Feb. 28, 1967 F. J. CUTRI 3,306,195

PATTERN DUPLICATING MACHINE

Filed April 28, 1965 4 Sheets-Sheet 1

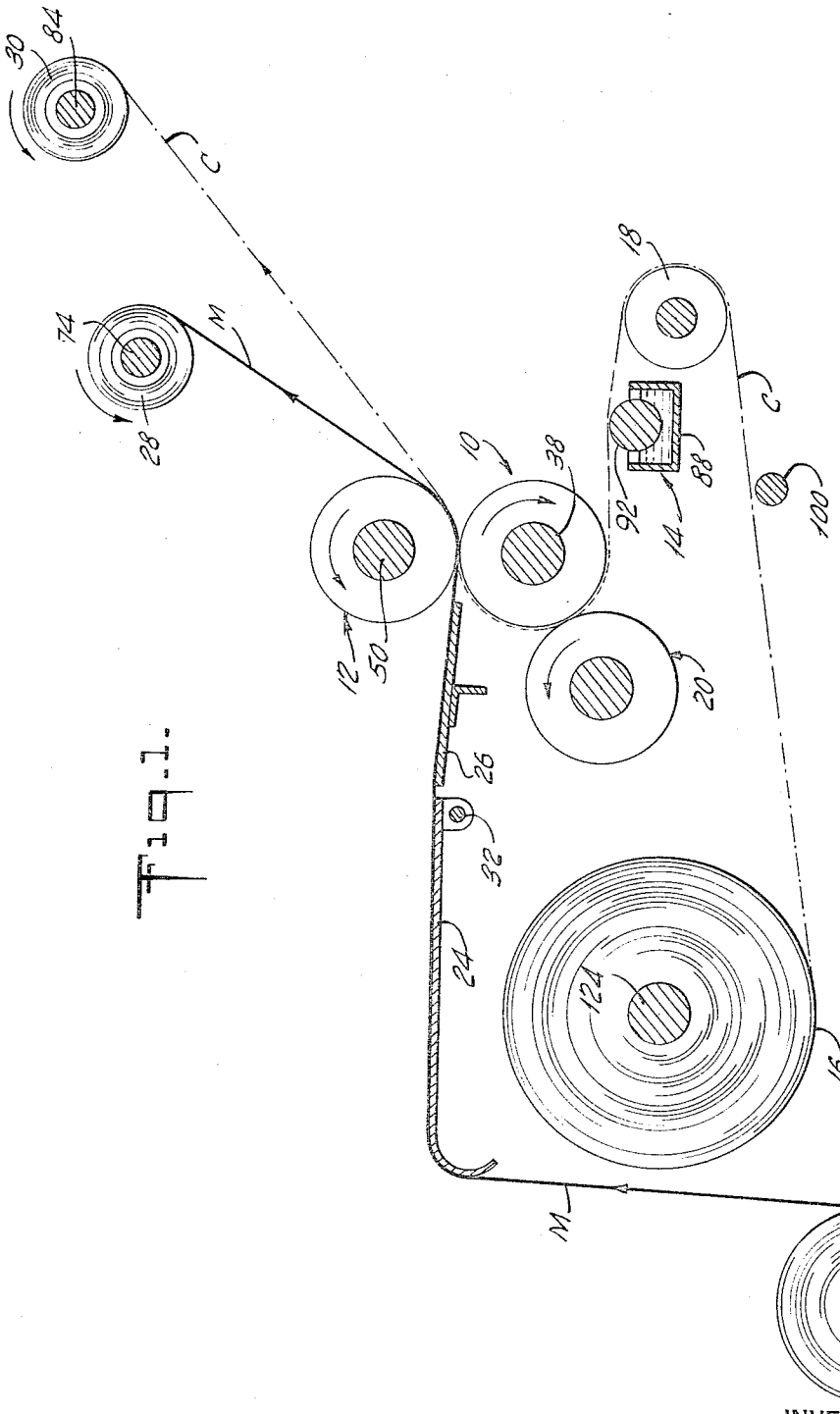


Fig. 1.

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FIG. 2.

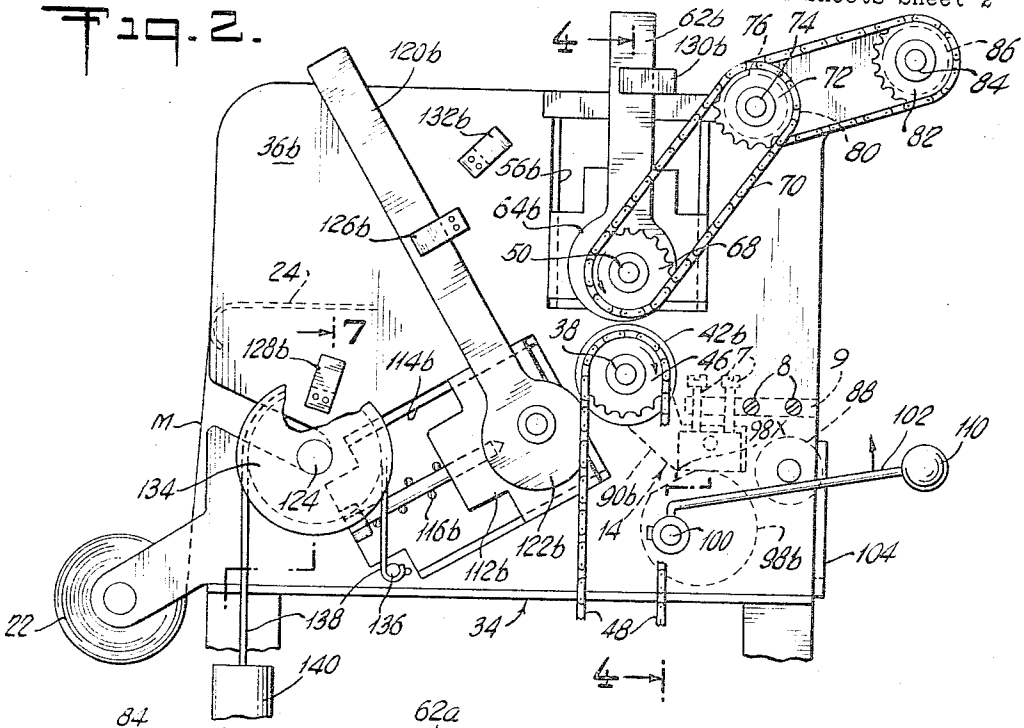
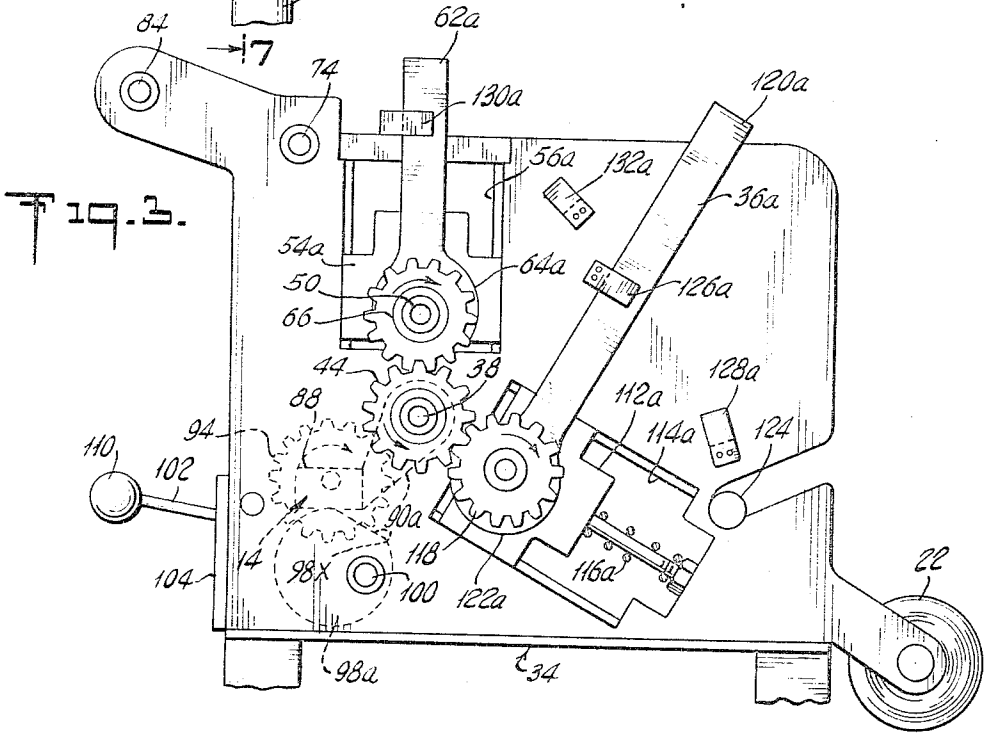


FIG. 3.



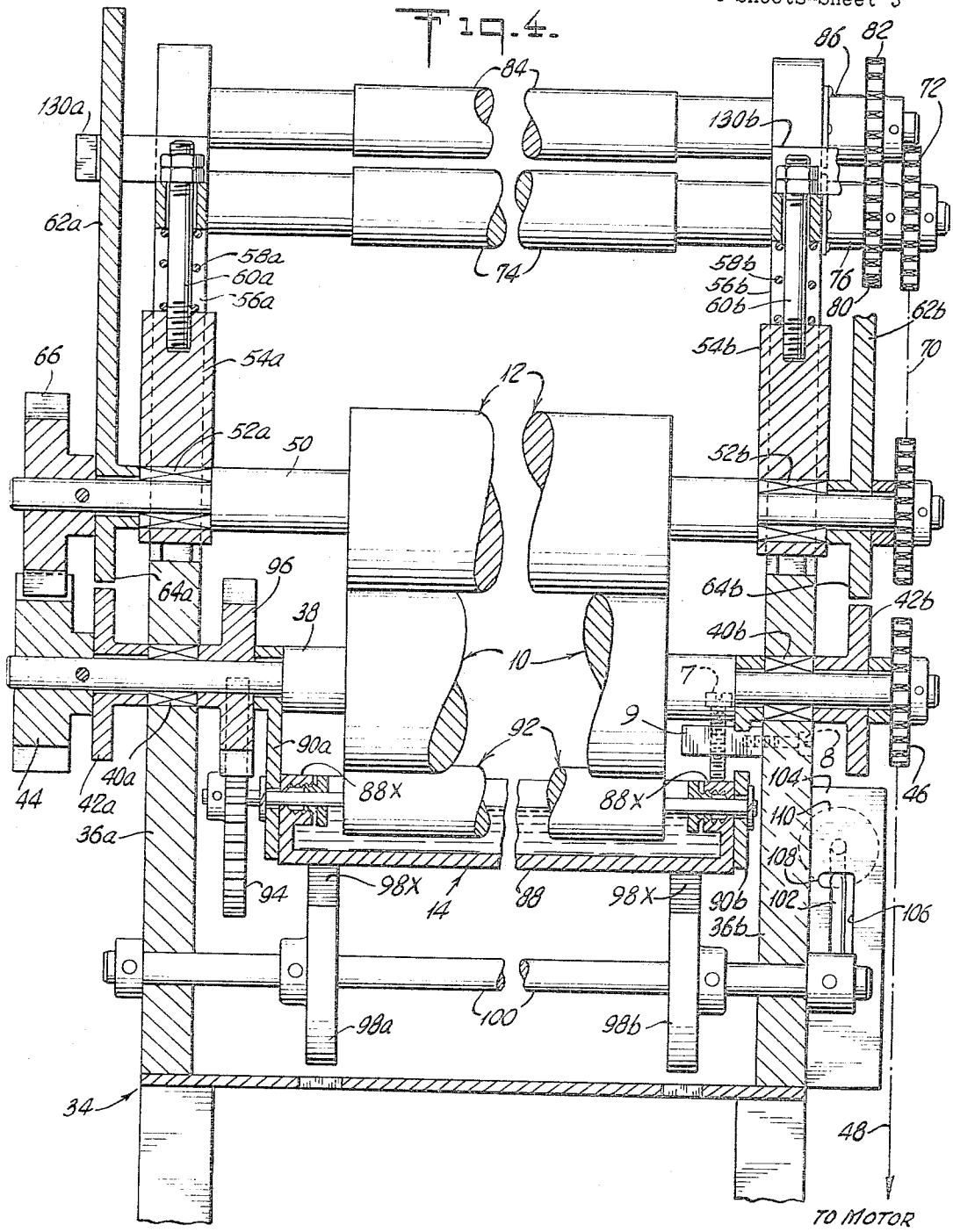
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PATTERN DUPLICATING MACHINE

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Fig. 4.



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FIG. 5.

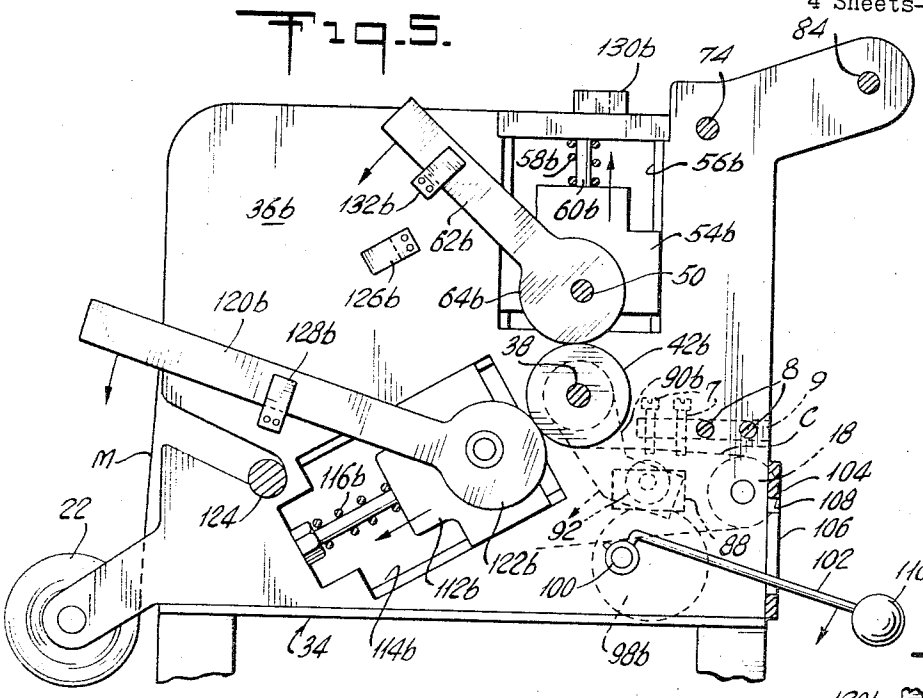


FIG. 6.

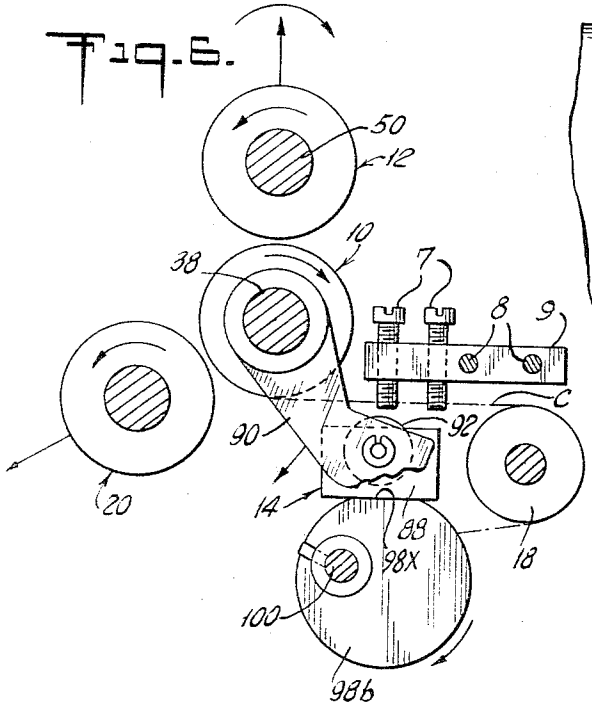
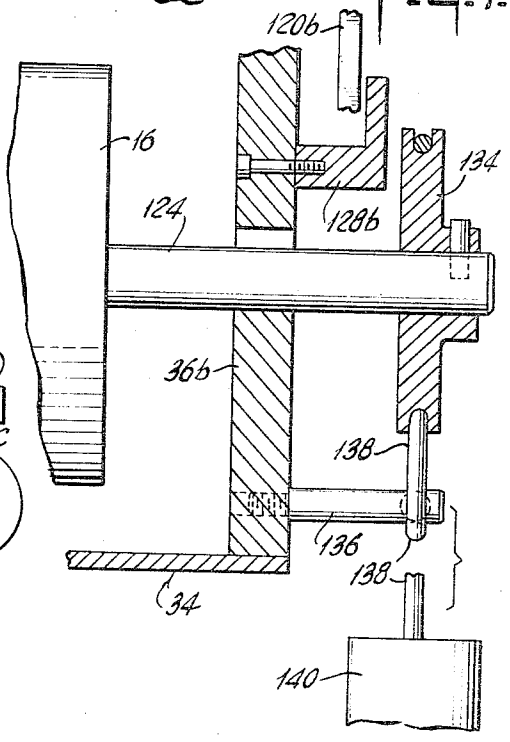


FIG. 7.



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3,306,195
PATTERN DUPLICATING MACHINE

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11 Claims. (Cl. 101—132.5)

The present invention relates to duplicating machines.

More particularly, the present invention relates to spirit duplicating machines which make it possible to transfer a pattern from a master sheet to a copy sheet which has been moistened with spirit so as to receive an impression of the pattern carried by a master sheet, in a well-known manner.

The known machines of this type are quite complex. Threading of the master sheet and copy sheet through conventional machines of this type is difficult to carry out and maintenance of proper synchronization between the moving parts is also difficult to maintain. Furthermore, adjustment of the parts and free access thereto is also difficult in conventional machines of this type.

One of the primary objects of the present invention is to provide a spirit duplicating machine which makes it quite simple for the operator to thread the sheets through the machine.

Another object of the present invention is to provide a machine of the above type which renders the parts easily accessible.

Also it is an object of the present invention to provide a machine where the moistening means which applies the spirit to the copy sheet can be very easily controlled by the operator.

The objects of the present invention also include a structure which transmits the drive in a very simple way to all of the moving parts while at the same time quaranteeing maintenance of proper synchronization of the moving parts.

The spirit duplicating machine of the invention includes a rotary main roller and a counter roller cooperating therewith to press against each other a master sheet and a copy sheet which pass together between the main and counter rollers. The copy sheet is guided along a given path to the main roller, and along this latter path there is situated, spaced from the main roller, a moistening means for applying spirit to that face of the copy sheet which subsequently is pressed against the master sheet. The structure further includes a pressure roller which presses the copy sheet against the main roller just prior to engagement of the copy sheet with the master sheet, and this pressure roller of course engages the face of the copy sheet which has just previously been moistened by the moistening means.

The invention is illustrated by way of example in the accompanying drawings which form part of the application and in which:

FIG. 1 is a schematic side elevation of the machine of the invention;

FIG. 2 is a fragmentary elevation of the machine of the invention as seen from one side;

FIG. 3 is an elevation of the machine as it appears from the side opposite from that shown in FIG. 2;

FIG. 4 is a fragmentary sectional view on an enlarged scale, as compared to FIG. 2, taken along line 4—4 of FIG. 2 in the direction of the arrows;

FIG. 5 shows the structure of FIG. 2 as it appears when manually operable levers have been displaced away from the positions thereof shown in FIG. 2 into the positions shown in FIG. 5;

FIG. 6 diagrammatically illustrates the positions which the parts take when the levers have the positions of FIG. 5; and

FIG. 7 is a fragmentary partly sectional elevation, on an enlarged scale as compared to FIG. 2, taken along line 7—7 of FIG. 2 in the direction of the arrows.

Referring to FIG. 1, it will be seen that the structure includes a main roller 10 which is illustrated as turning in a clockwise direction, this main roller cooperating with a counter roller 12 which is situated directly over the main roller 10 for pressing together the master sheet M and the copy sheet C. A moistening means 14 is provided for applying spirit to that face of the copy sheet C which subsequently is pressed against the master sheet M by the rollers 10 and 12. A means is provided for guiding the copy sheet C along a given path to the main roller 10, and this latter means includes the structure for positioning the copy sheet supply roll 16 as well as the freely turnable guide roll 18 around which the copy sheet passes before reaching the main roll 10. It will be noted that the moistening means 14 is spaced from the main roller 10.

Instead of simply being moistened just prior to engaging the master sheet, the copy sheet is further engaged by a pressure roller 20 which cooperates with the main roller 10 to press the copy sheet against the main roller 10 just prior to engagement of the master sheet by the copy sheet. This pressure roller 20 thus serves to impress the spirit into the fibers of the copy sheet C and to distribute the film of spirit uniformly over the copy sheet so that the quality of the copy is enhanced by the pressure roller 20.

The master sheet M moves from the master sheet supply roll 22 along stationary guide members 24 and 26 and around the counter roller 12 to the master sheet take-up roll 28. The copy sheet C travels from the supply roll 16 around the guide roll 18 and the master roller 10 to the copy sheet take-up roll 30. While the guide 25 remains at the position shown in FIG. 1, the guide 24 may be turned about a pivot 32 during setting up of the machine.

Referring now to FIG. 4, the machine includes a frame means 34 having a pair of side walls 36*a* and 36*b*. The main roller 10 includes a shaft 38 supported for rotation by bearings 40*a* and 40*b* which are directly carried by the side walls 36*a* and 36*b*, respectively, so that the axis of rotation of the main roller 10 is fixed. Reduced shaft portions of the main roller 10 respectively carry circular cam rings 42*a* and 42*b* adjacent to and outside of the side walls 36*a* and 36*b*, respectively. The shaft 38 also carries a gear 44 which is fixed to the shaft 38, and a sprocket wheel 46 is also fixed to the shaft 38 and is driven by a chain 48 which is in turn driven from a suitable motor, so that the main roller 10 is directly driven in order to operate the machine.

The counter roller 12 includes a shaft 50 supported for rotation by bearings 52*a* and 52*b* carried by slide blocks 54*a* and 54*b*, respectively, which are guided for vertical movement in suitable openings 56*a* and 56*b* formed in the side walls 36*a* and 36*b*, respectively. Springs 58*a* and 58*b*, which extend around guide bolts 60*a* and 60*b*, respectively, urge the slide blocks 54*a* and 54*b* downwardly, and thus the counter roller 12 is supported for rotation by a bearing means which is guided by the frame means 34 for movement toward and away from the main roller 10.

Reduced portions of the shaft 50 of the counter roller 12 turnably carry a pair of identical levers 62*a* and 62*b* either one of which can be manually turned by the operator, and these levers respectively carry cams 64*a* and 64*b* which can respectively be turned into and out of engagement with the cam rings 42*a* and 42*b* in a manner described in greater detail below.

The shaft 50 fixedly carries a gear 66 which meshes with the gear 44 so that the drive is transmitted from the

main roller **10** to the counter roller **12** through the gears **44** and **66**. The end of the counter roller **12** distant from the gear **66** fixedly carries a sprocket **68** which through a chain **70** drives a second sprocket **72** carried by the shaft **74** on which the master sheet take-up roll **28** is wound, and the shaft **74** is driven from the sprocket **72** through a suitable slip clutch **76**. The shaft **74** carries a second sprocket **80** which through a suitable chain drives a sprocket **82** which through a slip clutch **86** drives the shaft **84** which carries the copy sheet take-up roll **30**. These shafts **74** and **84** are supported for rotation by the side walls **36***a* and **36***b* of the frame means **34**. While the sprockets **72** and **80** are fixed to each other for rotation together, they are freely turnable on the shaft **74** and drive the latter only through the slip clutch **76**, while the sprocket **82** also is freely turnable on the shaft **84** and drives it only through the slip clutch **82**.

The moistening means **14** includes a trough **88** which has a pair of side extensions **90***a* and **90***b* formed with openings which receive the shaft **38** of the main roller **10**, so that in this way the trough **88** is capable of swinging about a horizontal axis which coincides with the axis of the main roller **10**. The moistening means **14** also includes the moistening roller **92** which dips into the spirit within the trough **88** and which of course is capable of engaging the face of the copy sheet C which is to be subsequently pressed against the master sheet M, as pointed out above. The transfer roll **92** is supported for rotation in suitable bearings carried by the end walls of the trough **88**, as indicated in FIG 4, and the roller **92** has beyond the trough **88** a shaft portion which fixedly carries a gear **94** which in turn meshes with a gear **96** fixed directly to the shaft **38**, so that the roller **92** is driven through the transmission **94**, **96** directly from the shaft **38**. In this way, proper synchronization of the speed of rotation of the roller **92** with respect to the speed of rotation of the main roller **10** is assured. At the same time the trough **88** is capable of swinging about the shaft **38** while the gear **94** remains in mesh with gear **96**.

In order to raise and lower the moistening means **14**, the trough **88** has a downwardly directed surface engaged by a pair of cams **98***a* and **98***b*, and these cams are fixedly carried by a rotary shaft **100** supported for rotation by the side walls **36***a* and **36***b* of the frame means **34** and fixedly carrying a manually turnable lever **102**. Thus, the operator by turning the lever **102** can turn the cams **98***a* and **98***b* so as to raise and lower the moistening means **14**. This lever **102** is guided in an elongated slot **106** of a plate **104** which is fixedly carried by the side frame plate **36***b*, and the ends of the slot **106** limit the extent of raising and lowering of the trough. At its upper end the slot **106** has a lateral extension **108** capable of receiving the lever **102** so as to maintain the latter in its raised position where the trough **88** is raised to the elevation where the transfer roller **92** engages the copy sheet.

Referring now to FIGS. 2 and 3, it will be seen that the lever **102** carries at its outer end a handle **110** capable of being engaged by the operator.

Optionally, the cams **98***a* and **98***b* are provided with flats, as exemplified by the flat **98***x* of cam **98***b* shown in FIG. 6, which flats are horizontal and uppermost and flush against the flat bottom of trough **88** in the cam positions corresponding to the lowermost trough position.

As an important feature, means are provided to adjust the height and tilt position of the raised trough **88**. Horizontal block **9** is fixed to vertical side frame piece **36***b* by means of screws **8** (see FIGS. 4 and 6). A pair of screws **7** are adjustably threaded downwardly through threaded bores of block **9**, with the screw heads above the block and their tips below the block. The tips of screws **7** abut the top of an end wall **88***x* of trough **88** when the trough is raised. If the tips of screws **7** are in a common horizontal plane, trough **88** will be horizontal. If slight tilting of trough **88** about the axis of roller **92** is required, this can be obtained by appropriate adjustment of the abutment screws **7**. Also, the adjusted position of these screws determines the height to which the trough can be raised. Accordingly, the screws **7** provide means to adjust the tension of copy sheet C against roller **92**.

The pressure roller **20**, which is not visible in FIG. 4, is mounted for rotation through a structure which is almost identical with that which mounts the counter roller **12** for rotation, except that the structure for mounting the pressure roller **20** is of course oriented differently. The shaft of the pressure roller **20** is carried by bearings which are supported for rotation by slide blocks **112***a* and **112***b* (FIGS. 2 and 3), and these blocks are guided for movement in openings **114***a* and **114***b* of the side walls of the frame means **34**. Suitable springs **116***a* and **116***b* form a spring means urging the slide blocks toward the main roller **10**, so that while the counter roller **12** is urged downwardly toward the main roller, the pressure roller **20** is urged upwardly into engagement with the main roller **10**. It will be noted from FIG. 1 that in a plane which is perpendicular to the axes of the rollers **10**, **12**, and **20**, the line which interconnects the axes of the rollers **10** and **12** makes with the line which interconnects the axes of the rollers **10** and **20** an angle greater than 90 degrees but less than 180 degrees.

As may be seen from FIG. 3, the shaft of the pressure roller **20** fixedly carries a gear **118** which meshes with the gear **44**, so that the drive is transmitted from the latter gear also to the pressure roller **20**.

Also, reduced portions of the shaft of the pressure roller **20** turnably carry the manually turnable levers **120***a* and **120***b* which respectively carry cams **122***a* and **122***b* capable of engaging the circular cams **42***a* and **42***b* carried by the main roller shaft **38**.

The front edges of the plates **36***a* and **36***b* are formed with downwardly and rearwardly inclined notches for receiving the shaft **124** on which the copy supply roll **16** is mounted.

A pair of brackets **126***a* and **128***a* are fixedly carried by the wall **36***a* to limit the swinging of the lever **120***a*, and a similar pair of brackets **130***a* and **132***a* are provided for determining the end positions of the lever **62***a*. In the same way, the wall **36***b* carries brackets **126***b* and **128***b* for limiting the turning of the lever **120***b*, and brackets **130***b* and **132***b* are carried by the wall **36***b* for limiting the turning of the lever **62***b*. These brackets can frictionally engage the levers to retain them in their end positions or any other suitable means such as a releasable detent structure or the like may be used for this purpose.

Referring to FIGS. 2 and 7, the shaft **124** which carries the copy sheet supply roll **16** fixedly carries a grooved brake pulley **134**, and the wall **36***b* fixedly carries a pin **136** to which one end of a brake band or rope **138** is fixed, this braking element **138** passing around the pulley **134** and carrying a weight **140**, so that through this construction the rotation of the supply roll **16** is suitably braked.

With the above-described structure, during normal operation the drive will be transmitted from the main roller by way of the above-described transmissions to the counter roller **12**, the pressure roller **20**, to the take-up rolls through the chain and sprocket drives described above, and to the moistening roller **92** through the gears **96** and **94**, as described above.

Whenever it is desired to thread the machine the operator need only turn the levers to the positions indicated in FIG. 5, and this will result in displacement of the counter roller **12** and pressure roller **20** away from the main roller **10**, so that the threading operations can be very easily carried out. At the same time the operator can turn the lever **102** to the lower position indicated in FIG. 5, so that the moistening means **14** will be automatically lowered, and in this way also the threading operations need not be hampered by the moistening means.

The spacing of the rollers with respect to each other in their disengaged positions drive by displacing the levers to the position of FIG. 5 is indicated in FIG. 6, and this clearance between the rollers in their disengaged positions is less than the extent to which the teeth of the gears **44**, **66**, and **118** mesh with each other, so that even when the rollers are disengaged the teeth of these gears still mesh with each other so that the rollers continue to rotate, assuming that the machine is turned on, and in this way also proper meshing of the gears at all times is guaranteed while at the same time threading is also facilitated.

When the levers are displaced to the position of FIG. 5, the cams carried thereby engage the circular cams carried by the main roller shaft in the manner shown in FIG. 5. It is to be noted that either one of the rollers **12** or **20** can be independently displaced toward or away from the main roller. Also, at any time it is possible for the operator to turn the lever **102** so as to raise or lower the trough which is shown in FIG. 6 in its lowered position.

What is claimed is:

1. In a spirit duplicating machine, a main roller, a counter roller parallel to and coacting with said main roller for pressing against each other a master sheet and a copy sheet which pass together between said main and counter rollers, means directing a copy sheet along a given path to said main roller, moistening means situated along said path in advance and spaced from said main roller for moistening the copy sheet with spirit at that face of the copy sheet which is subsequently pressed against the master sheet by coaction of said main and counter rollers, and a pressure roller parallel to said main roller and coacting therewith for pressing the copy sheet against said main roller, said pressure roller engaging the moistened face of said copy sheet before the latter is pressed against the master sheet, said moistening means including a trough and a moistening roller extending partly into said trough and engaging said face of said copy sheet, drive means operatively connected to said main roller for driving the latter, and transmission means transmitting rotation of said main roller to said moistening roller.

2. In a spirit duplicating machine, a main roller, frame means supporting said main roller for rotation, a counter roller parallel to said main roller and coacting therewith for pressing together a copy sheet and a master sheet which pass between said main and counter rollers, bearing means supporting said counter roller for rotation, said frame means guiding said bearing means for movement toward and away from said main roller, means carried by said frame means for directing a copy sheet along a given path to said main roller, moistening means situated along said path and spaced from said main roller for moistening with spirit that face of said copy sheet which is subsequently pressed against the master sheet by said main and counter rollers, a pressure roller parallel to said main roller and coacting therewith for pressing a copy sheet against said main roller, said pressure roller engaging the face of the copy sheet which has been moistened by said moistening means, second bearing means supporting said pressure roller for rotation, said frame means supporting said second bearing means for movement toward and away from said main roller, all of said rollers respectively having portions of reduced diameter situated in a common plane, a pair of manually turnable levers turnably carried by said portions of reduced diameter of said pressure and counter rollers, and a cam ring carried by said portion of reduced diameter of said main roller, said pair of levers respectively carrying cams for engaging said cam ring during turning of said levers so as to displace said pressure and counter rollers, respectively, toward and away from said main roller, said levers respectively having disengaged positions where said cams of said levers are spaced from said cam ring and engage

positions where said cams engage said cam ring, so that either one of said levers may be turned to displace the roller which carries the same away from or back toward the main roller.

3. In a machine as recited in claim **2**, spring means urging said second bearing means toward said main roller.

4. In a machine as recited in claim **2**, spring means urging said bearing means which carries said counter roller toward said main roller.

5. In a machine as recited in claim **2**, three gears respectively fixed to said rollers and meshing with each other, and drive means connected to said main roller for rotating the same, so that the drive is transmitted from said main roller to said counter and pressure rollers through said gears.

6. In a machine as recited in claim **5**, the teeth of said gears meshing into each other to a depth greater than the extent to which said pressure and counter rollers can be displaced from said main roller during turning of said levers, so that said gears remain in mesh during movement of said pressure and counter rollers toward and away from said main roller.

7. In a machine as recited in claim **2**, said moistening means including an enlongated trough mounted for swinging movement about a horizontal axis, a moistening roller extending along said trough for transferring liquid therefrom to said face of said copy sheet, and manually operable cam means carried by said frame means and engaging said trough for controlling the angular position thereof with respect to said horizontal axis.

8. In a machine as recited in claim **7**, said horizontal axis coinciding with the axis of said main roller and said said main roller having a pair of portions of reduced diameter, said trough having a pair of arms formed with openings which receive said portions of reduced diameter of said main roller, respectively, so that said trough is turnable about the axis of said main roller.

9. In a machine as recited in claim **8**, a gear operatively connected to said moistening roller for turning the same, and a second gear connected to said main roller for rotation therewith and meshing with said gear connected to said moistening roller so that the latter is rotated in response to rotation of said main roller.

10. In a machine as recited in claim **9**, a block fixed to said frame means above said trough, a pair of adjustment screws adjustably extended vertically through said block and extending below it, said adjustment screws positioned and adapted to engage the top of the wall of the trough while it is being raised and thereby serving as adjustable limit stops to determine the final raised position of the trough.

11. In a spirit duplicating machine, a main roller, a counter roller parallel to and coacting with said main roller for pressing against each other a master sheet and a copy sheet which pass together between said main and counter rollers, means directing a copy sheet along a given path to said main roller, a pressure roller parallel to said main roller and coacting therewith for pressing the copy sheet against said main roller, and moistening means situated along said path in advance and spaced from said main roller remote from said pressure roller for moistening the copy sheet with spirit at that face of the copy sheet which is subsequently pressed against the master sheet by coaction of said main and counter rollers, said pressure roller engaging the moistened face of said copy sheet before the latter is pressed against the master sheet, said moistening means including a trough and a moistening roller extending partly into said trough and engaging said face of said copy sheet, drive means operatively connected to said main roller for driving the latter, and transmission means transmitting rotation of said main roller to said moistening roller.

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