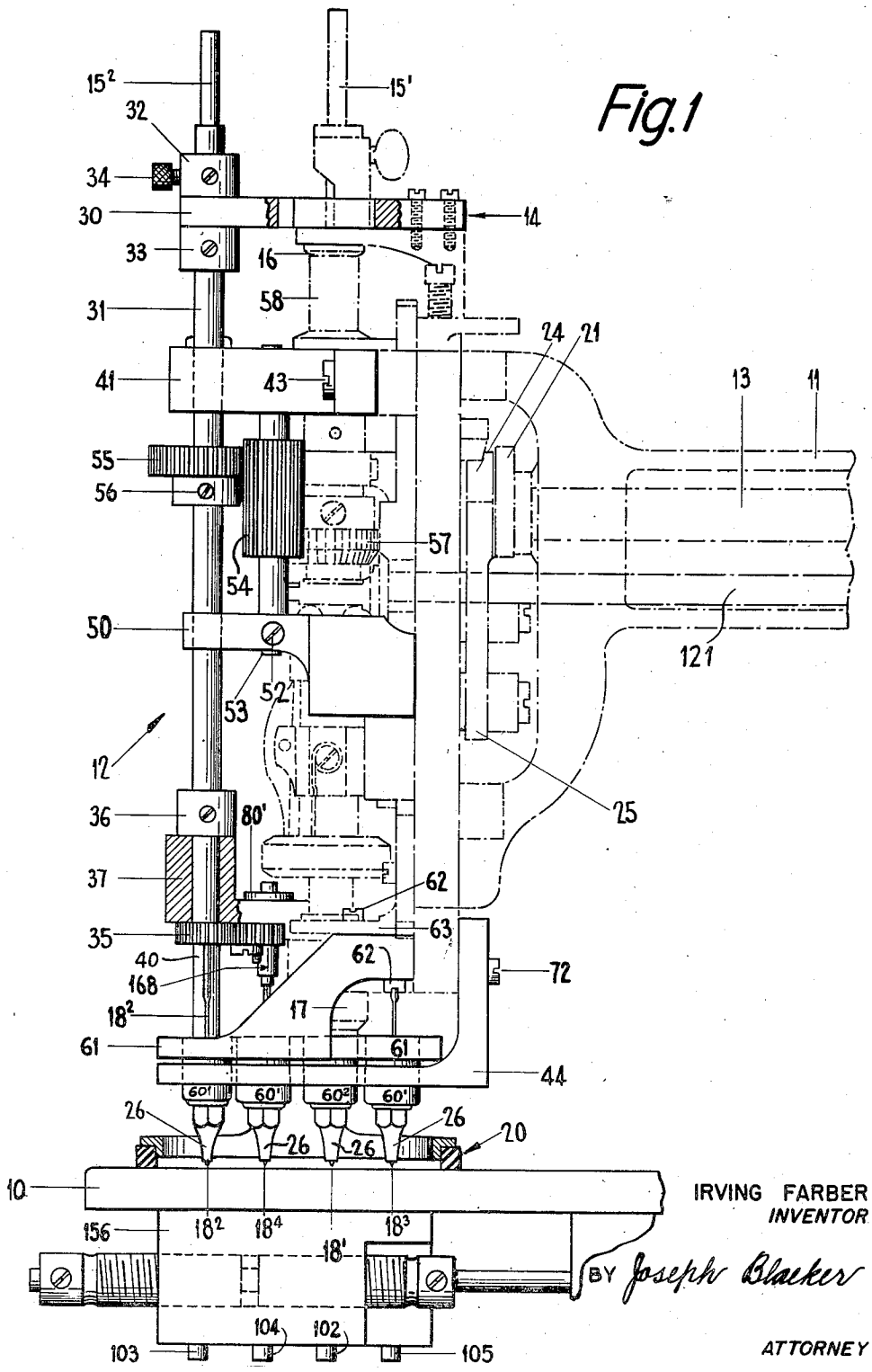
July 29, 1952 I. FARBER 2,604,860

MULTIPLE NEEDLE EMBROIDERING MACHINE

Filed June 12, 1946 6 Sheets-Sheet 1

Fig. 1



IRVING FARBER
INVENTOR

BY Joseph Blacker

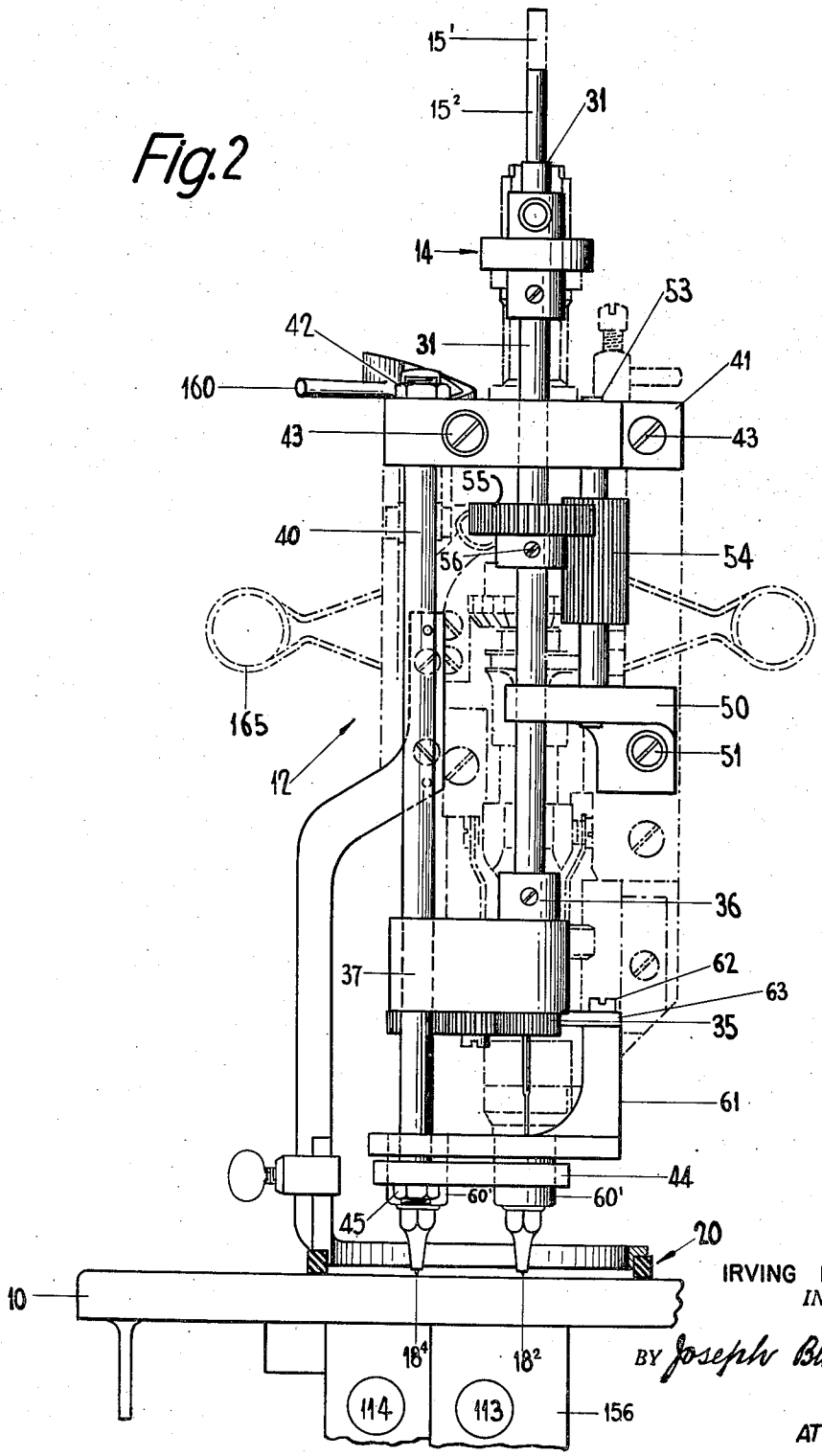
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MULTIPLE NEEDLE EMBROIDERING MACHINE

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Fig. 2



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MULTIPLE NEEDLE EMBROIDERING MACHINE

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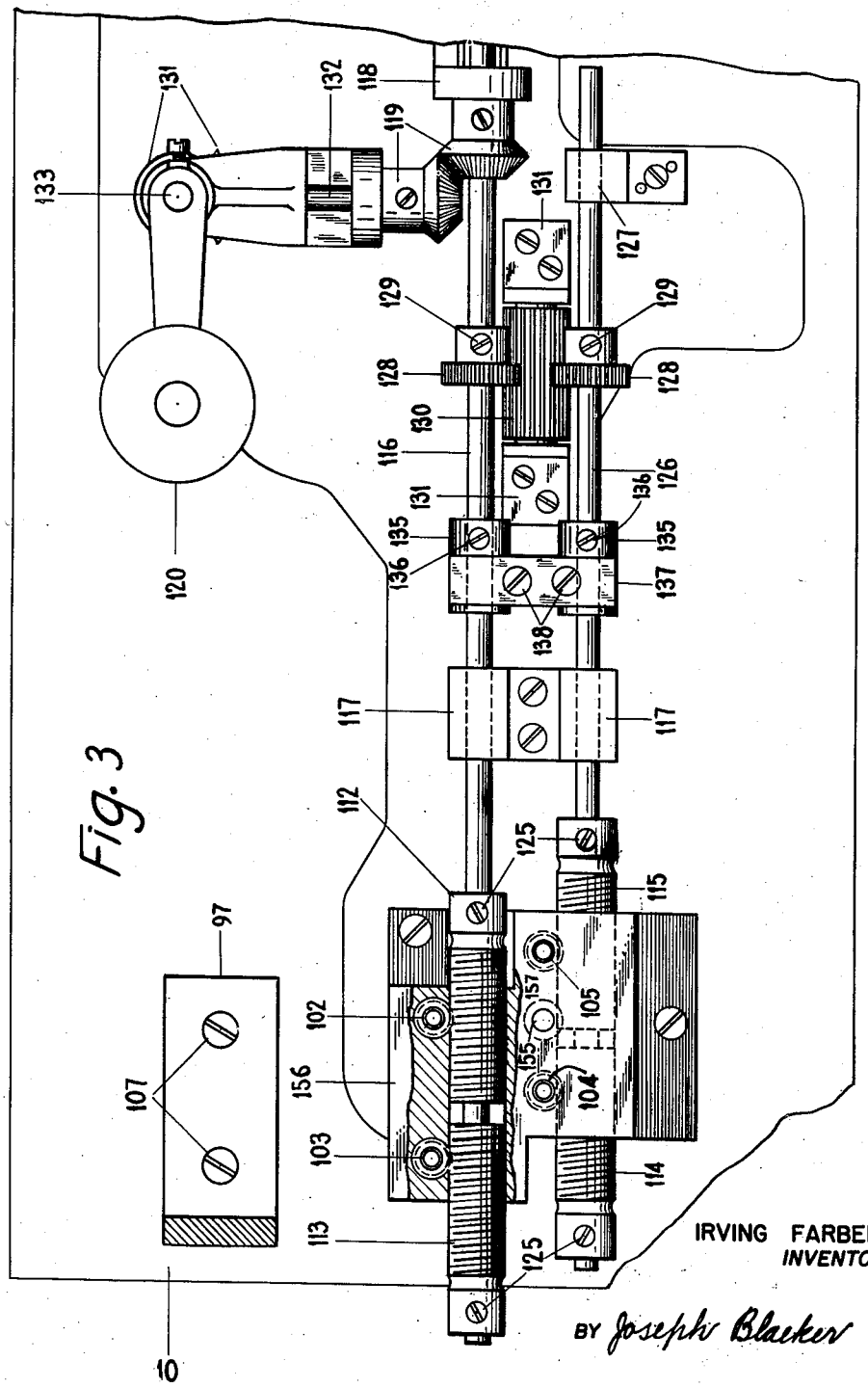


Fig. 3

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MULTIPLE NEEDLE EMBROIDERING MACHINE

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Fig. 4

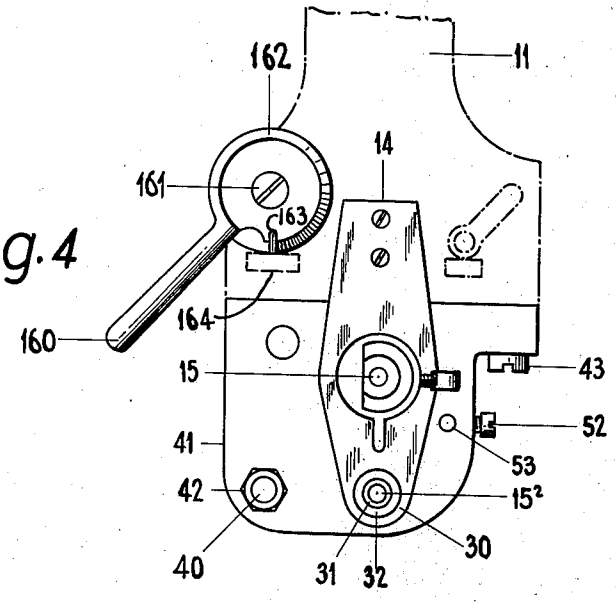


Fig. 5

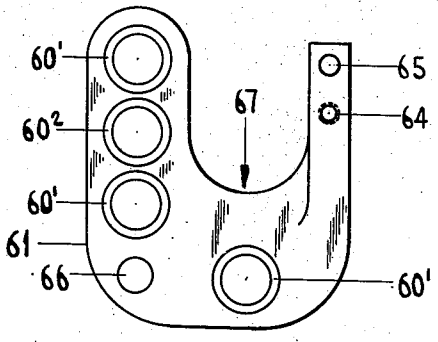
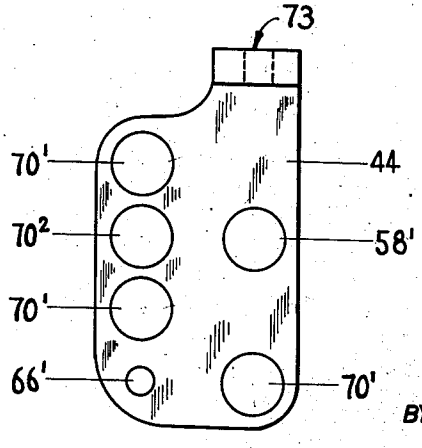


Fig. 6



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MULTIPLE NEEDLE EMBROIDERING MACHINE

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Fig. 8

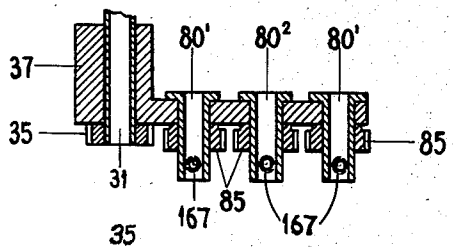
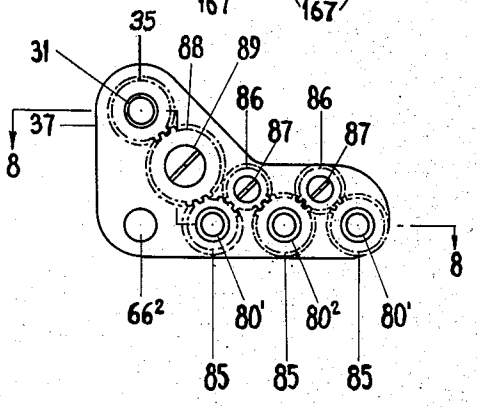


Fig. 7



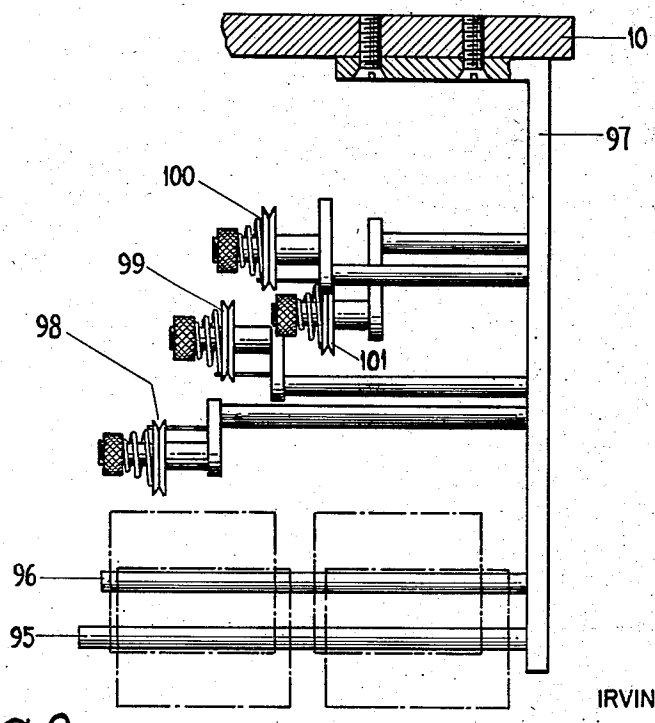


Fig. 9

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MULTIPLE NEEDLE EMBROIDERING MACHINE

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Fig. 10

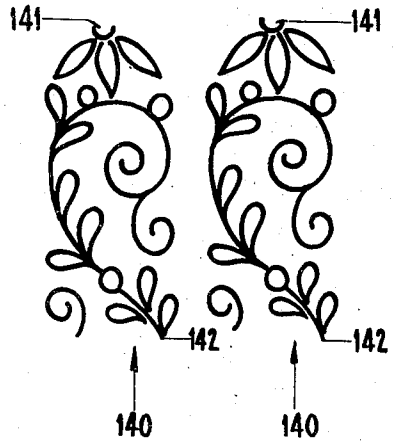


Fig. 12

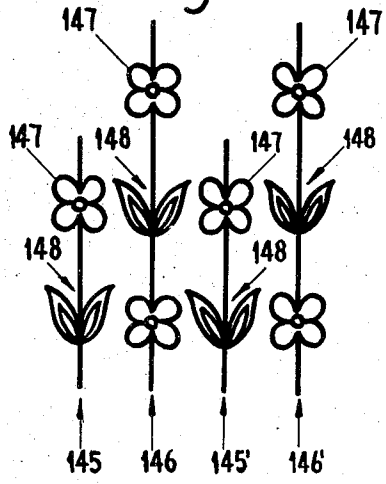


Fig. 11

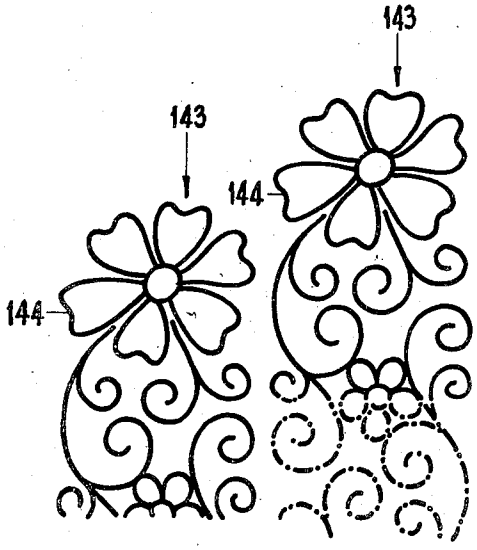
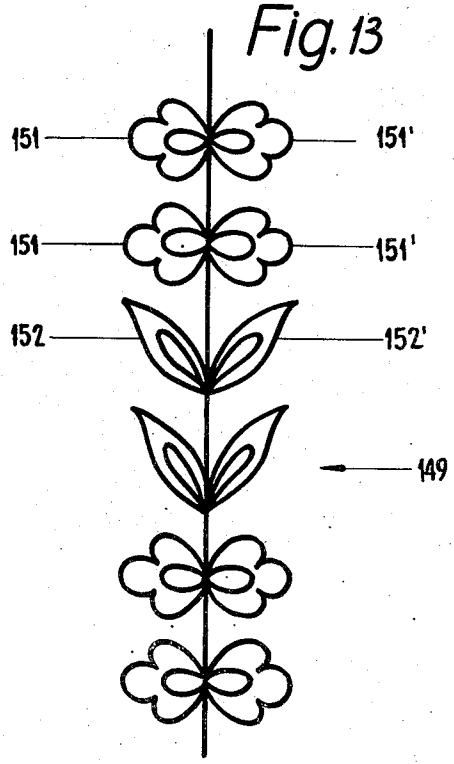


Fig. 13



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Patented July 29, 1952

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UNITED STATES PATENT OFFICE

2,604,860

MULTIPLE NEEDLE EMBROIDERING MACHINE

Irving Farber, Brooklyn, N. Y.

Application June 12, 1946, Serial No. 676,239

3 Claims. (Cl. 112—98)

1

This invention relates to improvements in "Bonnaz" embroidery machines wherein a universal-feed motion causes the cloth to move in any desired direction and wherein the needle moves in combination with the feed-motion to produce intricate designs.

The universal-feed mechanism of the "Bonnaz" embroidering machine which serves to control the direction of motion of the work is actuated by a hand crank positioned below the work-supporting base.

The machine also comprises a needle actuating shaft which actuates a needle bar driver and imparts vertical reciprocations to the needle.

In the practical application of embroidering machines of the class described, when it is desired to produce duplicate designs in parallel or linear form, it is found that the operator cannot exactly duplicate the second or third or fourth, etc. designs to be exactly like the first one. In practice it is found that when an attempt is made to duplicate "Bonnaz" embroidery designs one at a time and in side by side relation, it is impossible to achieve exact reproduction, due to the individual inaptitudes or characteristics of the operator. When such duplication is attempted, the faults in workmanship are clearly visible without the necessity of closely checking, even without a magnifying glass. There is, however, a demand in the art for the production of duplicate embroidery designs spaced on a strip of material in perfect parallel or linear relation.

An object of this invention is to produce an attachment for "Bonnaz" type embroidery machines which will adapt the embroidery machine for producing two or more identical designs simultaneously; that is, without any difference in the relative spacing of the various figures or elements constituting the designs.

Another object of this invention resides in an improved mechanism for producing a plurality of identical size embroidery designs and wherein each needle has its own coacting oscillating looper and means is provided for the individual adjustment of the loopers.

Another object of this invention is to provide a mechanism whereby the needles are so arranged as to produce a plurality of alternating design effects simultaneously.

Another object of this invention is to mount a plurality of front loopers in linear alinement and a plurality of rear loopers in linear alinement on separate drive shafts. To accomplish this I have provided independent worm gears, one for each looper, the front worm gears being located on one

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shaft and the rear worm gears being located on an independent shaft, and each worm gear is independently and rotatably adjustable on each drive shaft.

In "Bonnaz" type machines, before changing the character of the stitch, it is necessary to disconnect the looper from its driver and give to it a half-turn and a like adjustment to the needle, and in effecting these adjustments extreme care is essential to the proper retiming of the looper with respect to the line of needle actuation.

In this disclosure there are individual mountings of the looper actuating gears which permit these adjustments to be made.

Two forms of embroidery stitches are common to machines of this type, viz; the ordinary chain stitch and the drop stitch; and this improved multiple-needle machine has means for altering the character of the rows of stitching by individually changing the operative relationship of the loopers and actuating gear members so that one or more chain stitch rows of embroidery may be made simultaneously with one or more drop stitch rows of embroidery.

Another object of this invention is to provide an attachment for a "Bonnaz" embroidery machine wherein two needles are mounted in the front and two needles are mounted in the rear of the machine and to employ the front and rear needles in different relationships or in different combinations for effecting various types of composite embroidery, which is not possible with the ordinary single needle embroidery machines.

Another object of this invention is to produce an attachment for a "Bonnaz" embroidery machine whereby it is possible to simultaneously operate with one front needle and one rear needle which are in spaced-apart relation but lie in a single vertical plane.

With the above and other objects in view, the invention will be hereinafter more particularly described, and the combination and arrangement of parts will be shown in the accompanying drawings and pointed out in the claims which form part of this specification.

Reference will now be had to the drawings, wherein like numerals of reference designate corresponding parts throughout the several views, in which:

Figure 1 is a side elevation of a fragmentary portion of the sewing head of an embroidery machine equipped with the mechanism of this invention, a portion of the machine below the base being broken away.

Figure 2 is an end elevation of the sewing head

shown in Figure 1, the portion of the machine below the base being broken away.

Figure 3 is a bottom view of the machine, the thread spool holders for the needles being removed.

Figure 4 is a top plan view of the head portion of the machine, showing an elongated main needle-bar driver.

Figure 5 is a top plan view of a nipple carrier.

Figure 6 is a top plan view of the nipple guide.

Figure 7 is a bottom plan view of the carrier for the needle housings added by my attachment.

Figure 8 is a cross-sectional view, the section being taken as on line 8—8 in Figure 7.

Figure 9 is a front elevation of thread spool carriers.

Figure 10 shows a combination of two rows of "Bonnaz" embroidery made in accordance with this invention, with the two front needles.

Figure 11 shows a combination of two rows of "Bonnaz" embroidery made with the front left-hand needle and the rear right-hand needle.

Figure 12 shows a composite design of four rows of "Bonnaz" embroidery wherein the design elements are alternated and wherein, along any horizontal line passing through the design elements the two front needles show identical elements which differ from the identical elements made by the two rear needles.

Figure 13 shows a composite design of two rows of "Bonnaz" embroidery having a common meeting plane, using the front right-hand needle and a rear middle needle.

In the illustrated embodiment of the invention, the numeral 10 indicates the work supporting base of an embroidery machine embodying my invention and comprising a tubular overhanging bracket arm terminating in a head 12.

Journaled in the bracket arm 11 is a needle actuating shaft 13 having an actuating crank (not shown) for vertically reciprocating a needle-bar driver 14 which carries the main needle bar 15^1.

The main needle bar 15^1 reciprocates within, but is constrained to rotate in, suitable bearings 16, 17 in the head 12. The main needle-bar 15^1 carries at its lower end a hook-shaped needle 18^1 which coacts below the fabric with a looper (not shown) to draw loops of thread from a supply spool below the work supporting base 10, through the fabric and enchain the same above the fabric.

For the purpose of my invention I employ a large annular feeding foot 20. The inner circumference of the foot is of sufficient size to permit a plurality of needles 18^1, 18^2, 18^3, and 18^4, to be operatively positioned therein without any interference from the oscillating foot. The feeding foot 20 derives its feeding movements from a rotary cam 21 upon the shaft 13, as is well known in the art.

The rising and falling movements of the feeding foot 20 are derived from a rotary cam 24 upon the shaft 13 and are transmitted to the feeding foot by a lever 25. Work-holding and stripping nipples 26 are vertically reciprocated alternately with the feeding foot from the feeding foot lifting cam 24.

The feeding foot 20 is supported for universal feeding movements in the plane of the work supporting base 10, the direction of feeding being controlled by a hand crank 120 below the work supporting base 10.

For the purpose of this invention I have elongated the needle-bar driver 14 to provide a cantilever extension 30. At the free end of the extension 30 I have rotatably mounted a tubular needle bar housing 31. Upper and lower collars 32, 33 fixed to the housing 31 contact the upper and lower faces of the said extension. This mounting permits rotation of the housing 31 in relation to the needle-bar driver 14 and causes the housing to follow the up and down movements of the driver.

The upper collar 32 has a screw 34 threaded therein and extending through an aperture in the housing 31. The screw 34 serves to support a needle bar 15^2. The needle bar 15^2 supports the needle 18^2.

At the lower end of the tubular housing 31 I have suitably fixed a spur gear 35. I have mounted a collar 36 on the housing 31 in spaced relation from the gear 35 to provide support for a supplemental needle bar driver 37. The supplemental driver is thus constrained to follow the up and down movements of the needle bar driver 14.

For the purpose of maintaining the supplemental driver 37 in position while permitting vertical reciprocations thereof, I have provided a guide rod 40 having its upper end portion fixed in a bracket 41 by a threaded nut 42. The bracket 41 is secured to the head 12 by screws 43. The lower end portion of the guide rod 40 is fixed to a nipple guide 44 by a threaded nut 45.

A bracket 50 is fixed to the head 12 by a screw 51. The bracket 50 has a screw 52 serving to support a stationary shaft 53. Rotatably mounted on the shaft 53 is an elongated idler spur gear 54.

As shown in Figures 1 and 2, the idler gear 54 is in meshed relation with a spur gear 55 which is fixed by a screw 56 to the needle bar housing 31. It is thus possible for the needle bar housing 31 to be moved up and down by the needle-bar driver 14 while rotated by the idler gear 54.

It is to be noted that the elongated idler gear 54 is in meshed engagement with a drive gear 57 fixed to the main needle-bar housing 58. It will thus be seen that the gear 57 rotates the gear 55 and the needle bar housing 31 through the intermediary of the idler gear 54, the housings 58 and 31 rotating equally.

It is to be noted that the needle 18^2 is suitably threadably secured in the lower portion of the needle bar 15^2 and that in practice, when it is desired to adjust the vertical height of the needle 18^2 the screw 34 is employed to loosen the needle bar 15^2 to permit such adjustment. The screw 34 also serves to lock the needle bar 15^2 after said adjustment has been made.

Three nipple holders 60^1 of generally tubular form are threaded in a bracket 61. The bracket 61 is secured by screws 62 to a nipple lifter slide bar 63.

For a purpose to be described later, I have provided a nipple holder 60^2 threaded in the bracket 61. As best shown in Figure 5, a tapped hole 64 and a clearance hole 65 are provided for the screws 62. A clearance hole 66 is also provided for the guide rod 40.

It is to be noted that the body portion of the bracket 61 has a cavity 67 providing clearance for the main needle-bar housing 58.

As shown in Figure 6, the nipple guide 44 has three clearance apertures 70^1 for the three nipple

holders 60^1. The nipple guide 44 has a clearance aperture 70^2 for the nipple holder 60^2. The nipple guide 44 also has a clearance aperture 58^1 for the main needle bar housing 58 and an aperture 66^1 for the lower end of the guide rod 40. The nipple guide 44 is fixed to the rear portion of the head 12 by a screw 72 passing through an aperture 73 therein.

Figure 7 is a bottom plan view of the carrier and needle bar driver 37.

The needle bar driver 37 comprises two short needle housings 80^1 for two nipple holders 60^1 shown in Figure 5. The needle bar driver 37 also comprises one short needle housing 80^2 for the nipple holder 60^2. An aperture 66^2 is also provided for the guide rod 40. It is to be noted that in Figure 7, the guide rod 40 is omitted.

As shown in Figures 7 and 8, the needle housings 80^1 and 80^2 carry drive gears 85 which are suitably fixed thereto. Idler gears 86 are rotatably mounted on shoulder screws 87 on the needle bar driver 37. The idler gears 86 are in meshed relation with the drive gears 85. An idler gear 88 is rotatably mounted on a shoulder screw 89 on the needle bar driver 37. The idler gear 88 is in meshed relation with one of the drive gears 85. The drive gear 35 is fixed to the lower end portion of the needle bar housing 31.

It is to be noted that the rear needle housings 80^1 and 80^2 are of lesser height than the front needle housings 31 and 58.

It will thus be noted that when the needle bar housing 31 is rotated, its attached drive gear 35 rotates the idler gear 88. The idler gear 88 drives one of the drive gears 85. The idler gears 86 then cause rotation of the remainder drive gears 85.

Figure 9 is a front elevation of thread spool carriers 95 and 96. Each carrier serves as a mounting for two spools of thread or the like. The carriers 95 and 96 are fixed in an upright bracket 97. Thread tensioning devices 98, 99, 100, and 101 serve to adjust the tension of the threads leading to loopers 102, 103, 104 and 105, which are well known in the art (Figures 1 and 3).

As best shown in Figure 3, the thread holder bracket 97 is suitably fixed by screws 107 to the lower face of the work supporting base 10 of the machine.

The loopers 102 to 105, inclusive, are driven by individual looper drive gears or worm gears 112 and 115, inclusive (Figure 3).

A main looper drive shaft 116 is slidably and rotatably mounted in bearings 117 and 118. A bevel gear 119 is fixed to the looper drive shaft 116. Bevel gears 119 secured to shafts 132 and 116 and actuated by a crank handle 120 cause rotation of the looper drive shaft 116. The crank handle 120 also actuates the feed shaft 121 as is well known in the art.

It will thus be seen that the main looper drive shaft 116 actuates the loopers 102 and 103.

It is to be noted that the looper drive gears 112 and 113 are adjustably mounted on the looper drive shaft 116 by screws 125. The looper drive gears 114 and 115 are also adjustably mounted on a supplemental looper drive shaft 126 by screws 125. The shaft 126 is slidably and rotatably mounted in a bearing 117 and in a bearing 127.

The shafts 116 and 126 have gears 128 fixed thereto by screws 129. An elongated idler gear 130 is mounted in meshed relation with the gears 128. The idler gear 130 is rotatably mounted in bearings 131. The idler gear 130 makes it possible to move the looper drive shafts 116 and 126

horizontally while actuated by the crank handle 120.

For the purpose of connecting the main looper drive shaft 116 and the supplemental looper drive shaft 126 so that they will move horizontally in unitary relation, I provide shoulder collars 135 secured to the shafts 116 and 126 by screws 136. A centrally split connecting member 137 is secured by screws 138 and serves to hold the shoulder collars 135 in unitary relation. It will thus be seen that when the shaft 116 is moved, the shaft 126 is moved along in the same direction.

Figure 10 shows illustrations of two vertical rows of identical embroidery designs 140, 140 made by the two front needles 18^1, 18^2. The embroidery designs 140, 140 start and end in identical positions or at identical design elements 141, 141 and 142, 142.

Figure 11 shows illustrations of two rows of embroidery designs 143, 143, made by the front left-hand needle 18^2 and by the right-hand rear needle 18^3. It will be noted that the size of the design elements 144, 144 are wider than that shown in Figure 10, due to the increased space between the needles 18^2 and 18^3. It is also to be noted that the right-hand row is higher than the left-hand row because the needle 18^3 making this row is located rearwards of the front needle.

Figure 12 shows illustrations of four rows of embroidery designs 145, 145^1 and 146, 146^1 positioned in vertically spaced relation. The alternating effect is produced by making the first four design elements 147 simultaneously and in a single operation. The four succeeding design elements 148 are also produced simultaneously. The balance of the four rows of embroidery is produced by alternating the design effects in relative vertical positions.

Figure 13 shows an illustration of duplex embroidery design 149 made by using the front right-hand needle 18^1 simultaneously with the rear center needle (not shown). The right-hand needle 18^1 and the rear center needle (not shown) produce figures 151, 151^1 in the same operation. The operator then proceeds in a downward direction to make figures 152, 152^1 simultaneously.

As shown in Figure 3, a clearance aperture or housing 155 is provided in the looper housing 156 for the reduced end portion of a looper. A clearance aperture 157 is also provided in the housing 156 concentric with the aperture 155 for the gear teeth of the looper. The apertures 155 and 157 are employed for mounting a looper therein when it is desired to make embroidery such as is shown in Figure 13 which requires a rear central needle.

It will thus be seen that when this machine is operated with one front needle and one rear needle, which are in spaced-apart relation but lie in a single vertical plane, that composite designs such as that shown in Figure 13 may be produced while operating in the customary manner, that is, lengthwise of the fabric.

Figures 2 and 4 show hand operated means for raising the feeding foot 20. As shown, a lever arm 160 is rotatably mounted on a pivot 161. The lever arm 160 comprises an annular end portion 162 which is cam-shaped and slopes down from the right-hand end portion near the lever arm to a substantially flat plate-like surface. A pin 163 in a feeding-foot lifter 164 is in pressure contact with the annular portion 162 due to the force exerted by a spring 165 (Figure 2).

It is to be noted that the rear needle housings 80^1 and 80^2 are short as compared with the front

needle housings 31 and 58. The rear needle housings 80^1 and 82 (Figure 8) have threaded apertures 167, each serving to receive a screw 168 (Figure 1).

By making the rear needle housings 80^1 and 80^2 of short length I am able to position the rear needles 18^3, 18^4 very close to the front needles 18^1 and 18^2 without interfering with the construction of the "Bonnaz" embroidery machine.

The machine has four active needles which produce the design shown in Figure 12. The machine has five needle housings, only four of which may work at any particular time. The machine has one inactive housing 155 for the usual looper. The inactive housing 155 in conjunction with the needle 18^1 are used to produce the design shown in Figure 13.

Figure 1 is the front of the machine, the way the operator faces the machine when operating. The inactive nipple holder 60^2 shown in Figure 5 is for the housing 80^2. The clearance aperture 70^2 shown in Figure 6 is for the nipple holder 60^2.

In accordance with the patent statutes I have described and illustrated the preferred embodiment of my invention, but it will be understood that various changes and modifications can be made therein without departing from the spirit of the invention as defined by the appended claims.

I claim:

1. In a multiple-needle embroidery machine for simultaneously producing a plurality of independent embroidery designs, a plurality of front needle housings, a rear needle housing, a needle bar driver, a supplemental needle bar driver carried by said needle bar driver, said supplemental needle bar driver carrying one of said front needle housings and said rear needle housing, said rear needle housing being of lesser height than said front needle housings.

2. In a multiple needle embroidery machine having a set of front needles and a rear needle mounted in spaced-apart relation for simultaneously producing a plurality of identical and independent embroidery designs of uniform size, the designs produced by said front needles being in spaced-apart relation from the designs produced by said rear needles, said needles being independently rotatably mounted, a vertically reciprocable main needle bar driver carrying said front needles, a supplemental needle bar driver carrying said rear needle, said supplemental driver being positioned in a direction transversely of said machine, said main needle bar driver having an extension, the free end of said extension serving to support said supplemental needle bar driver, feeding foot means adapted to inclose all of said needles, each needle mounting comprising a gear, idler gear means positioned in meshed relation with said needle mounting gears to cause said needles to rotate equally, a main looper drive shaft for said front needles, a supplemental looper drive shaft for said rear needle, a plurality of loopers respectively coacting with said needles, and adjustable individual looper drivers mounted for oscillating each of said loopers equally and in timed relation with said needles, one of said needle mounting gears being a drive gear, a feed direction controlling shaft operatively connected with said drive gear, and means for actuating said shaft to cause identical actuations of said needles.

3. In a multiple needle embroidery machine having a plurality of front needles aligned lengthwise of the machine and a rear needle mounted for simultaneously producing a plurality of embroidery design elements in spaced-apart relation, said rear needle being positioned laterally of said front needles and of said machine, said needles being rotatably mounted, a vertically reciprocable main needle bar driver carrying said front needles, a supplemental needle bar driver carrying said rear needle, said main needle bar driver having an extension serving to vertically reciprocate said supplemental needle bar driver, feeding foot means adapted to inclose said needles, each needle mounting comprising a gear, idler gear means in meshed relation with said needle mounting gears causing said needles to rotate equally, a main looper drive shaft for said front needles, a supplemental looper drive shaft for said rear needle, gear means operatively connecting said drive shafts to cause both shafts to rotate in the same direction, looper drive gears mounted on said drive shafts, a plurality of loopers driven by said looper drive gears and respectively coacting with said needles, said looper drive gears being adapted for oscillating said loopers equally and in timed relation with said needles, one of said needle mounting gears being a drive gear, a feed direction controlling shaft operatively connected with said drive gear, and means for actuating said shafts to cause identical actuations of said needles.

IRVING FARBER.

REFERENCES CITED

The following references are of record in the file of this patent:

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