Aug. 18, 1953 P. DÜRRSCHMIDT 2,649,064

TUFTING MACHINE

Filed Feb. 27, 1951 3 Sheets-Sheet 1

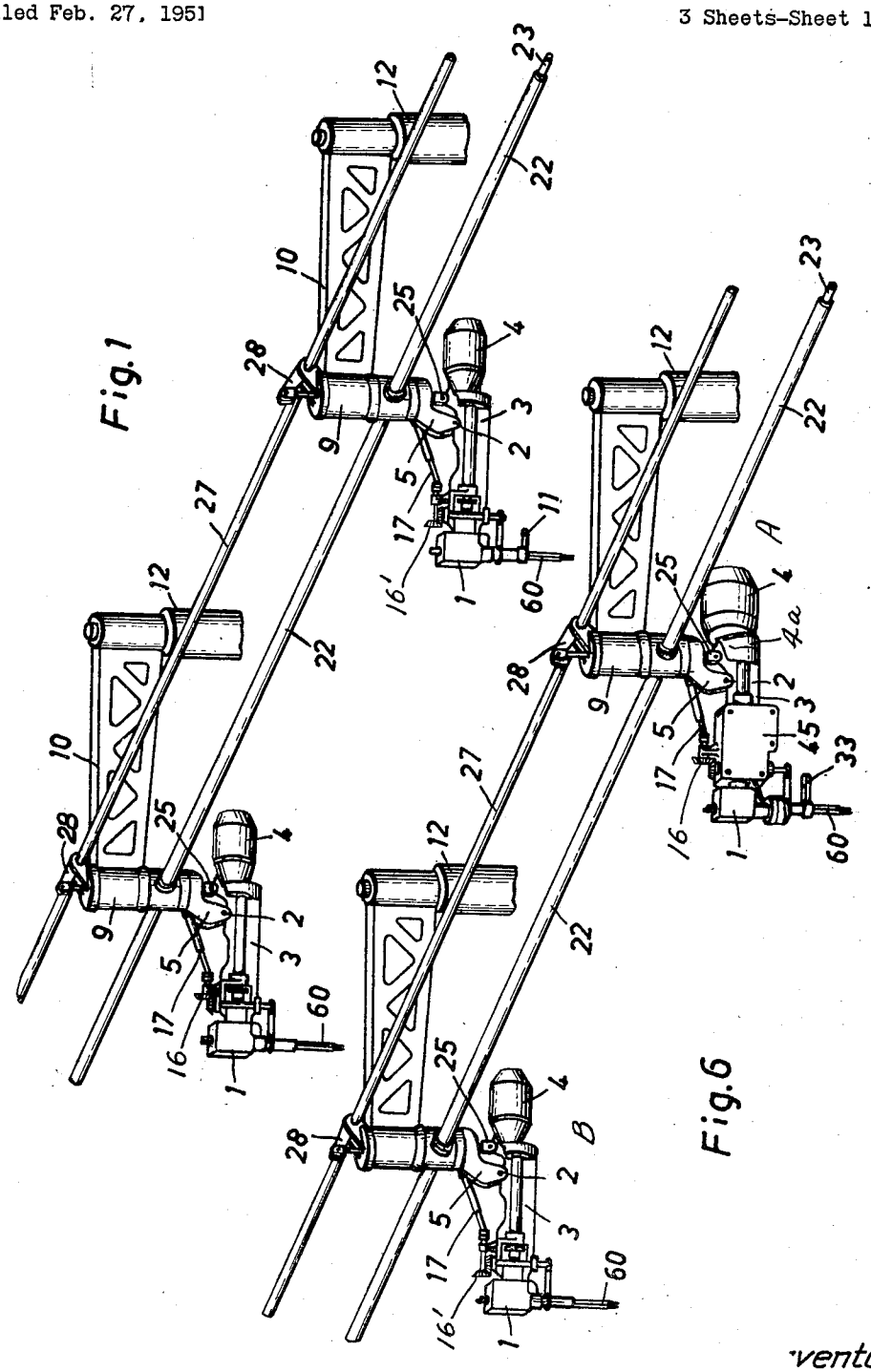

Fig. 1

Fig. 6

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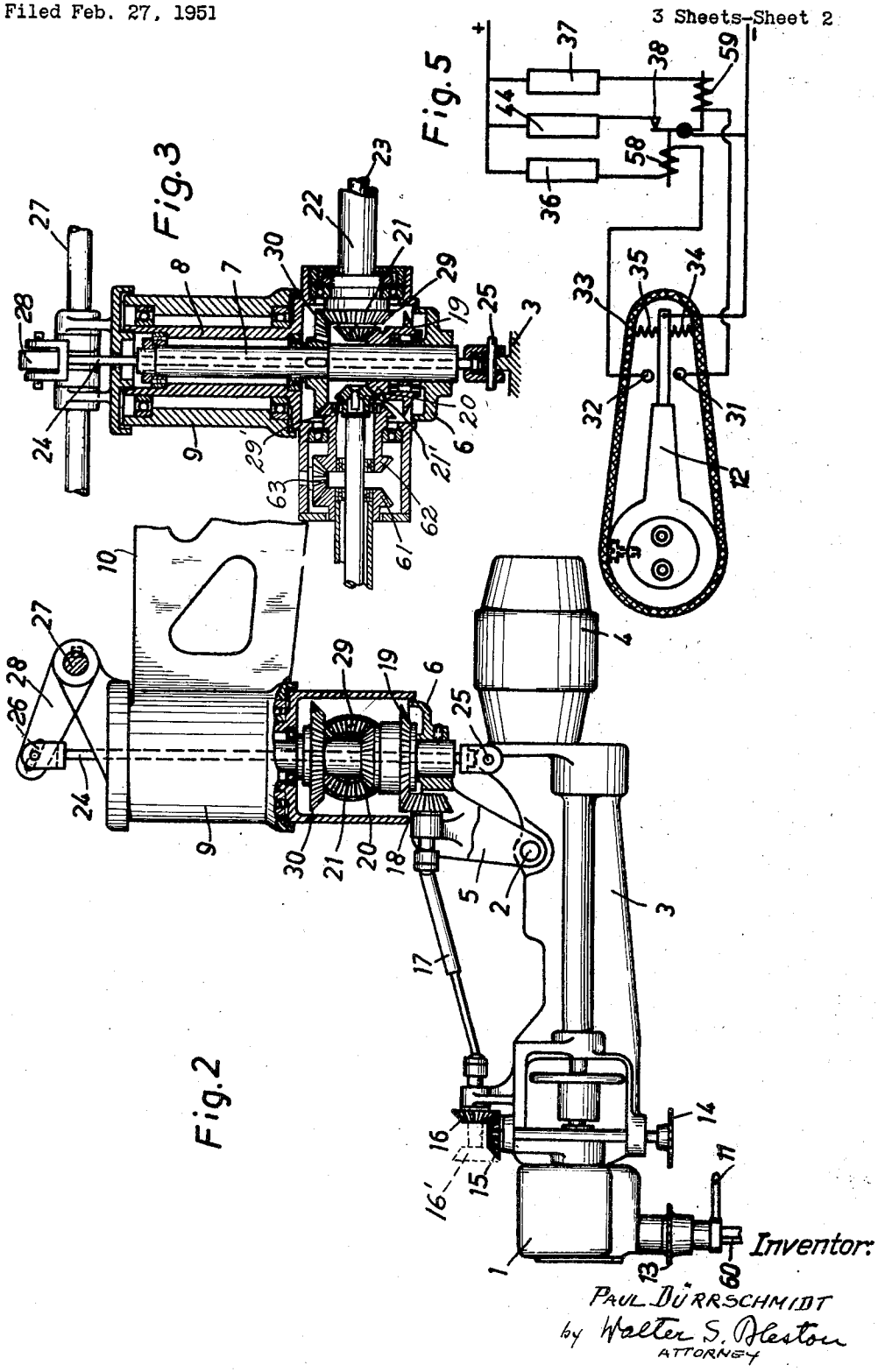

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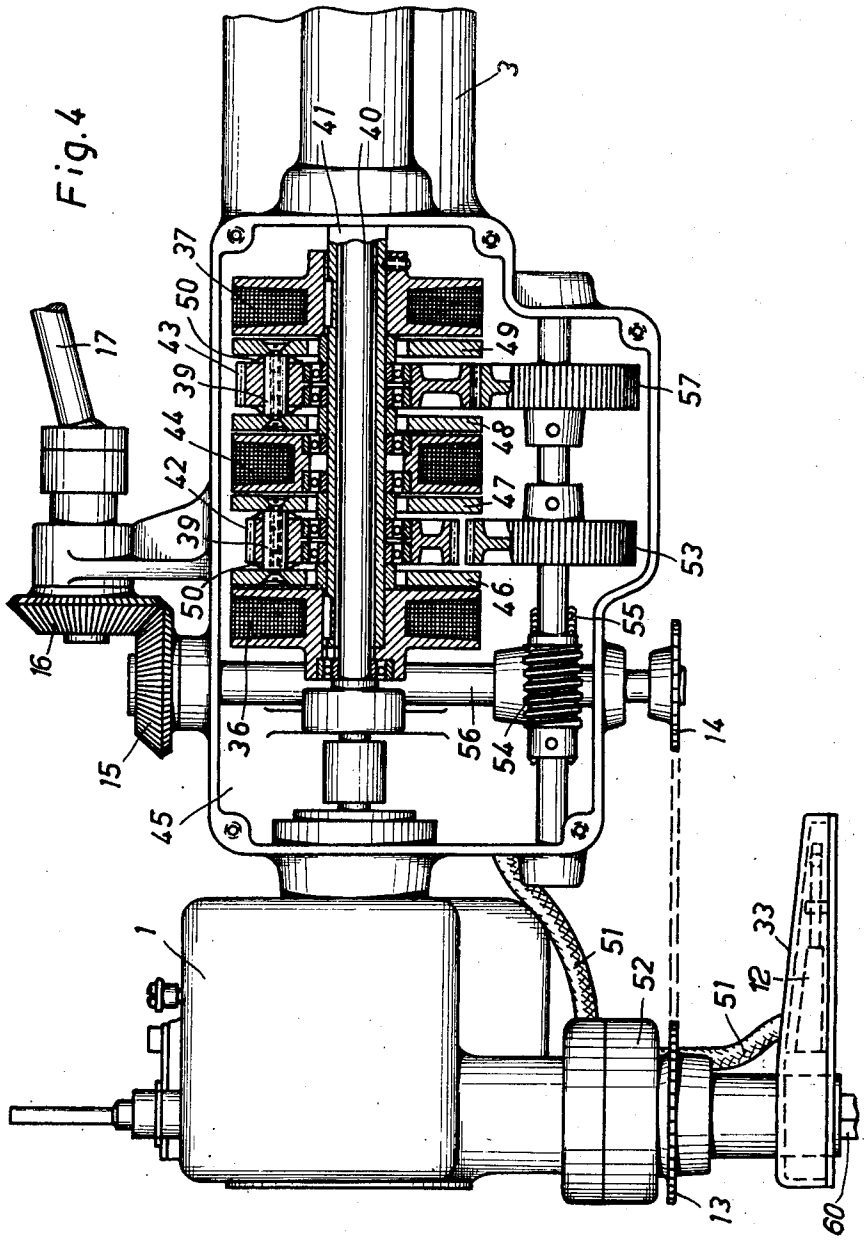
Fig. 4



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TUFTING MACHINE

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5 Claims. (Cl. 112—79)

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The invention relates to a carpet tufting machine of the type in which the tufting tools of individual machines are displaceable about a vertical axis in a carrier head which can be lifted and lowered and which can be displaced in any desired direction in a horizontal plane.

In known forms of carpet tufting machines this has usually been achieved by mounting the carrier head on one end of a two-armed lever swinging about a horizontal axis, the driving motor being disposed as a counter-weight on the opposite end of the said lever. The pivotal mounting of this two-armed lever is so connected by means of a toggle linkage with the vertical supporting column of the machine that a jib can be arranged to be revoluble about this supporting column on the end of which a short arm carrying the toggle linkage can be mounted in a horizontal plane.

The guiding of the tufting device, where carpets of multi-colour pattern are to be made, must be extremely precise and involves considerable work in order to produce satisfactory results in reasonable intervals of time.

The object of the present invention is to produce the same pattern efficiently on a number of carpets simultaneously with the minimum number of operatives, and to avoid the necessity for auxiliary personnel not trained in carpet tufting.

This is achieved by the present invention in that tufting devices of a carpet tufting machine having one or more displaceable tufting devices, are movable in synchronism with other carpet tufting machines by connection means, so that the manual operation of one tufting device by the tufting operative simultaneously controls one or more tufting devices of other carpet tufting machines. Mechanical, hydraulic, pneumatic or also electrical transmission means may be used for the positive control of the other tufting carrier heads.

The angular movement and the up and down movement of the tufting devices may be transferred by mechanical transfer means such, for instance, as shafts, to adjacent tufting devices, and such transmission means, for instance by means of lazy tong arrangements, may control the common longitudinal and lateral displacement of the tufting heads in a horizontal plane.

In another form of construction of the invention, all angular movements of a tufting device are transmitted to one or more other tufting heads by electro-magnetic control means. This has the advantage that the tufting operative is relieved of the heavy work of controlling the other machines, which is necessary in order to obtain the desired sensitivity in the tufting.

Preferably the individual driving motors with the tufting devices coupled with one another, are adjustable on the guiding tufting head, and also

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are adjustable on the other tufting heads to be put in or out of operation, so that, for instance, should a thread break, all the tufting heads have their operation simultaneously stopped until the thread is renewed, and all the tufting heads coupled together can then simultaneously operate further at the same place of the pattern. The renewal of a thread can take place by known means, for instance it can be facilitated by the use of compressed air.

In the application by tufting of flowers, ornaments or the like on to fabrics, it is known to control a number of tufting devices simultaneously from a pattern. Such devices are not suitable for application to carpet tufting machines.

The invention has the advantage that only the tufting head acting as a control need be operated by a skilled carpet tufting operative, a watch over the running of the thread by auxiliary help alone being necessary by the coupling of the other tufting heads thereto.

Further features and advantages of the invention are set forth in the following description with reference to the forms of construction shown in the drawings.

Fig. 1 is a perspective diagrammatic view of two carpet tufting machines, the controls of which are coupled by mechanical means,

Fig. 2 is a side view of one of the two carpet tufting machines shown in Fig. 1 on an enlarged scale, the casing of the control element being partly in vertical section,

Fig. 3 is a vertical sectional view of the control arrangement for the same machine taken on a plane displaced by 90°,

Fig. 4 shows another form of construction of a carpet tufting machine in side view with the cover plate of a housing for an electric transmission apparatus removed,

Fig. 5 is a wiring diagram of Fig. 4 with the pivoted lever in horizontal section,

Fig. 6 shows two carpet tufting machines coupled together, the control machine being of the type of Figs. 4 and 5.

In the form of construction shown in Figs. 1 to 3 of the drawings, the tufting carrier head 1 is carried at one end of a jib 3 which can swing in a vertical plane about the pivotal support 2, which jib carries at its opposite end the driving motor 4 mounted on a flange on it and acting as a counter-weight. The cheeks 5 forming a fork carrying the pivot spindle 2 are connected with the vertical shaft 7 by means of a plate 6 which is revoluble within an intermediate casing 8, which in turn is revoluble within the cylindrical housing 9 disposed on the end of the jib arm 10. The needle and the shears forming the tufting tools 60 are revolubly mounted in known manner about a vertical axis in the tufting carrier head 1 and are controlled by a handle 11. The tufting carrier head 1 can be raised and

lowered as it pivots about the pivotal spindle 2, and further, can be adjusted in any desired direction in a horizontal plane in that the jib arm 10, rotatable about the head of the supporting column 12, and the carrier fork 5 revoluble about the shaft 7, together form a toggle linkage.

The angular movement of the tufting tools 60 about their common vertical axis is transmitted by sprocket wheels 13, 14, and bevel wheels 15 and 16, from the ends of the ball jointed telescopically mounted shaft 17 and bevel wheels 18 and 19 via bevel wheels 20 and 21, 21' to the shafts 23 guided in the tubes 22. These shafts extend to adjacently disposed tufting machines, and there operate a precisely similar rotary movement of the tufting tools about their vertical pivotal axes by means of similar transmission elements. However, it will be noticed that owing to the bevel wheels 21 and 21' meshing with the bevel wheel 20 on opposite sides, each shaft portion 23 between two adjacent housings 9 reverses the direction of rotation of the wheel 19 of the one housing with respect to that of the wheel 19 of the other housing. Suitable means may be applied in order to cause rotary movement of the tools of all the machines in the same direction. This can be readily attained by alternately arranging in the series of the cooperating machines, a wheel 16 in the position shown in solid lines and a wheel 16' shown in dot and dash lines in Fig. 2.

Up and down movements of the tufting head carrier 1, which is permanently connected with a pendulum of the supporting jib 3 pivoted about the joint 2, is transmitted through the connecting rods 24. These rods 24 lie within the hollow shafts 7 and have two forked ends, of which one is connected by the pivotal spindle 25 with the supporting jib 3, and the other end is connected with a guide 28 keyed to the shaft 27 and moving in the slot 26. The shaft 27 transmits the up and down movement to the adjacent carpet tufting machines.

The shaft 27 and the tube 22 encasing the shaft 23 serve simultaneously to transmit the movements given to the tufting carrier head in various directions in the horizontal plane. This is effected by the shaft 27 which transmits all movements to all the pivotal arms 10 about their supporting columns 12, while the rotary movement of the jibs about the vertical shaft 7 is transmitted by tube 22. For this purpose a bevel wheel 29 is mounted on the one end of each of the tubes 22, which mesh with bevel wheels 30 mounted on the hollow shafts 7. The other end of each tube 22 is provided with a reversing gear which comprises a pair of bevel wheels 61, 62 in mesh with a freely rotating third wheel 63 on opposite sides thereof, and the wheel 29' integral with the wheel 62 and in mesh with the wheel 30. Thus, all the shafts 7 will turn in the same direction and at the same rate.

The shafts 7 and 23, as also the tubes 22, and the intermediate casing 8, are mounted to be freely revoluble on ball bearings, so that the minimum of power is necessary to operate the control from the handle 11 of one of the tufting arrangements.

It is also possible to transmit the forces necessary for the operation of a number of carpet tufting machines coupled together and operating from a common control, by electro-mechanical means. An arrangement of this type is shown in Figs. 4 to 6 wherein the machine with the common control is denoted by A, and one of the machines coupled with it is denoted by B. In this case the rotary movement of the control handle of machine A in one or other directions of rotation closes contacts 31 or 32, as the case may be. These contacts are mounted in a casing 33 of insulating material which is displaceable on the shaft of the said control handle 12 and is positioned in this by abutting springs 34 and 35. By moving the lever 33 in one direction or the other, contact 31 or 32, as the case may be, is closed.

Each of the machines comprises a main shaft 40 mounted on the jib 3, which drives the tufting tools and is driven by an electric motor, viz motor 4 in machine A and motor 4' in machine B. In machine A, a tubular shaft 41 also driven by motor 4 rotates about the main driving shaft 40 at a higher speed than the latter, for which purpose a transmission is provided diagrammatically indicated at 4a in Fig. 6. It will be noticed that the electric motor 4 is shown larger than motor 4' in view of the fact that motor 4 has to furnish the power for the operation of the control devices in addition to the power for operating the tufting tools. Disc magnets 36 and 37 are mounted on this high speed hollow shaft 41. Pinions 42, 43 freely revoluble on ball bearings on the shaft 41 are disposed between said disc magnets. Between these pinions a further disc magnet 44 is disposed which is revolubly mounted with respect to the casing 45 and is also carried on the hollow shaft 41 by means of a ball bearing. Pairs of disc armatures 46, 47 and 48, 49 are displaceably mounted by means of lateral bolts 39 on the pinions 42, 43, and abut against the side surfaces of the pinions 42, 43 against the action of spring discs 50.

By turning the lever 33 in one direction, the contact 32 is closed, which allows current to flow through the coil of the disc 36 and the armature disc 46, 47 is thereby drawn up laterally against the pinion 42. Consequently the pinion is driven in the same direction of rotation as the disc magnet 36 and drives through an intermediate wheel, not shown in the plane of section of Fig. 4, a pinion 53 which transmits the drive through worm 54 and worm wheel 55 to the shaft 56 of the bevel wheel 15. The latter transmits the rotary movement to the tufting tools as shown in Figs. 1 to 3 of the various carpet tufting machines coupled to the control machine.

The control lever 33 can thereby be operated with extreme precision, as only a minimum of force is necessary for its operation as is required by the pressure of the spring 35 to close contact 32. When the tufting device is turned in the opposite direction, the contact 31 is closed and the coil of the disc 37 is then energised to draw up the disc armature 48, 49 of the toothed wheel 43, and thereby a pinion 57 which engages with the pinion 43 directly without any intermediate wheel, so that the spindle 54 and the shaft 56 in this case are rotated in opposite directions.

At the end of the turning movement of the handle 33, contact is broken at the contacts 31 or 32, as the case may be, so that current no longer flows through the disc magnets 36 and 37. In this case the intermediate disc magnet 44 is energised and draws up the two adjacent disc armatures and then acts as a brake on the pinions 42 or 43, as the case may be, until one or other of the disc coils 36 or 37 is energised again. Brush contacts in the casing 52 carry

the current from the rotary handle 33 to the disc magnets in the casing 45 by cables 51.

The electrical wiring arrangement is shown in Fig. 5. As shown in this diagram, when at rest the current flows through the central disc coil 44 acting as a brake. Immediately the contacts 32 or 31 are closed, the switch relays 58 and 59 are operated and interrupt the current flowing through the winding 44 at the contact breaker 38. When contact is broken at 32 or 31, as the case may be, no current passes to the relays 58 or 59 respectively, and the contacts are brought back into the position of rest, for instance by means of return springs.

The up and down movement and the oscillating movement of the various tufting machines under control may be effected by the same means as in the example of Figs. 4 to 6, using the construction of Figs. 1 to 3. It is, however, also possible to effect these movements electro-magnetically or to transmit these movements by electro-mechanical devices, for instance by means similar to those of Figs. 4 and 5.

What I claim is:

1. A carpet tufting machine assembly comprising in combination a plurality of carpet tufting tool carrier heads in spaced relationship to operate on a number of separate carpets and including tools turnable in said heads about vertical axes, a plurality of vertical pivotal supports as many as there are tool carrier heads, a two-part jib for each of said supports and mounted with a first part thereon, said jib including a pivot pin having a horizontal axis and being hinged to said first jib part so as to be turnable with respect thereto about a vertical axis, said pivot pin carrying said second jib part turnable about said horizontal axis one of said tool carrier heads being mounted on said second jib part so as to be movable up and down relatively to said first jib part, a linkage between all said jibs to maintain parallelism thereof, first transmission means between the tools of all said carrier heads whereby a turn of the tools in the one head causes similar turns of the tools in the other heads, and second transmission means between said carrier heads whereby any up or down movement of one carrier head effects a similar movement of the other heads.

2. A carpet tufting machine assembly comprising in combination a plurality of carpet tufting tool carrier heads in spaced relationship to operate on a number of separate carpets and including tools turnable in said heads about vertical axes, a plurality of prime movers associated with said carrier heads, respectively, and being in driving connection with the tools therein, a plurality of vertical pivotal supports as many as there are tool carrier heads, a two-part jib for each of said supports and mounted with a first part thereon, said jib including a pivot pin having a horizontal axis and being hinged to said first jib part so as to be turnable with respect thereto about a vertical axis, said pivot pin carrying said second jib part, turnable about said horizontal axis, each of said second jib parts carrying one of said tool carrier heads and its associated prime mover so that said carrier heads are movable relatively to their associated first jib parts, a linkage between all said jibs to maintain parallelism thereof, first transmission means between the tools of all said carrier heads whereby a turn of the tools in the one head causes similar turns of the tools in the other heads, and second transmission means between said carrier heads whereby any up or down movement of one carrier head effects a similar movement of the other heads.

3. An assembly as claimed in claim 2, each of said second jib parts being mounted on its associated pivot pin intermediate its ends, and said carrier head and said prime mover thereon being located at the opposite ends of said second jib part.

4. An assembly of a plurality of carpet tufting machines in spaced relationship to operate on a number of separate carpets, each of said machines including a tool carrier head, tufting tools rotatably mounted about a vertical axis in said carrier head, a vertical support, a jib pivotally mounted on said support to swing in a horizontal plane, a horizontal pivot hinged to the outer end of said jib about a vertical axis, a member mounted on said pivot so as to be turnable about the horizontal pivot axis, said carrier head being mounted on said member at a point at a distance from said pivot so as to be swingable up and down, and a vertical shaft having one end pivotally connected to said member at another point at a distance from said horizontal pivot so as to be movable up and down as said member swings about said pivot axis, parallel links connecting the outer ends of the jibs of all said machines, means interconnecting the other ends of all said vertical shafts so that the up and down movement of any one of said carrier heads is repeated on all other carrier heads, and articulated connections between the tools of all said carrier heads so that the rotary movement of the tools in one of said carrier heads is simultaneously transmitted to the tools of all other carrier heads.

5. An assembly of a plurality of tufting machines in spaced relationship to operate on a number of separate carpets, each machine including a tool carrier head, an electric motor in driving connection with the tools of said head, a first jib part on the opposite ends of which said head and said motor are respectively mounted, a housing having a vertical axis and from which said first jib part is suspended intermediate its ends so as to be turnable about a horizontal axis and about the axis of said housing, a second jib part one end of which carries said housing, a stationary vertical pivot for the other end of said second jib part and three movable members in said housing and operatively connected to said first jib part, said members being responsive the first one to a rotary movement of said tools relatively to said tool head, the second one to a movement of said first jib part about said housing axis, and the third one to a movement of said first jib part about said horizontal axis, and connections of said first, of said second and of said third members, respectively, of all said machines so as to cause like movements of all the embroidery tools.

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