which gears with an internal ring of teeth on an intermediate wheel carried on one eccentric combined with an end plate or eccentric carrier. This intermediate wheel has also an external ring of teeth having teeth in mesh with the teeth of an internal ring of teeth on the shell or enclosing casing for the differential gear, the boss of said shell or casing being removably fixed on the right and left hand screwed shaft of the Horsfall grinder the end of which emerges from the boss or sleeve of the tube or cylinder upon which the grinder traverses. Such a motion can be most compactly arranged within a housing, will give a suitable traverse, will run noiselessly, has no sliding parts and by an interchange of the end plate carrying the eccentric and of the intermediate wheel with internal and external ring of teeth a variation in speed can be arranged for, using the same externally toothed driver and the same shell with ring of internal teeth.

I will now describe what I consider to be an extremely compact and simple construction of differential gear for the purpose indicated and according to the invention as set out above, and this construction is illustrated in the accompanying drawings, wherein:

Fig. 1 shows a sectional elevation of the complete differential gear.

Fig. 2 is a section of the shell or enclosing casing.

Fig. 3 shows a separate view of a binding ring.

Figs. 4 and 5 are two views of the externally toothed driver.

Fig. 6 is a separate section of the intermediate wheel with internal and external ring of teeth.

Figs. 7, 8 and 9 are respectively outside end elevation, section, and inside end elevation, of the eccentric carrying end plate which also makes good the enclosure of the gear when the shell or enclosing casing is applied as shown by Fig. 1.

I prefer to use an eccentric carrier such as will constitute the inner wall of the cylindrical housing for the differential gear and this element is very clearly shown at Fig. 1, and separately by the Figs. 7, 8 and 9. It is marked a and has a bored boss a' to fit the sleeve h' of the slotted enclosing tube or cylinder h on which the grinding roll trav-

erses. There is an elongated extension *a*2 to fit betwen the limbs of a bracket for positioning and to prevent rotation of the end plate *a*. I may make other equivalent provision to this end.

On the inner face of this end plate, is an outstanding ring *a*3 which is eccentrically disposed and carefully machined.

Upon this outstanding ring *a*3 sits the intermediate wheel *b*, which is also machined to produce a deep circular recess *b*3 on the inner face; this deep circular recess to fit on the eccentrically disposed outstanding ring *a*3. The intermediate wheel *b* has an internal ring of teeth *b'* and an external ring of teeth *b*2.

On the aforementioned sleeve *h'* is applied a driving pinion *c* (shown by Figs. 4 and 5) with external ring of teeth *c'* to mesh with a number of the teeth of the internal ring of teeth *b'* on the intermediate wheel *b*, and this driving pinion *c* has an outwardly directed boss *c*3 which is split for instance at two places *c*4, *c*4. On this boss fits a plain ring *d* of some depth and this has a pinching screw *d*2 the screwed shank of which fits a tapped hole *d'* in the ring *d*. This plain ring *d* positions the intermediate wheel *b*, and this pinching screw *d*2 clamps the split boss *c* and makes it bite and grip the sleeve *h'* so as to fix the pinion *c*, and thereby, the several elements of the gear group are properly located on the sleeve and the parts *a*, *b*, *c* and *d* properly positioned.

There is provided a shell *f* with bored boss *f'* and internal ring of teeth *f*2 with which some of the outer ring of teeth *b*2 on the intermediate wheel *b* gear, and the boss *f'* of such shell is fixed on the revolvable shaft *s* passing through the sleeve *h'*, the part of the revolvable shaft *s* enclosed within the tube or cylinder *h* being cut with the known right and left-hand screw thread.

Thus, when the tube or cylinder *h* for the traversing grinder is driven, its sleeve *h'* acting through the enclosed gears *c'*, *b'*, *b*2, *f*2, imparts motion to the shell *f* which in turn operates the right and left handed screw threaded shaft *s* and so drives the traversing grinder mounted on the tube or cylinder at a differential speed as required.

In the differential gear illustrated, the driving pinion *c* is supposed to have 30 teeth (*c'*) while the number of the internal teeth on the intermediate gear *b* is 36 (*b'*) and the external teeth number 54 (*b*2) while the number of internal teeth on the shell is 60 (*f*2). With the sleeve *h* making 800 revolutions per minute, then the right and left-handed screw shaft *s* will make 600 revolutions.

A change of the eccentric carrying end-plate *a*, for one with different size of outstanding ring *a*3, and of the intermediate gear wheel *b* for one with a different number of teeth, will change the differential speed obtainable from the motion.

The passage ways marked *a*4, *a*5, *a*6 are oil ducts leading respectively to the outstanding *a*3, to the boss *a'*, and to the under face of the arm-like extension *a*2, while the letters *a*7, *a*8 indicate machined faces. The crescent shaped facing *a*8 is produced by machining the annular recess in the end plate *a* from two centres, one being the centre of the motion and the other centre being that of the eccentric ring *a*3. This crescent shaped facing need not be present on motions having a number of teeth different from the above description.

I declare that what I claim is:

1. An enclosed differential motion for traversing card grinding rollers, comprising a stationary supporting plate, means for fixing said supporting plate against rotation, an eccentric ring projecting from said supporting plate, an intermediate pinion having an annular groove in one face thereof, said groove engaging said eccentric ring, said intermediate pinion having an external ring of teeth and an internal ring of teeth, a driving pinion having teeth in mesh with the internal ring of teeth on the intermediate pinion, said driving pinion having a boss, a rotatable hollow sleeve passing through said pinions, means for fixing said boss to said sleeve for rotation therewith, an exterior casing having a ring of internal teeth in mesh with a portion of the external teeth on the intermediate pinion, all of said rings of teeth being in radial alinement, a right and left-hand screw-threaded shaft mounted for rotation in said sleeve and passing through said casing, and means for fixing said casing on said shaft for rotation therewith.

2. An enclosed differential motion for traversing card grinding rollers upon a stationary supporting shell, comprising a supporting plate, means for holding said supporting plate against rotation, an axially extending eccentric ring on the inner face of said supporting plate, an intermediate pinion having an axial groove in its face adapted to receive said eccentric ring thereby to support said intermediate pinion for rotation adjacent to the supporting plate, said intermediate pinion having external and internal teeth, a driving pinion provided with teeth in mesh with the internal teeth of the intermediate pinion, a sleeve passing through said pinions, means for fixing the driving pinion on said sleeve for rotation therewith, an enclosing casing co-operating with the supporting plate to enclose said pinions, said enclosing casing having an internal ring of teeth in mesh with some of the outer teeth of the intermediate pinion, all of said teeth being in radial alinement, a right and left-hand screw-threaded shaft mounted for rotation in said sleeve and passing through said casing, said casing hav-

ing means for fixing it on said shaft for rotation therewith.

3. An enclosed differential motion for traversing card grinding rollers upon a supporting shell, comprising a stationary supporting plate, said plate having a boss and an axial extension for fixing the supporting plate against rotation, an eccentric ring on the inner face of the supporting plate, an intermediate pinion having a groove in its face adapted to engage the eccentric ring, said pinion having external teeth and internal teeth, a driving pinion having a split boss, a sleeve carried by said shell and passing through said pinions, a concentric fixing device mounted on said boss and having means for fixing said split boss on said sleeve for rotation therewith and for retaining said driving pinion in position, said driving pinion having a ring of teeth in mesh with the internal teeth of the intermediate pinion, an enclosing casing having an internal ring of teeth in mesh with some of the external teeth of said intermediate pinion, a shaft mounted for rotation in said sleeve, and means for fixing said casing upon said shaft for rotation therewith, all of said teeth being in radial alinement.

4. An enclosed differential gear for traversing card grinding rollers, comprising a stationary plate having a sleeve and a fixing extension, said plate being provided with an axially extending eccentric formed on its inner face, an intermediate pinion having an axial groove in engagement with said eccentric, said pinion being provided with internal and external rings of teeth, a revoluble tube disposed within said sleeve, a driving pinion mounted on said tube and having a ring of external teeth, said driving pinion being provided with a split boss, a clamping ring and stud mounted on said boss and adapted to fix the pinion for rotation with said tube and to position the pinions, and enclosing casing having an internal ring of teeth in mesh with the external teeth of the intermediate pinion, said casing having a boss, a shaft passing through said tube, pinions and casing boss, and means for fixing said boss to said shaft for rotation therewith, the combination being such that all the teeth are in radial alinement and adjacent to the stationary plate.

In testimony whereof I have signed my name to this specification.

JAMES DRONSFIELD.