Sept. 4, 1934. J. J. FLANIGAN 1,972,380

DUPLICATING MACHINE

Filed Feb. 27, 1932 2 Sheets-Sheet 1

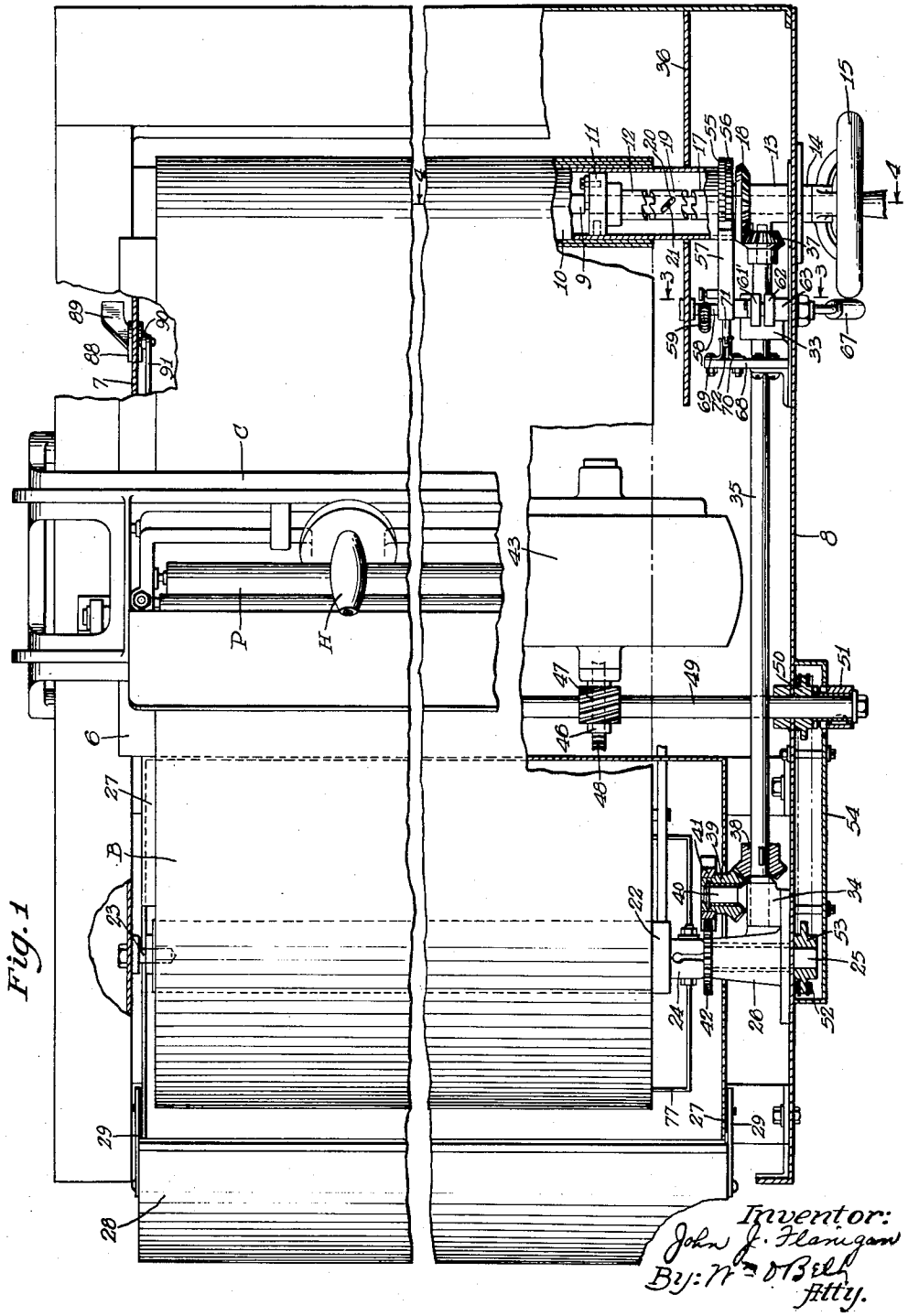


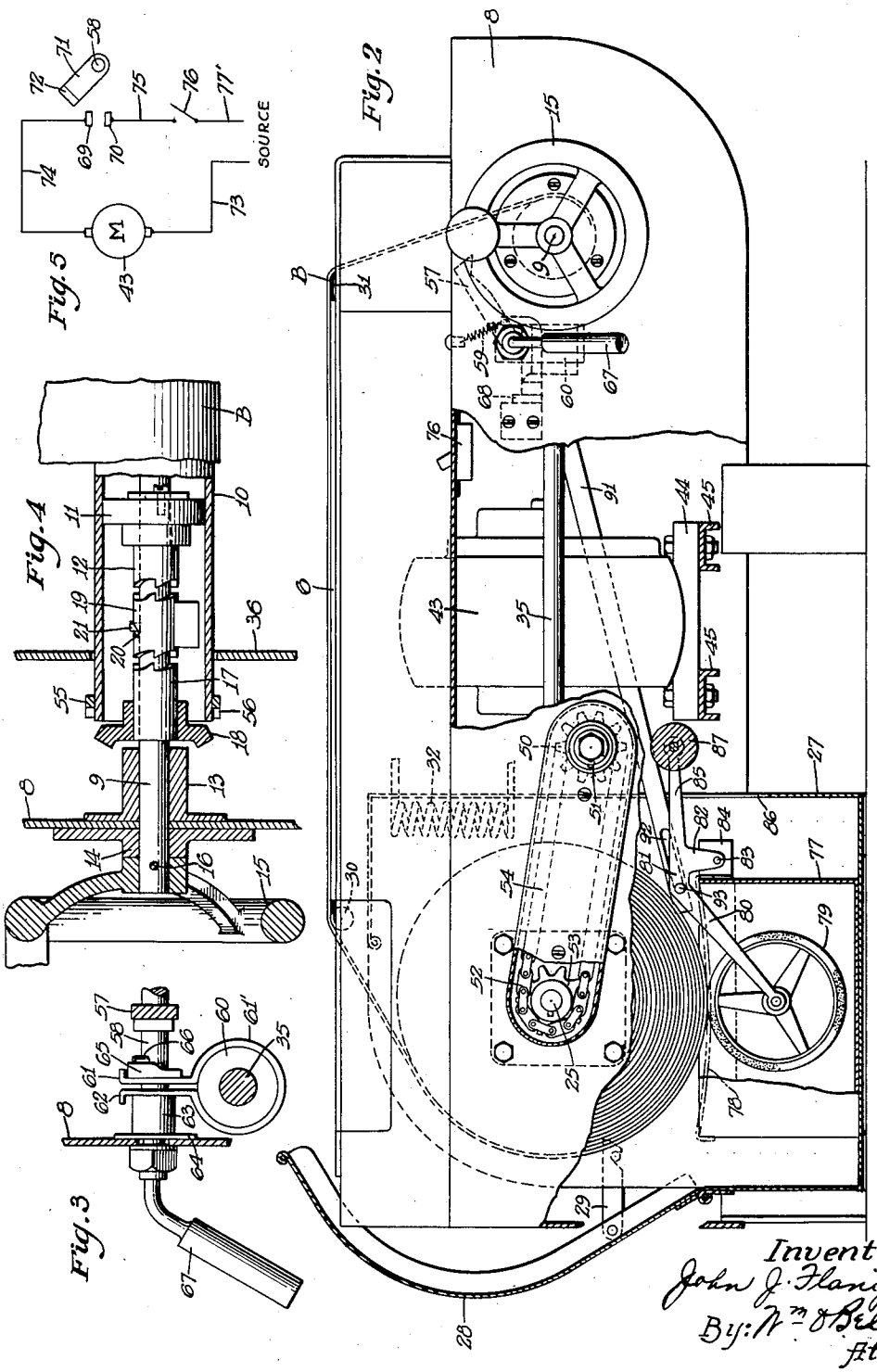
Fig. 1

Inventor:
John J. Flanigan
By: W. O'Brien
Atty.

Sept. 4, 1934. J. J. FLANIGAN 1,972,380

DUPLICATING MACHINE

Filed Feb. 27, 1932 2 Sheets-Sheet 2



Inventor:
John J. Flanigan
By: Wm. O. Bell
Atty.

Patented Sept. 4, 1934 1,972,380

UNITED STATES PATENT OFFICE

1,972,380

DUPLICATING MACHINE

John J. Flanigan, Oak Park, Ill., assignor to Vivid, Incorporated, Chicago, Ill., a corporation of Illinois

Application February 27, 1932, Serial No. 595,455

11 Claims. (Cl. 242—55)

This invention relates to duplicating machines of the kind operating on the hectograph principle.

In hectograph duplicating machines a gelatinous substance provides the impression surface and usually this substance is in the form of a band wound upon a supply spindle, removably mounted in the machine, and it is withdrawn from this spindle and stretched over the bed of the machine to be wound upon a take-up spindle, the successive portions of the band positioned on the bed providing the impression surfaces. Sometimes these machines are used continuously and but a few impressions are taken from the matrix provided on each portion of the band positioned above the bed and as the band is relatively short, it is, under these conditions, quickly wound from the supply spindle onto the take-up spindle. Sometimes, however, a large number of impressions are taken from the successive matrices on the band or the machine is used only at intervals during the day and under these conditions of operation the band is not so quickly wound from the supply spindle onto the take-up spindle. When the machine is so operated that the band is quickly wound from one spindle to the other, a large number of bands are used in the course of a day, but where the bands are not so quickly wound from one spindle to the other, only a few of the relatively short bands are used. It is the salient object of my invention to provide a novel duplicating machine including a band of sufficient length to supply enough impression surfaces to care for those conditions of operation under which a limited number of short bands are now used in the course of a day.

Gelatin bands become soft and even gummy and sticky when warmed and this makes handling, winding and unwinding quite difficult and it may happen that the condition of the band will be such that it will not be satisfactory for use. This may arise when the bands are used in localities where the temperature and humidity run quite high as in tropical or semitropical countries. In view of this, another object of my invention is to keep the band in proper condition by regulation of temperature in the parts wherein the band is stored.

Other objects are to provide a novel duplicating machine in which the band is wound in one direction by power and wherein the band may be manually wound in this or the opposite direction; in which a moistening device may be contacted with the band to condition the same during power or manual winding thereof; in which the portion of the band stretched over the bed is held in taut condition and wherein power winding is prevented so long as the band is so held; and which is economical in manufacture and efficient in operation.

A selected embodiment of the invention is illustrated in the accompanying drawings and therein

Fig. 1 is a top plan in which certain parts are broken away;

Fig. 2 is a side elevation wherein certain parts are broken away;

Fig. 3 is a sectional view taken substantially on the line 3—3 on Fig. 1;

Fig. 4 is a sectional view taken substantially on the line 4—4 on Fig. 1; and

Fig. 5 is a diagrammatic view of the electric circuit.

In the machine illustrated in the accompanying drawings, 6 is the bed supported between trackways carried by the side frame members 7 and 8. A carriage C, which may be of the kind disclosed in my co-pending application, Serial No. 565,283, filed September 26, 1931, is provided and is supported for reciprocation over the portion of the gelatin band B stretched across the bed and when the platen roller P in the carriage is lowered by manipulation of the handle H, a sheet bearing a form to be duplicated may be applied to the band to provide a matrix or sheets may be applied to the band to take impressions from a matrix previously provided thereon. Band is used herein in a generic sense, that is to say, the band may be a continuous one-piece gelatinous strip or it may be made up of a plurality of standard length bands or short strips, suitably joined together.

A shaft 9 is journaled in the side frame members 7 and 8 adjacent the front ends thereof and the hollow spindle 10 is rotatably supported about this shaft. In the spindle 10 adjacent one end thereof, a disc 11 is fast and is rotatable with the spindle about the shaft. Embracing the shaft and unitary with the disc and projecting from one face thereof is a clutch member 12. A bearing 13 is carried by the side frame member 8 inwardly thereof and the shaft 9 is journaled in this bearing and in a bearing 14 carried by the side frame member 8 outwardly thereof. The shaft projects beyond the bearing 14 and a hand wheel 15 is fixed thereto by a pin 16 or the like whereby manipulation of the hand wheel 15 causes rotation of the shaft 9. A clutch member 17 is rotatably mounted on the shaft 9 and on the periphery thereof is an outwardly facing bevel gear 18 disposed adjacent the inner end of

the bearing 9. Mounted between the clutch members 12 and 17 is a weighted sliding clutch member 19 having a slot 20 therein through which the pin 21 fast in the shaft is projected. When the hand wheel 15 is rotated in a clockwise direction, the action of the pin 21 in the slot 20 causes the sliding clutch member 19 to move along the shaft 9 and engage the clutch member 12 whereby the spindle 10 is connected to the shaft 9 and is so rotated that the band B is wound thereon.

The end of the supply spindle 22 adjacent the side frame member 7 is removably journaled on a stud 23 or the like and a clamping device 24 at the other end thereof detachably connects this spindle to the shaft 25 journaled in the bearing member 26 carried by the side frame member 8 and the band B is normally stored on this spindle. Surrounding the spindle 22 and the band B wound thereon is a housing 27 having a movable lid 28 including a latch 29 for holding the lid in an open position so that the band may be withdrawn from the spindle 22 and directed over the roller 30, at the rear end of the bed 6, and the bed and past the guide 31, at the front end of the bed, and the free end of the band is detachably connected, in an approved manner, to the take-up spindle 10.

When all of the band B is wound on the spindle 22, the lid 28 is moved into closing position whereby the band is enclosed in the housing 27. Thus, the band is fully housed and protected against damage and this facilitates keeping the band in proper condition and also prevents dust and the like from collecting on the band. I have provided a coil 32 in the housing 27 and by circulating a refrigerating medium through this coil a predetermined temperature is maintained in the housing 27 whereby the band is kept in proper condition, and this permits use of the machine in tropical or semi-tropical localities where conditions are not suitable for practical use of ordinary hectograph duplicating machines. It is to be understood that the provision of the coil 32 is optional and may be omitted if desired or not needed, as when the machine is to be used under ordinary conditions.

Carried by the side frame member 8 inwardly thereof are bearings 33 and 34 in which a shaft 35 is journaled, this shaft extending longitudinally of the machine in the compartment defined between the vertical partition 36 and the side frame member 8. At the forward end of the shaft 35 is a bevel gear 37 meshed with the bevel gear 18. At the rear end of the shaft 35 is a bevel gear 38 meshed with the bevel gear 39 rotatably mounted on the shaft 40 carried by the bearing 34. Fast on the bevel gear 39 is a spur gear 41 meshing with a spur gear 42 fast on the shaft 25. When the hand wheel 15 is rotated in a counter-clockwise direction, the action of the pin 21 in the slot 20 causes the sliding clutch member 19 to disengage the clutch member 12 whereupon the spindle 10 is disconnected from the shaft 9 and the sliding clutch member moves along the shaft until it engages the clutch member 17 whereupon the shaft is connected to the bevel 18 and rotation of this bevel gear is transmitted to the bevel gear 37 and to the shaft 35, thence through the bevel gear 38 to the bevel gear 39 and through spur gear 41 to spur gear 42 whereby the shaft 25 and consequently the spindle 22 are rotated and rotation of the spindle 22, as brought about by these devices, causes the band B to be wound thereupon.

As stated, the band B is stretched over the bed 6 between the spindles 22 and 10 and manipulation of the hand wheel 15 causes one or the other of the spindles to be rotated for rotation of the hand wheel causes the sliding clutch member 19 to engage either the clutch member 12 or the clutch member 17 and to disengage the other clutch member to thereby free the other spindle, and when a spindle is so rotated, the band is wound thereon and this arrangement may be used to slightly shift the position of the band B on the bed 6 to orient a matrix provided on the portion thereof stretched over the bed 6. The hand wheel 15 is utilized to wind the band in a step-by-step manner onto the spindle 10 and the portions of the band positioned over the bed 6 in the intervals in this step-by-step movement provide the impression surfaces.

When all of the band has been wound onto the spindle 10, it is desirable that it be rewound onto the spindle 22 and, while this may be done by operation of the hand wheel 15, it is usually done at one time rather than in a step-by-step manner and by reason of the length of the band I have found it advantageous to provide power means for rewinding the band onto the supply spindle. This power means includes an electric motor 43 mounted on a bracket 44 carried by struts 45 secured to the side frame members. On the shaft 46 of the motor I provide a worm gear 47 meshed with a worm wheel 48 fast on the shaft 49 extending transversely of the machine and journaled in bearings carried by the side frame members. The shaft 49 extends through the side frame member 8 and rotatably mounted thereon outwardly of the side frame member is a sprocket 50. A clutch member 51 is keyed to the shaft 49 to be rotatable therewith and slidable therealong whereby it may be engaged or disengaged with the sprocket 50 and when engaged with the sprocket 50 this clutch member connects said sprocket to the shaft 49. When the band is being wound manually by rotation of the hand wheel 15, the clutch member is in disengaged position. An endless chain 52 is directed about the sprocket 50 and about a sprocket 53 fast on the shaft 25 outwardly of the side frame member 8. This chain and the sprockets are enclosed in a housing 54 secured on the outer side of the side frame member 8. When the sprocket 50 is rotated with the shaft 49, rotation is transmitted through the chain 52 to the sprocket 53 and thence to the shaft 25 whereby the spindle 22 is rotated in a direction to wind the band B thereon. During the time the power means is winding the band onto the spindle 22 the sliding clutch member 19 is in an intermediate position, disengaged from both the clutch member 12 and the clutch member 17. While I have shown the power means as winding the band onto the rear spindle, it is to be understood that it could be utilized to wind the band onto the front spindle, or a power means might be provided to wind the band onto both spindles without departing from the purview of my invention.

In order to provide a proper impression surface, it is desirable that the portion of the band directed over the bed be stretched taut and this is accomplished by providing devices to prevent unwinding movement of the spindles 10 and 22. The spindle 10 extends beyond the vertical partition 36 and two ratchets 55 and 56 are fastened thereon, each having a like number of similar teeth. The ratchets are mounted side by side and the teeth on one ratchet are preferably dis-

posed in a position midway between the teeth on the other ratchet and this alternate disposition of the teeth on these ratchets provides a fine adjustment without the necessity of providing relatively fine teeth and because of the alternate disposition of the teeth a tooth on one or the other of the ratchets is always in position to be engaged by the pawl 57. The pawl 57 is fast on a shaft 53 journaled in bearings in the side frame member 3 and partition 36 and a spring 59 acts to normally hold the pawl out of engagement with the teeth of the ratchets. Fast on the shaft 35 below the shaft 53 is a disc 60 surrounded by a brake band 61' including limb portions 61 and 62 having openings therein through which the shaft 53 is extended. A sleeve 63 is disposed about the shaft 58 between the limb portion 62 and a plate 64 engaging the side frame member 8, and this sleeve limits movement of the limb portion 62 along the shaft 58. Rotatably mounted on the shaft 58 is a cam member 65 which is disposed between the limb portion 61 and a pin 66 fast on said shaft 58. A handle 67 is provided on the shaft 58 and this handle is disposed outwardly of the side frame member 8. When the handle 67 is turned to rotate the shaft 58, the pin 66 acts on the cam member 65 to force the same along the shaft 58 whereby the limb portion 61 is forced toward the held limb portion 62 and in this way the brake band 61' is tightened on the periphery of the disc 60 and the shaft 35 is held against rotation and since the shaft is connected to the spindle 22, in the manner described, the spindle is held against rotation. At the time the handle 67 rotates the shaft 58 to clamp the brake band 61' on the disc 60, the pawl 57 is moved toward the ratchets 55 and 56 and engages a tooth on one or the other of these ratchets and prevents unwinding movement of the spindle 10. In the foregoing manner both the spindles are held against unwinding movement. By rotating the handle 67 in the opposite direction, the spindles are released. But when the spindles are held against unwinding movement, the spindle 10 is turned to wind the band thereon and slight movement imparted to this spindle draws the band taut over the bed.

The band B is semi-fragile and consequently if the motor 44 is set in operation at the time the spindles are held against unwinding movement, the band might be torn or otherwise damaged. To prevent this I provide a safety arrangement. A plate 68 of insulating material projects inwardly from the side frame member 8 and mounted thereon is a pair of vertically spaced contacts 69 and 70. Fast on the shaft 58 is an arm 71 of insulating material carrying a contact plate 72. At the time the handle 67 is turned to clamp the brake band 61' on the disc 60 and engage the pawl 57 with either the ratchet 55 or the ratchet 56, the arm 71 is so turned that the plate 72 is moved from bridging position between the contacts 69 and 70. A conductor 73 (Fig. 5) leads from the source of current to one terminal of the motor 43 and a conductor 74 leads from the other terminal of the motor to the contact 69. A conductor 75 leads from the contact 70 to one terminal of the main switch 76 and a conductor 77' leads from the other terminal of the switch to the source. Thus, the contacts 69 and 70 and the switch 76 are in series and should the main switch 76 be closed at the time the plate 72 is disengaged from the contacts 69 and 70, the motor 43 is not set in operation. But when the handle 67 is moved to release the spindles, the plate 72 moves into position to close the circuit between the contacts 69 and 70, and hence when the switch 76 is closed, the motor 43 is set in operation to wind the band onto the spindle 22.

It is essential that the gelatin band be moistened from time to time and preferably this moistening is brought about prior to the time the successive portions of the band move into impression position over the bed 6 and it is usually advantageous to moisten the band at the time it is rewound onto the spindle 22. To this end a water tank 77 is provided at the bottom of the housing 27. When not in use, this tank may be closed by the removable plate 78. However, when it is desired to moisten the band, the tank 77 is filled with water so that at least a portion of the periphery of the roller 79 is always immersed in the water. The roller 79 is carried by arms 80 of the members 81 which include depending lugs 82 pivotally mounted at 83 on brackets 84 carried by the tank 77. Arms 85 project from the members 81 through slots 86 in the forward end of the housing 27 and a weight 87 is carried by these arms outwardly of the housing. Mounted in the side frame members 7 adjacent the front of the machine is a rotatable member 88 including a handle 89. The member 88 includes an arm 90 to which a link 91 is pivotally connected. At the rear end of the link 91 is a slot 92 through which a pin 93 on one of the members 81 is extended. By turning the handle 89, the member 88 is so rotated that the arm 90 is positioned to move the link 91 into a position whereat the forward end of the slot 92 engages the pin 93 and when in this position the roller 79 is held out of contact with the band B wound upon the spindle 22. But when the handle 89 is turned to rotate the member 88 so that the member 90 positions the arm 91, as shown in Fig. 2, the weight 87 acts to urge the roller 79 into engagement with the periphery of the roll of the band B wound on the spindle 22 and as the spindle rotates and the band B moves past the roller 79 water picked up by said roller in the tank 77 is applied to the band.

By providing a band of sufficient length to care for conditions of operation under which only a limited number of short bands are used, the necessity of removing and installing bands is obviated. Thus, the liklihood of damage due to careless handling and improper storing is avoided. By providing a moistening device in the machine, the treatment of the band is facilitated and there is greater assurance that the band will be treated properly and this increases its life. Operation and use of the machine is also facilitated by providing a long band and this may be made up in a single unit or by joining together a plurality of short bands. By the use of such a long band considerable time is saved and this is augmented by the provision of power means for rewinding the band. Moreover, inadvertent operation of the power rewind is prevented by the safety arrangement cooperating with the holding device which maintains the portion of the band stretched over the bed in taut condition. The machine also includes a manually operable winding device which is capable of operation independently of the power winding and this may be utilized not only for the purpose of winding the band but also to stretch the band and to orient the matrix. The provision of a housing in which the band is stored and of means for maintaining a desired temperature in this housing permits the use of the machine in localities whereat the use of hectograph

duplicating machines has previously been impractical. And the machine is economical in manufacture and efficient in operation.

I have shown a selected embodiment of the invention but this is susceptible of variation and modification and I reserve the right to all changes and alterations within the spirit and scope of the following claims:

I claim:

1. In a duplicating machine, a supply spindle, a take-up spindle, means for winding a band onto and from both of said spindles, power means for rewinding the band onto the supply spindle, means for locking said spindles against rotation, and means for preventing operation of said power means when the spindles are locked against rotation.

2. In a duplicating machine, a supply spindle, a take-up spindle, manually operable means for winding a band from one spindle onto the other, power means independent of said manually operable means for winding said band from one spindle to the other, means for locking said spindles against rotation, and means for preventing operation of said power means when the spindles are locked against rotation.

3. In a duplicating machine, a band providing an impression surface, a supply spindle for the band, a take-up spindle for the band, means for winding the band from the supply spindle onto the take-up spindle, power means for rewinding the band onto the supply spindle, means for arranging the band in operative state, and means preventing operation of said power means when the band is arranged in operative state.

4. In a duplicating machine, a band providing impression surfaces, spindles onto and from which said band is wound and between which said band is extended, means for arranging the portion of the band between the spindles in operative state to provide an impression surface, power means for winding the band, and means preventing operation of the power means when the portion of the band between the spindles is arranged in operative state.

5. In a duplicating machine, a pair of spaced spindles, a band extended between said spindles and adapted to be wound onto one spindle as it is unwound from the other spindle, power means for rotating said spindles, locking means for preventing unwinding movement of said spindles, and means preventing operation of said power means when said locking means is in locking position.

6. In a duplicating machine, a supply spindle, a take-up spindle, a band extended between said spindles and adapted to be wound onto one of said spindles as it is unwound from the other spindle, manually operable means for rotating said spindles to wind said band, locking means for holding said spindles against unwinding movement, and power means for rotating said spindles to wind said band and operable only when said locking means is released to permit unwinding movement of said spindles.

7. In a duplicating machine having a bed, a supply spindle at one end of said bed, a take-up spindle at the other end of said bed to which a band withdrawn from said supply spindle and directed over said bed may be connected, a shaft connected to said supply spindle and having a pair of movement receiving members thereon, a movement receiving member connected to said take-up spindle, winding means including a part adapted for cooperation with one of the movement receiving members on said shaft and with the movement receiving member connected to said take-up spindle and selectively operable to drive either said supply spindle or said take-up spindle to wind said band thereon, and power means including a part cooperating with the other of said movement receiving members on said shaft and operable to wind said band from said take-up spindle onto said supply spindle.

8. In a duplicating machine having a bed, a supply spindle at one end of said bed, a take-up spindle at the other end of said bed to which a band withdrawn from said supply spindle and directed over said bed may be connected, a shaft connected to said supply spindle and having a pair of movement receiving members thereon, a movement receiving member connected to said take-up spindle, winding means including a part adapted for cooperation with one of the movement receiving members on said shaft and with the movement receiving member connected to said take-up spindle and selectively operable to drive either said supply spindle or said take-up spindle to wind the band thereon, a power driven shaft, and means for connecting said power driven shaft with the other of the movement receiving members on the shaft connected to said supply spindle whereby said power driven shaft may be operated to wind said band from said take-up spindle onto said supply spindle.

9. In a duplicating machine having a bed, a supply spindle at one end of said bed, a take-up spindle at the other end of said bed to which a band withdrawn from said supply spindle and directed over said bed may be connected, a shaft connected to said supply spindle and having a pair of movement receiving members thereon, a movement receiving member connected to said take-up spindle, winding means including a part adapted for cooperation with one of the movement receiving members on said shaft and with the movement receiving member connected to said take-up spindle and selectively operable to drive either said supply spindle or said take-up spindle to wind the band thereon, a power driven shaft, and means including a releasable part and connecting said power driven shaft with the other of the movement receiving members on the shaft connected to said supply spindle whereby said power driven shaft may be operated to wind said band from said take-up spindle onto said supply spindle, said releasable part disconnecting said power driven shaft when the winding means is operated.

10. In a duplicating machine having a bed, a container at one end of said bed, a supply spindle mounted in said container, a take-up spindle mounted at the other end of said bed, a shaft extending into said container and connected to said supply spindle, a pair of movement receiving members mounted on said shaft, a movement receiving member connected to said take-up spindle, winding means including a part adapted for cooperation with one of the movement receiving members on said shaft and with the movement receiving member connected to said take-up spindle and selectively operable to drive either said supply spindle or said take-up spindle to wind the band thereon, and power means including a part cooperating with the other of said movement receiving members on said shaft, the power means and the part thereof cooperating with said movement receiving member and said movement receiving member being mounted out of said container, said power means being

operable to wind the band from the take-up spindle onto the supply spindle.

11. In a duplicating machine having a bed, a container at one end of said bed, a supply spindle mounted in said container, a take-up spindle mounted at the other end of said bed, a shaft extending into said container and connected to said supply spindle, a pair of movement receiving members mounted on said shaft, a movement receiving member connected to said take-up spindle, winding means including a part journaled in said container and adapted for cooperation with one of said movement receiving members on said shaft, said one of said movement receiving members being mounted in said container, said winding means also cooperating with the movement receiving member connected to said take-up spindle and being selectively operable to drive either said supply spindle or said take-up spindle to wind the band thereon, and power means including a part cooperating with the other of said movement receiving members on said shaft, the power means and the part thereof cooperating with said movement receiving member and said movement receiving member being mounted out of said container, said power means being operable to wind the band from the take-up spindle onto the supply spindle.

JOHN J. FLANIGAN.