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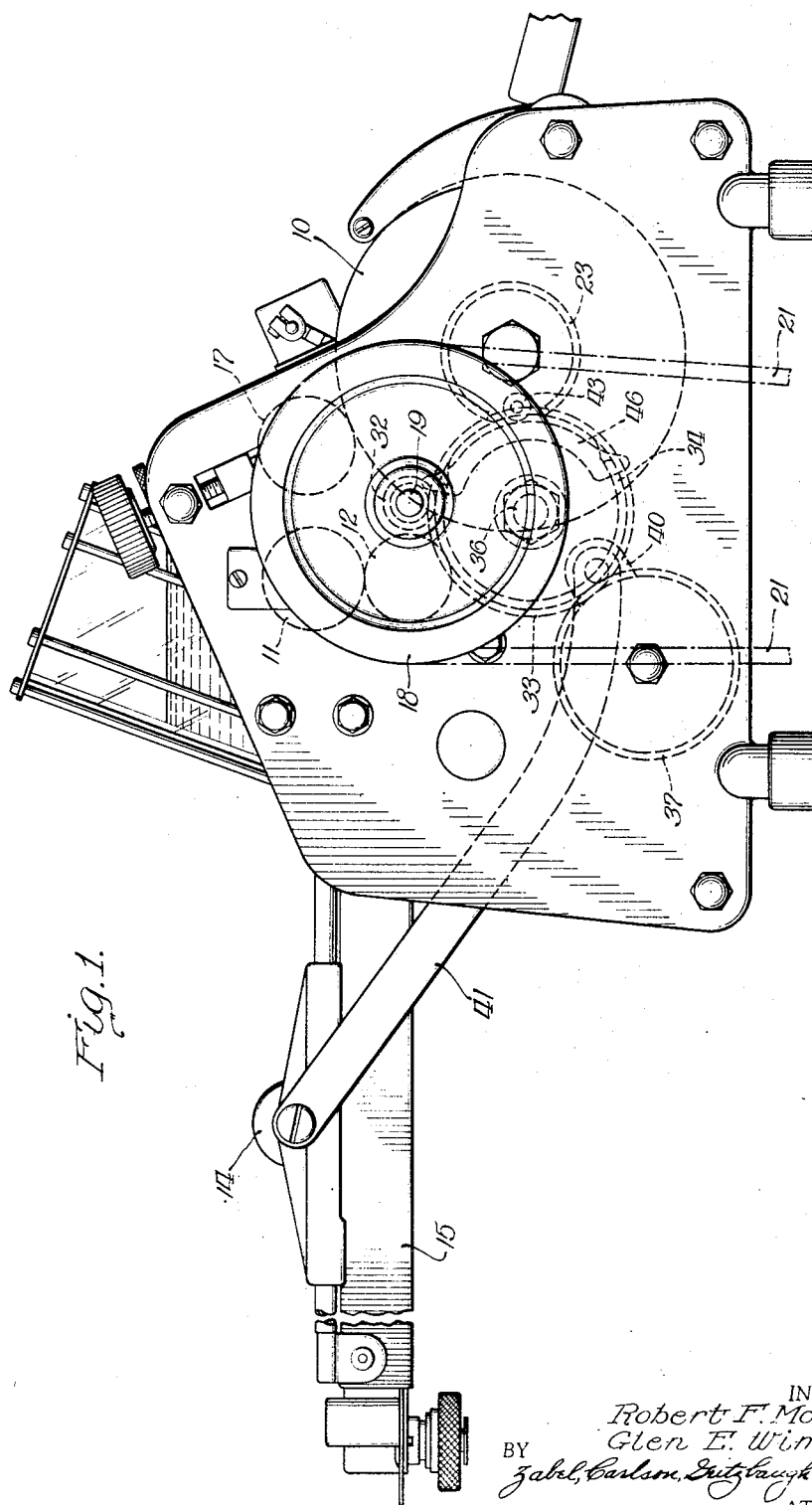
R. F. MORRISON ET AL

2,243,283

DUPLICATING MACHINE

Filed April 7, 1939

4 Sheets-Sheet 1



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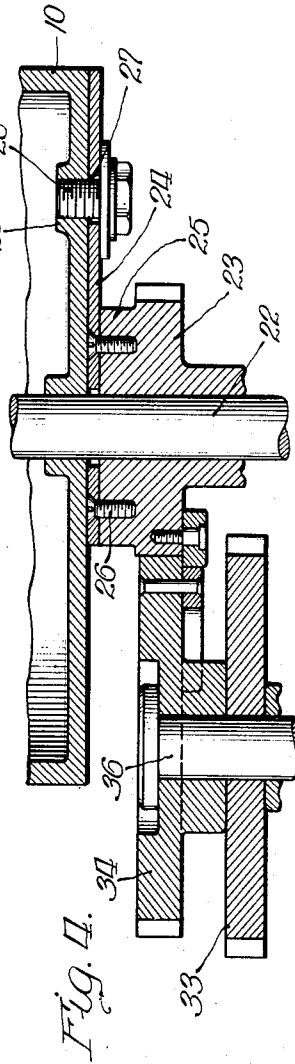
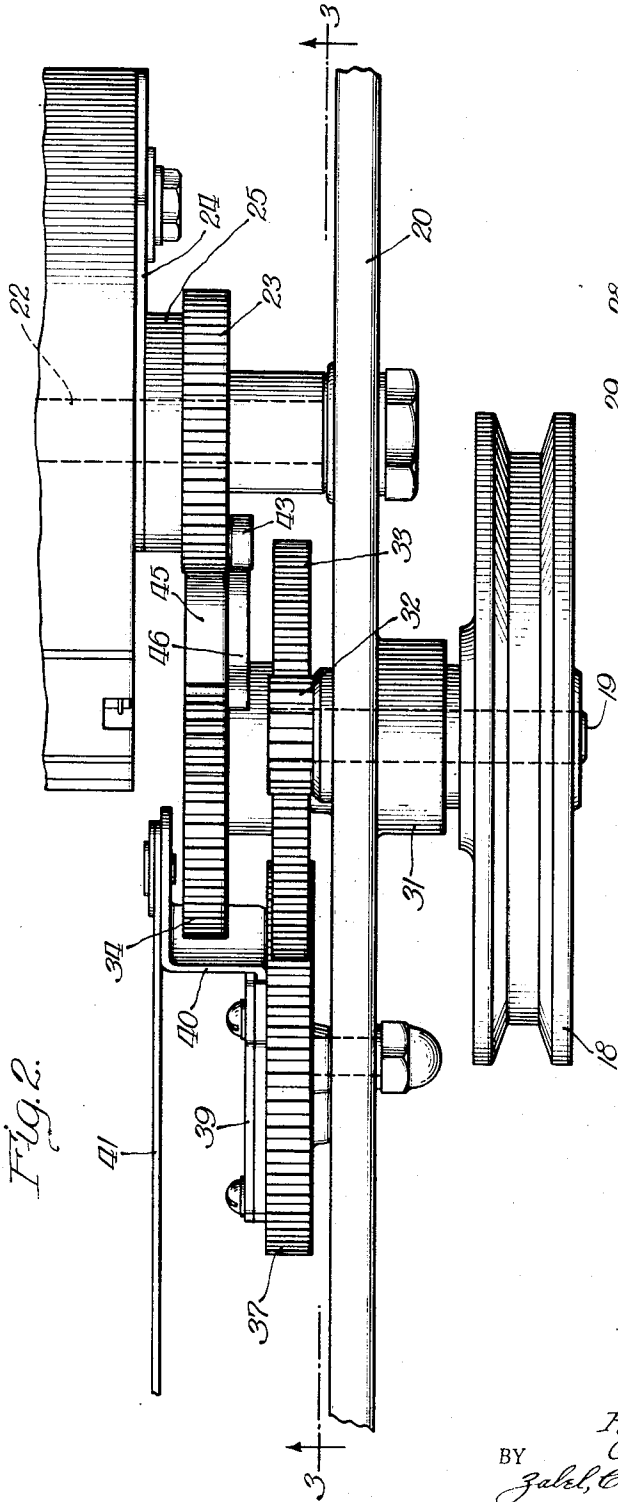
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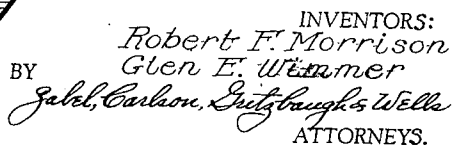
4. Sheets-Sheet 2



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4 Sheets-Sheet 3



May 27, 1941.

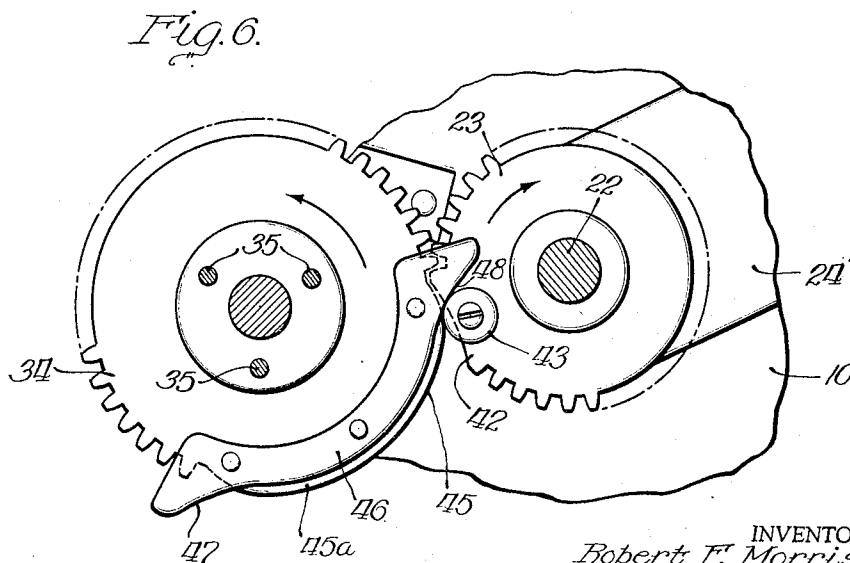
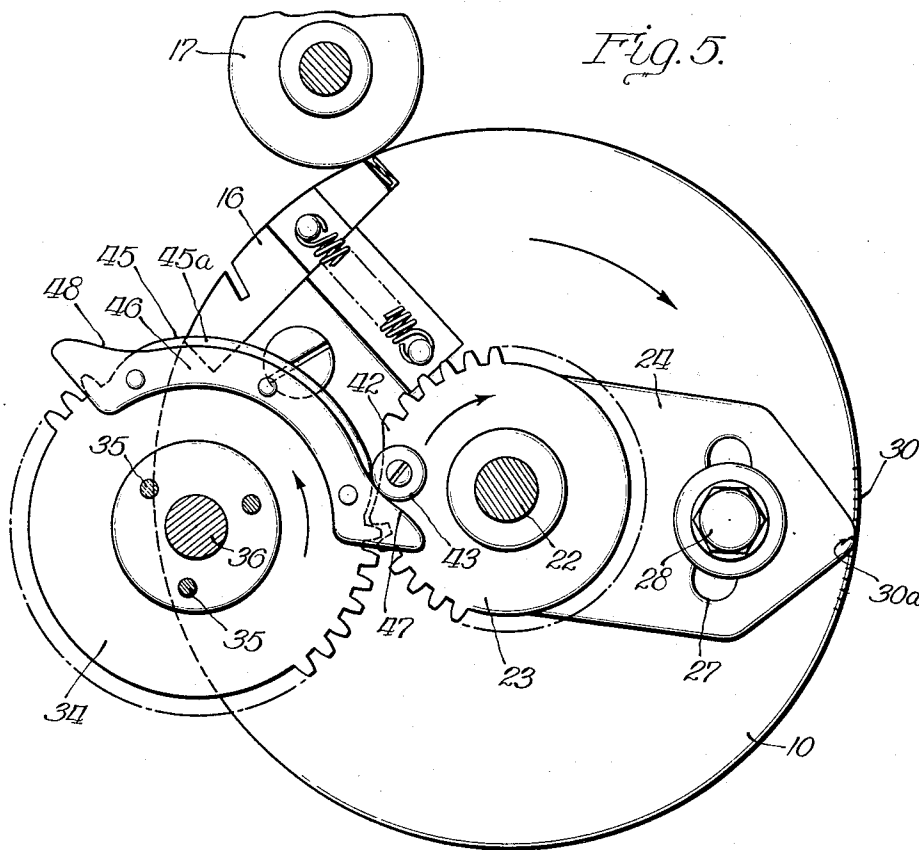
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DUPLICATING MACHINE

Filed April 7, 1939

4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE

2,243,283

## DUPLICATING MACHINE

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Application April 7, 1939, Serial No. 266,471

8 Claims. (Cl. 101—132.5)

The present invention relates to duplicating machines of the type wherein copy sheets are fed by means of feed rolls to a rotating drum which carries a master copy. The invention is particularly applicable to duplicating machines of the type described in which the drum and feed rolls are to be maintained in a stationary position at the beginning of each operation to provide time for advancing a copy sheet to the feed rolls. The feed rolls act as a margin stop properly to position the copy sheet so that when the drum and feed rolls are started the sheet will engage the master copy upon the drum in the right position.

It is an object of the present invention to provide a duplicating machine with improved means whereby a continuous rotating movement of a drive member may be translated into intermittent rotation of the drum and feed rolls, and the shock of starting and stopping the drum and feed rolls may be eliminated to a substantial degree. It is a further purpose of the present invention to provide a novel gear arrangement by which a continuously driven member may intermittently drive the duplicating drum and cause gradual acceleration and deceleration of the drum immediately at the end and the beginning of the dwell period thereof.

Other objects and advantages of the invention will appear as the following detailed description progresses, reference being had to the accompanying drawings wherein:

Fig. 1 is a view in side elevation of a duplicating machine embodying the present invention;

Fig. 2 is an enlarged fragmentary plan view of a portion of the machine shown in Fig. 1;

Fig. 3 is a sectional view taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view similar to Fig. 3 illustrating a changed position of the drum with respect to the continuously driven member, and

Fig. 6 is a fragmentary sectional view taken on the same line as Fig. 5, illustrating a further position of the continuously driven member and the drum.

Referring now in detail to the drawings wherein a preferred embodiment of the invention is shown, a duplicating machine of the general type described is illustrated in Fig. 1. The machine illustrated is a duplicating machine in which a rotating platen or drum 10 carries a master sheet

which has imprinted thereon in reverse the matter to be transferred to copy sheets. The machine embodies means including cooperating feed rolls 11 and 12 which advance copy sheets to the master sheet on the drum. One of the feed rolls 12 has cooperating therewith a copy sheet moistening device 13 which supplies a solvent for the carbon or ink on the master sheet. The duplicating machine includes also a copy sheet feeding device 14 which feeds copy sheets to the rolls 11 and 12 from a suitable tray 15. The drum 10 is provided with means 16 adapted to receive and hold a master sheet. A platen roller 17 presses the copy sheets against a master sheet on the drum 10.

Means are provided whereby the drum 10 is intermittently rotated from a continuously driven member 18. The member 18 is shown in the present instance as a pulley mounted upon a shaft 19 which is journaled in the frame 20 of the duplicating machine. The pulley 18 is adapted to be driven by a belt 21. It will be understood, of course, that the shaft 19 may be rotated continuously by hand or by any power means, such as a motor.

The drum 10 is mounted on a shaft 22 which is journaled in the side frame 20 of the machine. The feed rolls 11 and 12 are connected to the drum 10 to rotate therewith by a suitable gearing, not shown. A driven gear 23 is mounted on the shaft 22 at one end of the drum. This gear is rotatable on the shaft 22 and is adapted to be connected to the drum 10, which is fixed on the shaft 22, by a plate 24. The plate 24 is fixed to the gear 23 by suitable fastening means such as screws 25 and 26. An arcuate slot 27 is provided in the plate 24 to receive a fastening screw 28. The screw 28 extends through the slot 27 and is threaded into a boss 29 provided in the end of the drum 10. By loosening the screw 28 it is possible to shift the plate 24 and the gear 23 circumferentially of the drum 10 so as to adjust the relative angular position of the drum and the gear 23. This angular adjustment is measured by indications 30 provided on the drum 10 (see Fig. 3) and a pointer portion 30a provided on the plate 24.

The shaft 19 is journaled in a boss 31 provided in the frame 20. This shaft has a pinion 32 fixed thereon. The pinion 32 is adapted to mesh with and drive a gear 33 which has a second gear 34 fastened thereto in any desired manner, such as by rivets 35 shown in Figs. 3, 5 and 6. The gears 33 and 34 are journaled on a stub shaft 36 which is mounted in the frame 20.

The gear 33 meshes with a gear 37 which is rotatably secured to the frame 20 by a stub shaft 38. The gear 37 has thereon a mounting bracket 39 which secures a crank arm 40 to the gear. The mounting is such that the crank arm 40 is removable by sliding it out of the bracket 39. The crank arm 40 connects to a link 41 which drives the copy sheet feeding device 14.

Referring now to Figs. 3-6 in particular, it will be observed that the gear 23 has a cam portion 42 and that beside this cam portion a roller 43 is rotatably mounted on the gear by a headed screw 44. The cam portion 42 of the gear 23 is adapted to cooperate with a cam surface 45 provided on a mutilated section 45a of the gear 34. The cam surface 45 extends through approximately one-third of the periphery of the gear 34. It will be evident that so long as the cam surface 45 is riding on the cam portion 42 of the gear 23, the gear 23 cannot turn, and the drum 10 will therefore be held stationary.

The gear 34 carries a cam plate 46 which is adapted to cooperate with the lug or roller 43 so as to gradually accelerate the gear 23 and the drum 10 when the dwell period approaches its end, due to the cam portion 42 arriving at the end of the cam surface 45. The cam plate 46 has a curved face 47 that is adapted to engage the roller 43 in the manner shown in Fig. 5 so as to force the roller 43 to start to move in the direction of the arrow indicated on the gear 23 in Fig. 5. The shape of the face 47 is such as to gradually accelerate the gear 23 so that when the teeth of the gear 23 mesh with the teeth of the gear 24 they will be traveling at a speed which will prevent any clashing and undue strain on the teeth.

When the drum 10 is being brought to a stop so as to remain stationary during the advance of a copy sheet to the feed rolls 11 and 12, it is also desirable to gradually slow the drum down and thus avoid excessive strain upon the mechanism and the incidental noise that goes with suddenly stopping any rotating element of substantial weight. The cam plate 46 is provided with a face 48 which engages the lug or roller 43 and gradually slows the roller down until the surfaces of the cam portion 42 and the cam portion 45 come together.

The operation of this device is believed to be clear from the foregoing description. It will be observed that the duplicating drum 10 and its feed rolls 11 and 12 are intermittently driven from the continuously rotating shaft 19. The stopping and starting of the drum, however, is accomplished by a gradual deceleration and acceleration which removes the strain from the driving gear teeth and causes smooth, quiet operation.

While the preferred embodiment of the invention has been shown and described, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims in which it is the intention to claim all novelty inherent in the invention as broadly as possible in view of the prior art.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means ad-

jacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to accelerate rotation of the driven gear as said cams separate and the gears come into meshing relationship, said last-named means comprising a cam member on the drive gear extending circumferentially thereof at the mutilated portion, and a lug on the driven gear in position for operative engagement with said cam member for bringing the driven gear gradually up to approximately its normal speed of rotation before said gears engage.

2. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means adjacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to retard the driven gear as the aforesaid cams are brought together, said last-named means comprising a cam member on the drive gear extending circumferentially thereof at the mutilated portion, and a lug on said driven gear in position for operative engagement with said cam member for slowing said driven gear down gradually after the gears disengage.

3. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means adjacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to accelerate rotation of the driven gear as said cams separate and the gears come into meshing relationship, said last named means comprising a roller on one gear and a cam on the other gear.

4. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means adjacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having

faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to retard the driven gear as the aforesaid cams are brought together, said last named means comprising a roller on one gear and a cam on the other gear.

5. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means adjacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to accelerate rotation of the driven gear as said cams separate and the gears come into meshing relationship, said last named means comprising a roller on the driven gear and a cam on the drive gear projecting into the path of said roller.

6. In a duplicating machine, the combination with a rotatable drum having means thereon for securing a master sheet thereto, of means adjacent to said drum adapted to forward a copy sheet into impression relationship to said master sheet, a drive shaft, and means to intermittently rotate said drum by continuous rotation of said drive shaft, said last named means comprising a drive gear having a mutilated section, a driven gear operatively connected to said drum and adapted to mesh with said drive gear, cams on the driven gear and said mutilated section having faces adapted to engage and when engaged to hold the driven gear stationary, and means on the two gears cooperating to accelerate rotation of the driven gear as said cams separate and the gears come into meshing relationship and to retard rotation of the driven gear as the aforesaid cams are brought together, said last named means comprising a roller on the driven gear and cams on said drive gear at the ends of said mutilated section projecting into the path of said roller.

7. In a duplicating machine, the combination of a rotatable drum, means for mounting a master copy on said drum, means comprising forwarding rolls for carrying copy sheets into impression relationship with a master copy on said drum as the drum rotates, a mutilated gear fixedly mounted on said drum having an outwardly concaved bearing portion at its edge face, a second mutilated gear rotatably mounted in position to mesh with said first-named gear and having a smooth edge portion adapted to have sliding engagement with the concaved bearing portion of said first-named gear for providing a dwell period for said first-named gear, a lug extending axially from said concaved bearing portion of said first-named gear, and cams on said second gear adapted by engagement with said lug upon rotation of said second gear gradually to stop said first-named gear at the start of a dwell period and gradually to start said first-named gear again into rotation at the end of a dwell period.

8. In a duplicating machine, the combination of a rotatable drum, means for mounting a master copy on said drum, means comprising forwarding rolls for carrying copy sheets into impression relationship with a master copy on said drum as the drum rotates, a mutilated gear fixedly mounted on said drum having an outwardly concaved bearing portion at its edge face, a second mutilated gear rotatably mounted in position to mesh with said first-named gear and having a smooth edge portion adapted to have sliding engagement with the concaved bearing portion of said first-named gear for providing a dwell period for said first-named gear, a roller extending axially from said concaved bearing portion of said first-named gear, and cams carried by said second gear and extending outwardly a substantial distance beyond the teeth of the gear adapted by engagement with said roller upon rotation of said second gear gradually to stop said first-named gear at the start of a dwell period and gradually to start said first-named gear again into rotation at the end of a dwell period.

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