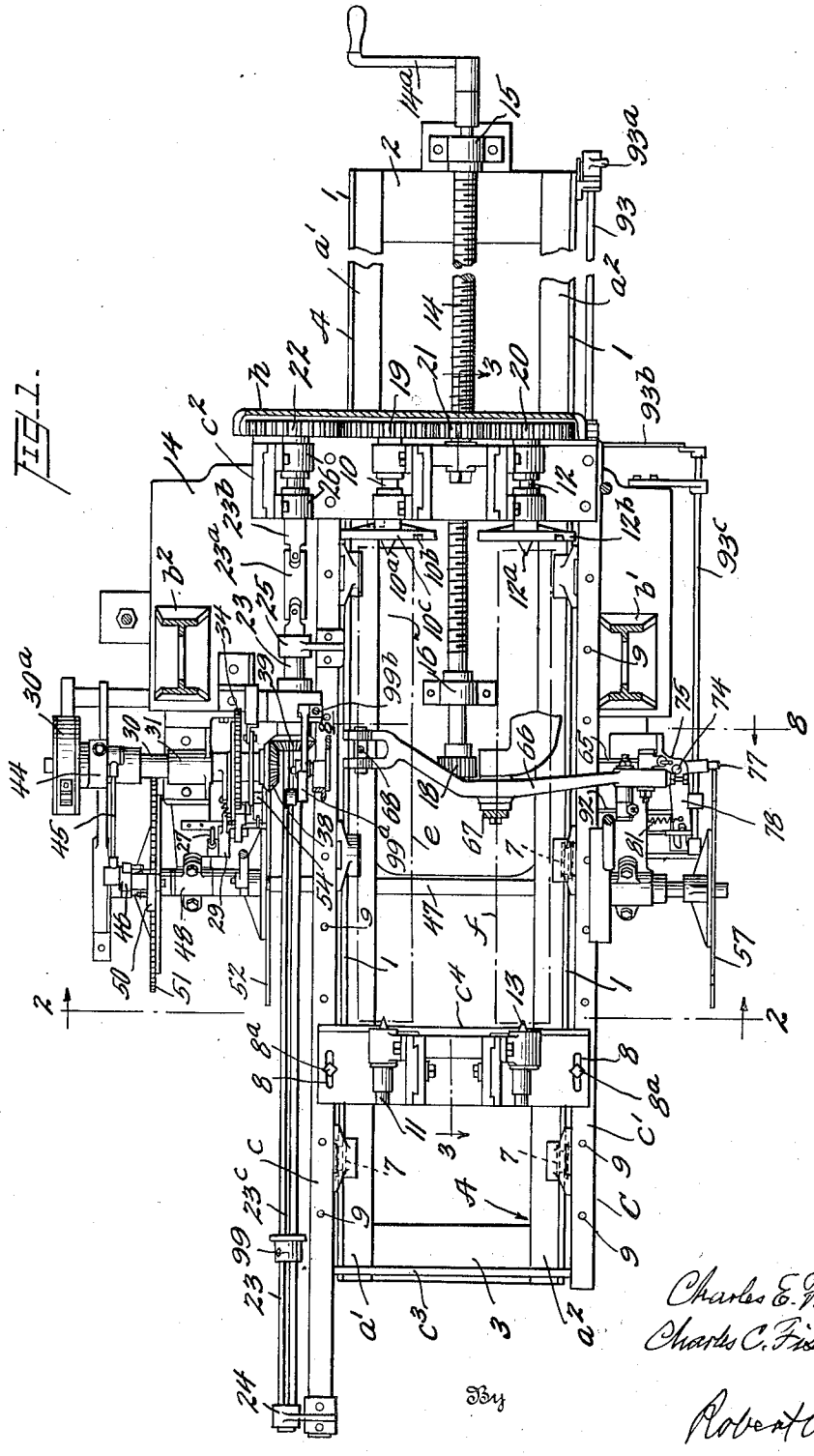
Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Filed March 6, 1939 6 Sheets-Sheet 1

FIG. 1.



Inventor
Charles E. Fisher, Dec'd.
Charles C. Fisher, Exr.

By

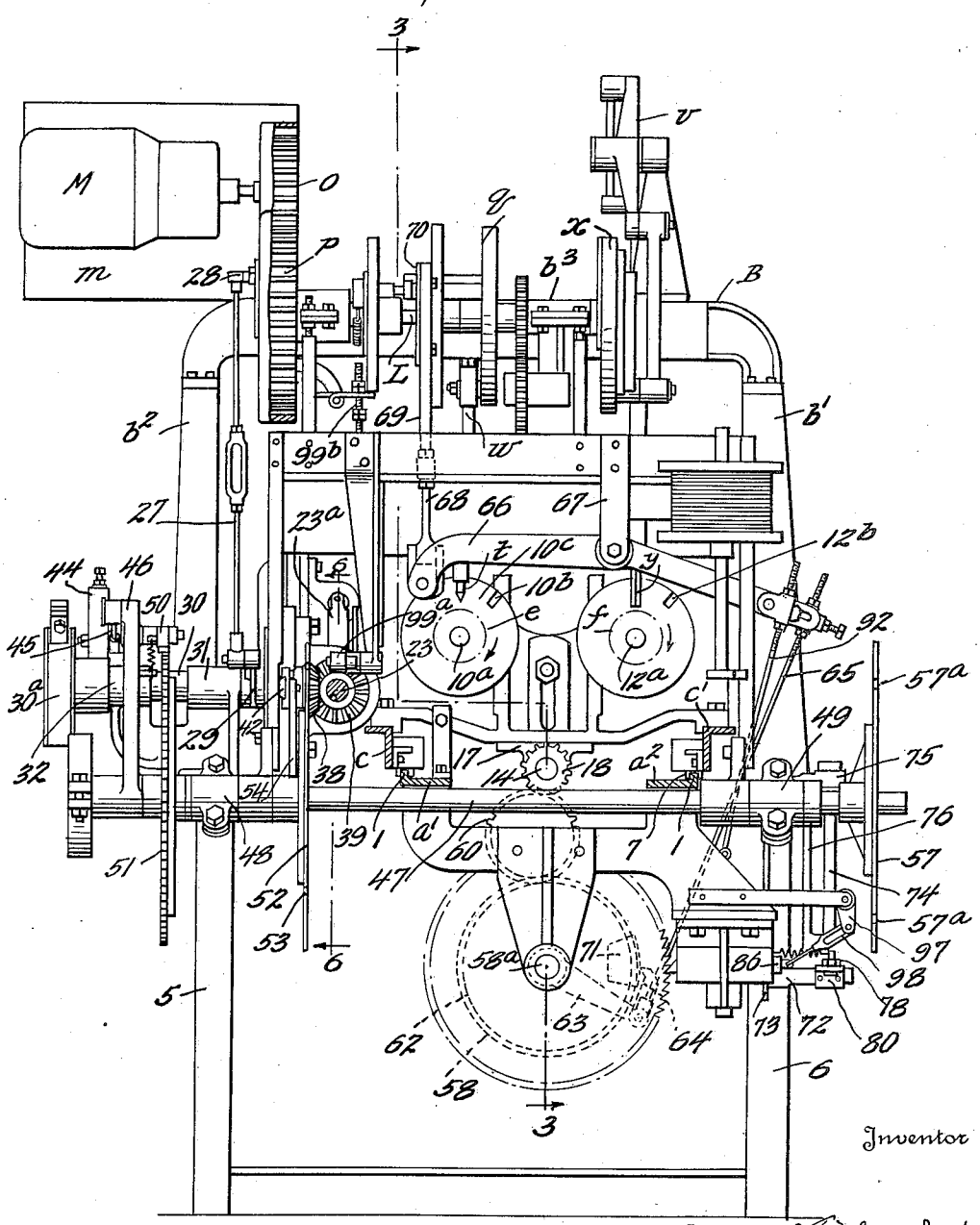
Robert Watson
Attorney

Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Filed March 6, 1939 6 Sheets-Sheet 2

FIG. 2.



Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Filed March 6, 1939 6 Sheets-Sheet 3

FIG. 5.

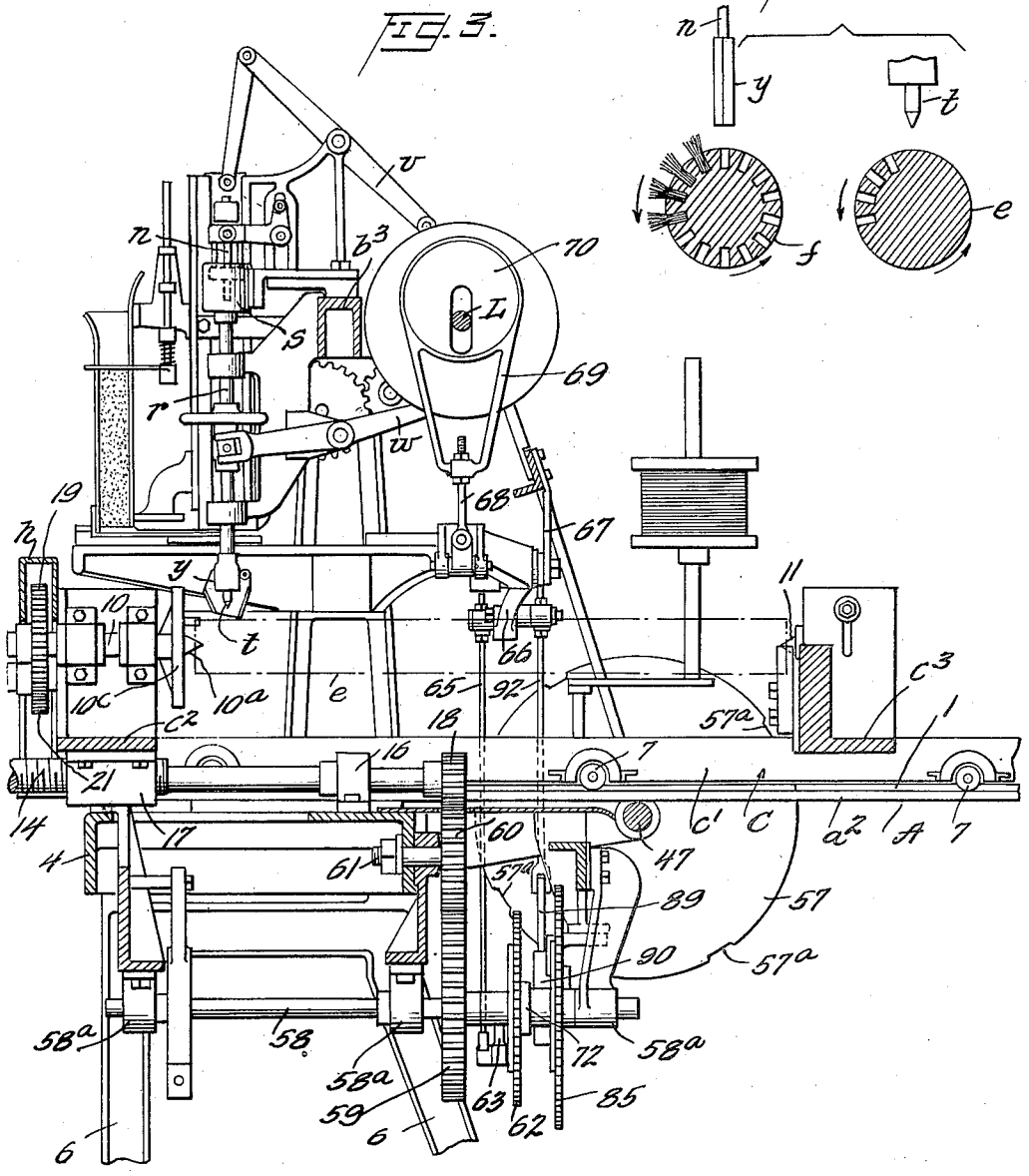
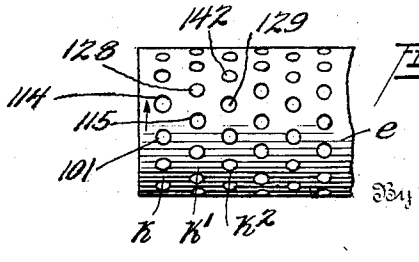


FIG. 5.

FIG. 4.



Inventor
Charles E. Fisher, Dec'd
Charles C. Fisher, Exr.

Robert Watson
Attorney

Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHE

Filed March 6, 1939 6 Sheets-Sheet 4

FIG. 6.

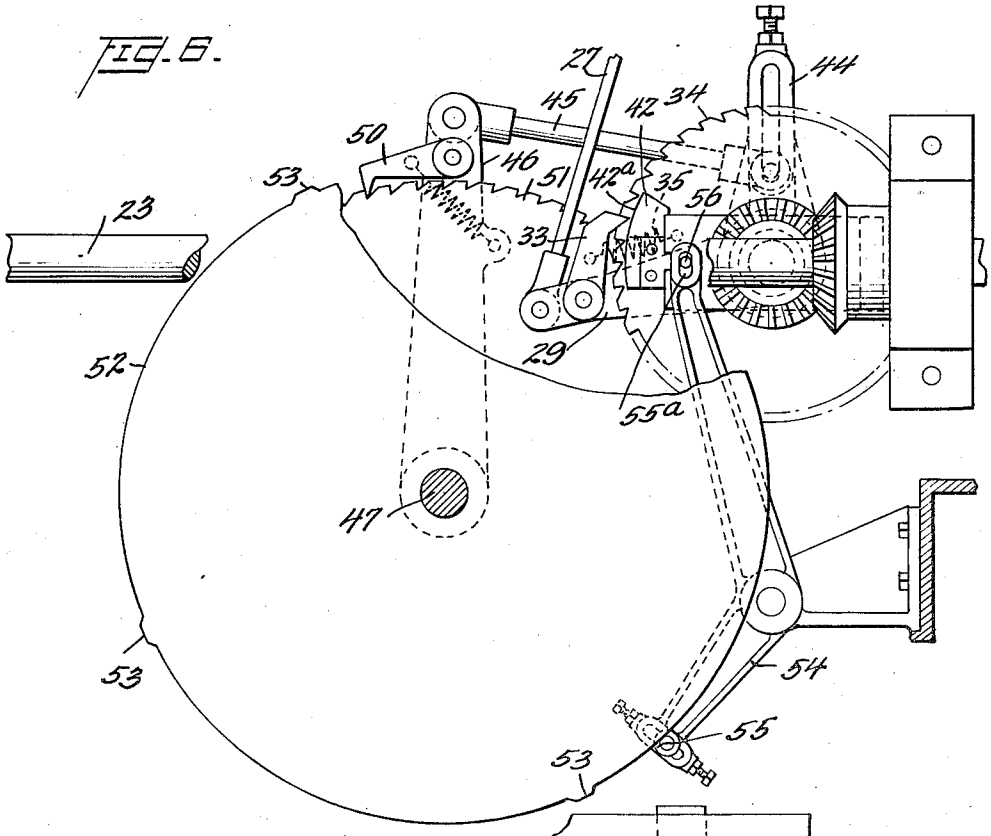
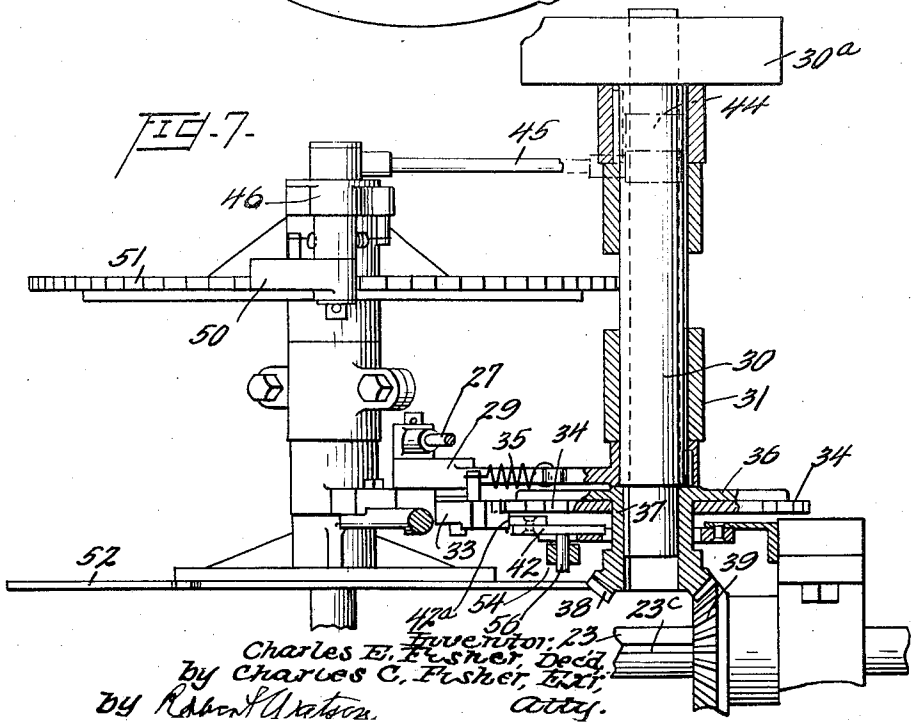


FIG. 7.



Inventor: Charles E. Fisher, Decd.
by Charles C. Fisher, Exr.
by Robert S. Watson. Atty.

Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Filed March 6, 1939 6 Sheets-Sheet 5

FIG. 8.

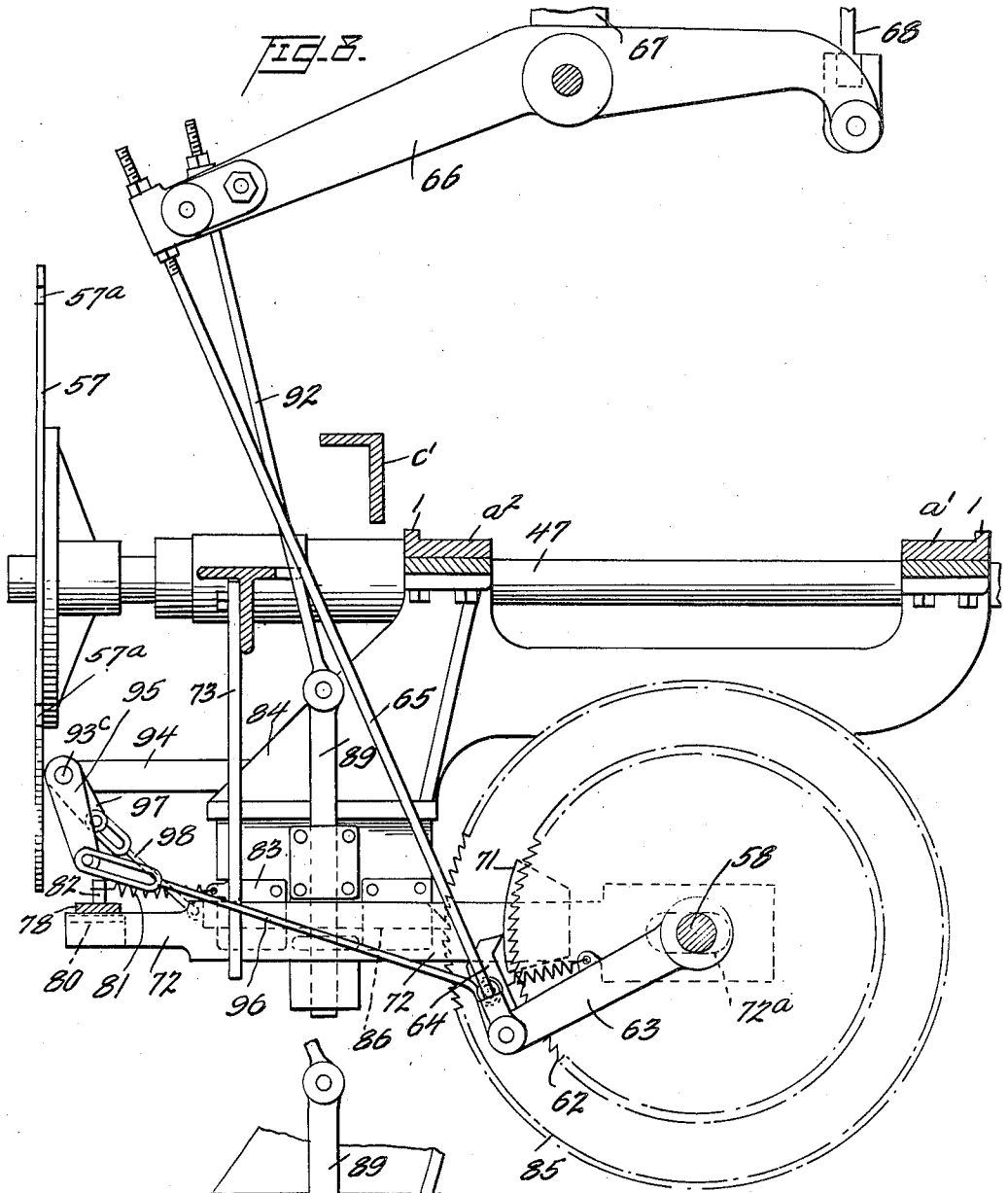
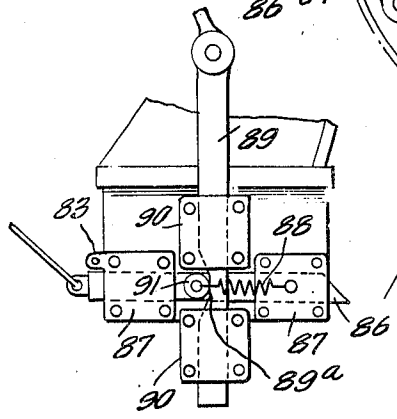


FIG. 9.



Inventor
Charles E. Fisher, Dec'd,
Charles L. Fisher, Exr.

By
Robert H. Watson
Attorney

Dec. 3, 1940. C. E. FISHER 2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Filed March 6, 1939 6 Sheets-Sheet 6

FIG. 10.

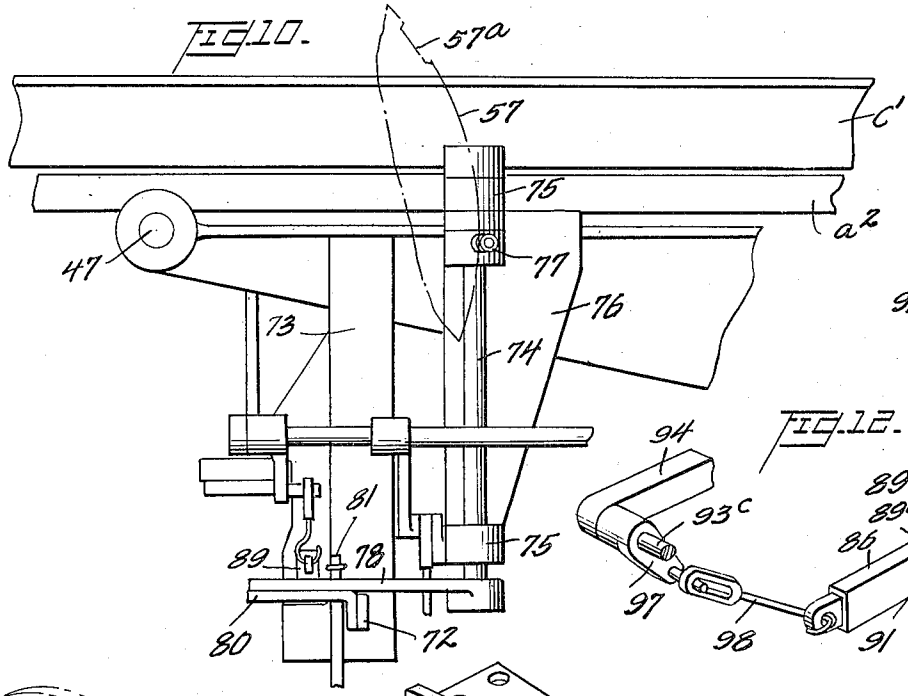
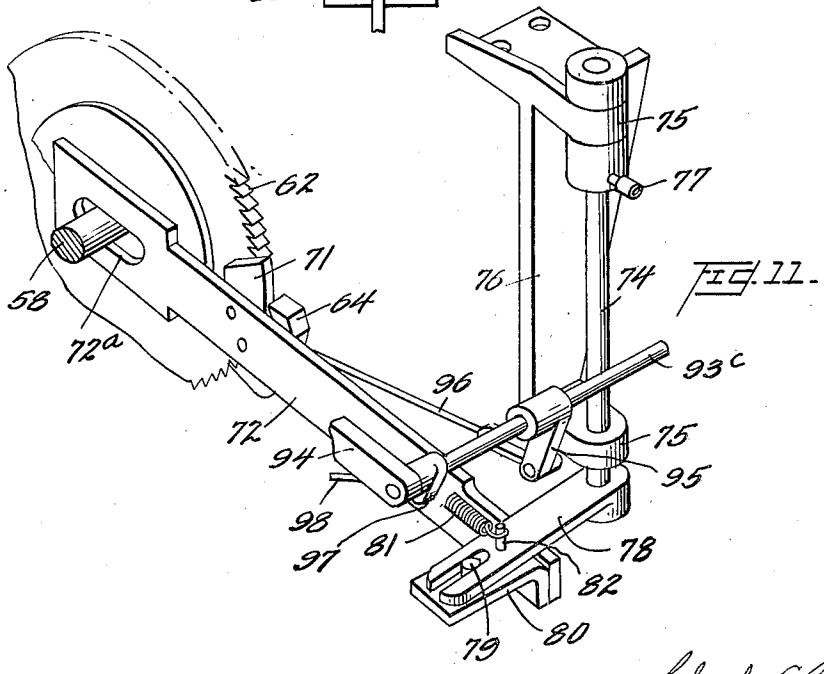


FIG. 12.

FIG. 11.



Inventor
Charles E. Fisher, Dec'd.
Charles C. Fisher, Exr.

By

Robert Watson
Attorney

Patented Dec. 3, 1940 2,223,681

UNITED STATES PATENT OFFICE

2,223,681

MACHINE FOR MAKING CYLINDRICAL BRUSHES

Charles E. Fisher, deceased, late of Baltimore, Md., by Charles C. Fisher, executor, Ellicott City, Md., and Mollie Fisher, executrix

Application March 6, 1939, Serial No. 260,208

7 Claims. (Cl. 300—3)

This invention relates to mechanism for automatically making brushes having cylindrical cores. The mechanism is adapted for use with brush making machines of the type shown in patent to Charles E. Fisher No. 1,512,588, dated October 21, 1924, and it is so shown in the drawings. The machine of said patent embodies means for automatically boring holes in one brush back and at the same time selecting tufts of fibre or bristle from a magazine, forming staples and driving the staples and tufts into holes previously bored in another brush back. During these operations the brush backs are held parallel with one another, one beneath the boring tool and the other beneath the staple-driving rod, and the backs are adjusted automatically step by step with respect to the boring and staple-driving devices and the latter descend simultaneously to operate on the brush backs. In the present invention the operation, in so far as boring and tufting is concerned, is the same, but the cylindrical brush cores are supported on a horizontally movable carriage and the cores are given a rotary step by step movement while one core is being bored with a circular series of holes and a similar series of tufts are applied to the other core, when the carriage is stepped forward so that a succeeding series of holes may be drilled and tufts applied and these operations continue until the brush is finished. Provision is made also for controlling the rotary movements so that the tufts in successive rows may be spirally arranged or staggered as desired.

Fig. 1 is a top plan view of the lower part of the machine, showing the gearing for adjusting the cylindrical brush bodies or cores axially and longitudinally, the boring and tufting mechanism being omitted;

Fig. 2 is a transverse section through the machine taken about on the line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken about on the line 3—3 of Fig. 2, looking from left to right;

Fig. 4 is a plan view of one end of a brush core partly bored;

Fig. 5 is a diagrammatic view illustrating the relation of the boring and staple-driving devices to the cores being operated upon;

Fig. 6 is a section approximately on the line 6—6 of Fig. 2, showing on an enlarged scale, partly broken away, the mechanism at the left in Fig. 2, and at the upper side of Fig. 1, for causing axial rotation of the brush cores;

Fig. 7 is a top plan view of the same, parts being shown in horizontal section;

Fig. 8 is a section approximately on the line 8—8 of Fig. 1, showing on enlarged scale the mechanism for causing longitudinal movement of the carriage and brush cores;

Fig. 9 is a detail view of the check-operating device shown in Figs. 2 and 8;

Fig. 10 is a side view of the cam-operated means for controlling the engagement and disengagement of the pawl which actuates the ratchet wheel shown in Fig. 8, and also hand-operated means for holding the pawl and check in disengaged positions;

Fig. 11 is a perspective view of the same, and,

Fig. 12 is a similar view showing the hand-controlled means for holding the check in inoperative position.

Referring to Figs. 1–3, inclusive of the drawings A represents a relatively long and narrow frame composed of parallel flat bars a' and a^2, each having an upturned side flange 1, these bars being connected together by end pieces 2 and 3. This frame is suitably secured in horizontal position upon the bed plate 4 of an automatic brush-making machine, having boring and stapling mechanism like that shown in patent to Charles E. Fisher No. 1,512,588, dated October 21, 1924. The bed plate is mounted upon supporting legs 5 and 6, and upon the bed plate is mounted an arched support B which carries the driving motor and the main shaft for operating the boring and tufting mechanism, this support consisting of uprights b', b^2 and the cross piece b^3. As the boring, tuft-gathering and staple-driving mechanisms are substantially the same as in the aforesaid patent to Charles E. Fisher and form no part of the present invention, these features need not be described in detail. In the machine of said patent, two flat brush backs are arranged upon a movable table, parallel with one another, and while one back is being bored with holes to receive tufts, tufts of bristle or fibre are taken from a magazine and stapled in the holes of a previously bored brush back.

In the present invention, the operation of boring and tufting is the same, but the bodies which are bored and tufted are long and cylindrical, and the invention relates particularly to the mechanism for moving these cylindrical bodies axially and longitudinally so that one body will be bored while a previously bored body is being tufted, the finished brush having the tufts spirally arranged, or in straight or staggered rows, as desired.

As shown in Fig. 2, an electric motor M on a suitable support m drives a main shaft L through gears o and p and a clutch, not shown. A cam

wheel *q* on this shaft (Figs. 2 and 3) operates a centrally pivoted lever *w*, to move a drill stem *r* downward and upward during each revolution of the shaft L. A continuously running motor S, movable with the stem, operates a drill *t* to bore a hole in a brush core during each downward movement. Simultaneously with the movements of the drill stem, a centrally pivoted arm *v* operated by another cam *x* on the main shaft operates a stapling mechanism, including a staple driving rod *n*, to staple a tuft in a previously bored hole in another core. The rod drives the staples and tufts through an open pocket *y* into the holes in the core, as in the Fisher patent referred to.

The flanges *l* of the stationary frame A serve as rails for a movable carriage C consisting of long side bars *c* and *c'* connected together at their forward ends by a cross bar c^2 and toward their rear ends by a cross bar c^3 and by an adjustable cross bar c^4. The side bars of the carriage have grooved rollers **7** which travel on the flanges *l* of the frame A. As shown, the cross bar c^4 has transverse slots **8** in its ends through which bolts 8^a extend and each of the side bars has a series of spaced bolt holes **9** to receive the bolts and by these means the cross bar c^4 may be secured in any desired position of adjustment along the side rails.

A spindle **10** journalled in bearings on the cross bar c^2 has a tapered end 10^a adapted to enter an axial hole in the end of a cylindrical wooden core which is to be bored radially to receive the brush tufts, the core being indicated at *e*, in dotted lines in Figs. 1 and 3 and in full lines in Fig. 5. A dog, not shown, clamped about the end portion of the core, and having an arm which enters a slot 10^b in the face plate 10^c, mounted on the spindle, causes the core to rotate with the spindle. A spindle **11** is rotatably mounted in a bearing on the cross bar c^4 in line with the spindle **10** on the cross bar c^2 and the end of this spindle is adapted to engage a central hole in the opposite end of the wooden core. This spindle is spring-pressed toward the core. Similarly a spindle **12** is journalled in bearings on the cross bar c^2 and this spindle, having a pointed end 12^a and a slotted face plate 12^b, is in alinement with a spring-pressed spindle **13** on the cross bar c^4. The spindles **12** and **13** are adapted to support a cylindrical brush core which has previously been bored with radial holes while the tufts are being stapled in the bored holes, this brush core being indicated in dotted lines at *f* in Fig. 1 and in full lines in Fig. 5.

The cross bar c^4 is adjustable toward and from the cross bar c^2 to suit brush cores of any desired length, and the frame or carriage C is manually adjustable longitudinally on the stationary frame A to position the end portions of the brush cores which are adjacent the face plates 10^c and 12^b beneath the boring and tufting devices, respectively, before the machine is started. This is approximately the position of the carriage in Fig. 3, where the end portion of the core *e* adjacent the face plate 10^c is beneath the vertically movable drill *t*. This hand adjustment of the carriage is effected by turning a feed screw **14** by means of a hand crank 14^a thereon, first throwing certain pawls out of engagement with the gearing which automatically moves the carriage, as hereinafter explained. The feed screw **14** is journalled in a bearing **15** at the forward end of the stationary frame A and a bearing **16** on the bed plate **4**, and it extends through a threaded sleeve **17** secured to the under side of the cross bar c^2, as shown in Figs. 2 and 3.

A gear casing *h* is secured to the forward end of the cross bar c^2, and within this, gears are arranged for turning the spindles **10** and **12**, with the wooden cores, simultaneously in the same direction and to the same extent, these movements being accomplished automatically, step by step, until a circular row of holes, evenly spaced apart, have been bored in the core *e* and a circular row of tufts have been stapled in the previously bored core *f*, and the carriage C is then stepped forward automatically to bring the core *e* into position to be bored with another circular series of holes and the core *f* into position to receive a corresponding series of tufts, these forward movements of the carriage being accomplished by automatic means, hereinafter described, acting through a gear **18** on the feed screw **14**.

Rotary movements of the brush cores

The automatic means for giving the spindles **10** and **12**, and the cylindrical brush cores, a rotary step by step movement will first be described. In the gear casing *h* are gears **19** and **20**, of the same diameter, secured to the spindles **10** and **12**, respectively, and an intermediate gear **21** meshing with the gears **19** and **20** to cause rotation of the latter gears in the same direction, and these gears are operated by a drive gear **22** meshing with the gear **19**. A shaft **23** mounted in bearings **24** and **25** on the side bar *c* of the carriage C extends parallel with said side bar and is connected by a flexible coupling member 23^a to a short shaft 23^b which is journalled in bearings **26** on the cross bar c^2, and on this shaft is secured the drive gear **22**. This shaft is rotatable step by step by a train of gearing to be described and through the gears in the gear casing *h*, the spindles **10** and **12** are rotated in unison step by step to cause corresponding rotary movements of the brush cores.

The means for giving a rotary movement to the shaft **23** and the spindles **10** and **12** which rotate the brush cores is illustrated in Figs. 1, 2, 6 and 7. A rod **27** connects an eccentrically mounted pin **28** on the gear *p* with a pin on a rocker arm **29** which is keyed to shaft **30** supported in suitable bearings **31** and **32**. This rod makes a downward and upward movement during each revolution of the main shaft. A pawl **33**, pivoted to the rocker arm, is spring-pressed into engagement with a ratchet wheel **34** by a spring **35**. The ratchet wheel **34**, as shown in Fig. 7, is secured to a disc **36** on a sleeve **37** which is keyed to the shaft **30** and a bevel pinion **38**, mounted on the sleeve, engages a bevel pinion **39** keyed to the shaft **30**. The shaft **23** has a keyway 23^c extending throughout its length and the pinion **39** is keyed to the shaft but the latter is slidable longitudinally through the pinion. From this it will be seen that every time the pawl **33** moves the ratchet wheel **34**, the shaft **23** will turn and the spindles **10** and **12** will be moved and with them the brush cores will be moved circumferentially a given distance. To prevent over-running a friction brake 30^a is applied to the end of the shaft **30**. Following each movement and while the pawl **33** is descending, the drill *t* and staple-driving rod *i*, Fig. 5, will simultaneously make a downward and upward movement and the former will bore a hole in the core *e* and the latter will staple a tuft in a previously bored hole in core *f*.

After the core *e* has been bored with the first complete circular row of holes, evenly spaced apart, as the row *k*, Fig. 4, and a corresponding row of tufts has been stapled into previously bored holes in the core *f*, it is necessary to shift the carriage C forward in order that a succeeding row of spaced holes *k'* may be bored in the core *e* and a corresponding row of tufts may be stapled into previously bored holes in the core *f*. This forward shifting of the frame which carries the cores is accomplished automatically while the pawl **33** is descending by means to be hereinafter described. It is desirable to stagger the holes in successive rows and correspondingly stagger the tufts. Assuming that it is desired to have the holes and tufts in each row located midway between the holes and the tufts in adjacent rows, this is accomplished as follows: If the hole **101**, Fig. 4, be considered the first hole and **114** the last hole bored in row *k*, having 14 holes, and the movements of the core are in the direction of the arrow, then during the next upward movement of the pawl **33** a slide **42**, having a curved end **42a** will be moved to disengage the pawl from the teeth on the ratchet wheel **34** for half of the upward travel of the pawl and the latter will move the ratchet wheel only half as far as it does when the pawl is engaged throughout the length of its upward travel, and hence the first hole **115** in the second row *k'* will be spaced midway, circumferentially, between the last and first holes bored in the row *k* and, similarly, holes **129** and **142** will be the first and last holes bored in the row k^2. In other words, after one complete circular row of holes has been bored in one core and one complete circular row of tufts has been stapled into the previously bored holes of another core, the cores will be moved circumferentially only half a space to start the next rows of holes and tufts. All of the tufts and holes in the successive rows will be staggered with respect to the holes and tufts in the adjacent rows, but the holes and tufts in each row will be spaced the same distance apart circumferentially of the cores. It is to be noted that this half spacing at the commencement of each row gives a spiral effect to the holes and tufts. Thus, the holes **101**, **115** and **129**, and the holes **114**, **128** and **142** are spirally arranged.

The means for holding the pawl **33** out of engagement with the ratchet wheel **34** to accomplish reduced spacing of the cores circumferentially after the completion of each row of holes and tufts and before the commencement of the next row of holes and tufts, will now be described. As previously stated, the arm **29**, Figs. 1, 2, 6 and 7, which is rocked by the rod **27**, is keyed to the rock shaft **30** and upon this shaft is secured a radially extending slotted arm **44** which rocks with the shaft. A link **45** connects this arm with an arm **46** journalled on a shaft **47** which extends transversely of the machine and is mounted in bearings **48**, **49** on the frame of the machine. The arm **46** carries a pawl **50** which engages the teeth of a ratchet wheel **51** keyed to the shaft **47**, and secured to this shaft is a cam wheel **52**, circular in form, and having short cam surfaces **53** on its periphery, spaced equal distances apart. A centrally pivoted lever **54** has a roller **55** at one end which bears against the periphery of the cam wheel, while its opposite end has a slot **55a** which is engaged by a pin **56** on the slide **42** for moving the pawl **33** out of engagement with the teeth of the ratchet wheel **34**. The link **45** has one end adjustable in the slot of the rocker arm **44** to adjust the extent of movement of the pivotally mounted arm **46** and the pawl **50**.

In operation, as the rod **27** moves the rocker arm **29** and pawl **33** up and down, during each revolution of the main shaft L, it also causes the slotted arm **44** to rock back and forth and, through the link **45** and the pivoted arm **46**, the pawl **50** is moved back and forth to advance the ratchet wheel **51** a certain number of teeth at each forward movement, and this will cause a corresponding movement of the cam wheel **52**. When one of the short cam surfaces **53** on the cam wheel **52** engages the roller on the lever **54**, the latter is moved and shifts the slide **42** horizontally outward and this slide disengages the pawl **33** from the teeth of the ratchet wheel **34**. The pawl **33** then rides on the curved end of the slide until the roller on the lever **54** passes off of the cam surface on the cam wheel, when the slide is withdrawn by the lever and the spring **35** moves the pawl into engagement with said ratchet wheel **34**. These cams are so spaced apart around the periphery of the cam wheel that when one complete row of holes has been bored in one brush core and a complete row of holes has been filled with tufts in another brush core, one of the cams will cause the lever **54** to throw the slide outwardly for the first half of the next upward movement of the pawl **33**, so that the pawl will give the ratchet wheel only a half of its normal movement, and consequently the brush cores will be given only half of their normal circumferential movements after the last hole in a circular row has been bored in one row and the last tuft in a circular row has been set in another core.

The half spacing at the change from one row to another produces a spiral arrangement of the tufts in the complete brush. If it is desired to have the tufts in straight rows from end to end of the brush, this can be done by replacing the cam wheel **52** with a disc of the same diameter without the cam projections **53**, so that the slide **42** will not be operated to disengage the pawl **33** from the ratchet wheel **34**. The pawl will then move the ratchet wheel, and hence the brush cores, the same distance at all times and the holes and tufts in the successive rows will be in longitudinal alinement. Or, if it is desired merely to stagger the tufts in successive rows without having them spirally arranged by half spacing the first hole or tuft in a row, this can be done by changing the length of the cam surfaces **53** so as to change the time that the pawl **33** is held out of engagement with the ratchet wheel; or the part **42a** on the slide might be lengthened or shortened to produce the same effect. However, the spiral arrangement of the tufts is most desirable and this is accomplished by the half spacing, as described.

Longitudinal movement of carriage and brush cores

The shaft **47** which carries the cam wheel **52** for controlling the circumferential spacing movement of the brush cores also carries, at the opposite side of the machine, a cam wheel **57** which controls the longitudinal movement of the carriage and the brush cores after each row of holes has been bored and each row of tufts has been stapled. A shaft **58**, journalled in suitable bearings **58a**, beneath and parallel with the feed screw (Figs. 2 and 3) carries a gear **59** which meshes with a gear **60** journalled on a stub shaft **61**, and this latter gear meshes with the pinion **18** on the feed screw. Hence any rotary movement given

to the shaft 58 will cause rotary movement of the feed screw. A ratchet wheel 62 is secured to the shaft 58, and a ratchet lever 63, journalled on said shaft, carries a pawl 64 for moving the ratchet wheel and the train of gears which operate the feed screw. The ratchet lever 63 moves constantly back and forth while the main shaft is in operation, but the pawl 64 is held out of engagement with the wheel except at the times when it becomes necessary to shift the carriage carrying the brush cores forward with respect to the drill and tufting devices to start a new row of holes in one core and a new row of tufts in the other core. As shown in Figs. 2, 3 and 8, the ratchet lever 63 is connected by a rod 65 to one end of a lever 66 which is centrally pivoted to a stationary support 67, and the opposite end of the lever is adjustably connected by a threaded rod 68 to an eccentric strap 69 which is movable up and down by an eccentric 70 on the main shaft L. As will be evident, during each revolution of the main shaft, the ratchet lever 63 will be given a downward and upward movement, but the pawl will ride idly against the curved edge of a plate 71 (Figs. 2, 8 and 11) and will not engage and move the ratchet wheel to cause endwise movement of the carriage and brush cores except when the last hole in a circumferential row has been bored in one core and the last tuft in a circular row in the other core has been stapled. Then the pawl 64 will be permitted to engage the ratchet wheel and cause rotation of the feed screw and longitudinal movement of the carriage and cores to the exact distance predetermined for the spacing of the circular rows of holes and tufts, and after this short movement the pawl 64 will be disengaged from ratchet wheel 62 until the cores have made a complete step by step rotation and one core has been bored with a new row of holes and the other core has been stapled with a new row of tufts, at the completion of which the carriage and cores will be moved longitudinally as before to position the cores with respect to the boring and stapling devices for the succeeding holes and tufts. These longitudinal movements occur without stopping the movements of the boring and stapling devices, but in the short intervals while they are disengaged from the cores after the last hole in a circumferential row has been bored in one core and the last tuft has been stapled in a row in the other core. At the next descent of the boring and stapling devices, they commence to operate on new rows of bores and tufts, respectively.

The plate 71 for holding the pawl 64 normally out of engagement with the ratchet wheel 62 is secured to a slide 72 which is movable radially with respect to the ratchet wheel. As shown, one end of the slide has a slot 72a through which the shaft 58 extends and the other end of the slide is supported by a flat metal strip 73 depending from the frame of the machine, this strip having a slot at its lower end through which the slide is movable. A shaft 74 is vertically arranged in bearings 75 in a fixture 76 which depends from the machine frame, and this shaft carries a laterally projecting roller 77 which bears against the periphery of the cam wheel 57. A slotted lever 78 secured to the lower end of the shaft engages a pin 79 on an arm 80 secured to the side of the slide 72, so that when the roller is on the high portions of the cam wheel, the slide and curved plate 71 will be held in the position shown in Fig. 11, wherein the plate holds the pawl 64 out of engagement with the ratchet wheel. A spring 81 connects a pin 82 on the arm 78 with a fixed part 83 on a bracket 84 and this spring constantly urges the slide 72 and plate 71 toward the axis of the ratchet wheel 62 and holds the roller 77 on shaft 74 against the edge of the cam wheel. When the roller drops into one of the depressions 57a in the cam wheel, the arm 78 moves the slide 72 and plate 71 radially inward to permit the pawl 64 to engage the ratchet wheel, this movement being reversed the moment the roller 77 rides out of the depression in the cam wheel.

To prevent over-running of the mechanism operated by the ratchet wheel 57 and to ensure exact longitudinal spacing of the carriage and brush cores, a ratchet 85, secured to the shaft 58, has teeth reversely arranged with respect to the teeth on the ratchet wheel 62, as shown in Fig. 8, and a check pawl 86, slidable in suitable guides 87, is pressed by a spring 88 towards the teeth of the ratchet wheel 85, as shown in Figs. 8 and 9. A flat metal rod 89 is vertically movable in guides 90 above and below the check pawl and this rod has a long notch 89a in one edge which is engaged by a roller 91 on the check pawl 86 when the rod is in the position shown in Figs. 8, 9 and 12. The sliding rod 89 is movable upwardly by a rod 92 attached to the pivoted arm 86, every time the latter arm causes the ratchet lever 63 to move upwardly, and during this upward movement, the rod 89 forces the roller 91 and check pawl 86 rearwardly out of engagement with the teeth of the ratchet wheel 85; but when the pawl 64 on the arm 63 has completed its upward movement, the rod 89 descends and permits the check pawl 86 to engage the ratchet wheel 85 to prevent any further movement of the shaft 58 and the mechanism which it operates to shift the carriage.

For the purpose of adjusting the carriage when the machine is stopped, by turning the feed screw 14 by hand, it is necessary to disengage the check 86 from the teeth of the ratchet wheel 85 and also to disengage the pawl 64 from the ratchet wheel 62. As shown in Fig. 1, a shaft 93 is journalled on the side of the frame A and has a handle 93a by which the shaft can be turned, this handle being placed within reach of the operator when he turns the crank 14a to move the carriage. The shaft 93 operates a link 93b which in turn operates a shaft 93c to give the latter a rotary movement. One end of the shaft 93c is journalled in a support 94, Fig. 8, and upon this end is a crank 95 which has a lost-motion connection with a rod 96 connected to the pawl 64 whereby rotation of the crank will move the pawl out of engagement with the ratchet wheel 62. Another crank 97 on the shaft 93c has a lost-motion connection with a rod 98 which is pivotally connected to the check 86. It will be evident that by turning the handle on the shaft 93, the operator may move the check 86 and pawl 64 out of engagement with the ratchet wheels and hold them out of engagement while he adjusts the carriage by turning the crank 14a.

After the machine has been operated to complete the boring of one core and the tufting of the other core, it is necessary to stop the mechanism, and for this purpose a stop 99, Fig. 1, is adjustably mounted on the shaft 23 which is movable with the carriage. As the carriage moves forward, from left to right in Fig. 1, this stop engages a lever 99a which trips a clutch on the main shaft and disengages the latter from

the driving gear. This lever operates a rod 99b, Figs. 1 and 2, to trip the clutch, the latter being the same as in the Fisher patent before referred to and not herein shown.

What is claimed is:

1. In a brush making machine having vertically reciprocating means for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having means for supporting two cylindrical cores side by side in horizontal position beneath the boring and stapling mechanisms, respectively, means for rotating said cores simultaneously step by step in time with the movements of the boring and stapling devices to permit said devices to bore a circular series of holes spaced evenly apart in one core and to simultaneously staple a similarly spaced series of tufts in the holes of a previously bored core, while the carriage is stationary, and means for moving the carriage and cores endwise after each circular series of holes has been bored in one core and a circular series of tufts has been stapled into the other core.

2. In a brush making machine having vertically reciprocating means for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having means for supporting two cylindrical cores side by side in horizontal position beneath the boring and stapling mechanisms, respectively, means for rotating said cores simultaneously step by step in time with the movements of the boring and stapling devices to permit said devices to bore a circular series of holes spaced evenly apart in one core and to simultaneously staple a similarly spaced series of tufts in the holes of a previously bored core, while the carriage is stationary, means for moving the carriage and cores endwise after each circular series of holes has been bored in one core and a circular series of tufts has been stapled into the other core, and means for shortening the circumferential spacing movements of the cores during the step following the completion of one circular series of holes and tufts and before the commencement of the next circular series of holes and tufts, to stagger the holes and tufts in successive rows.

3. In a brush making machine having vertically reciprocating means for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having means for supporting two cylindrical cores side by side in horizontal position beneath the boring and stapling mechanisms. respectively, means for rotating said cores simultaneously step by step in time with the movements of the boring and stapling devices to permit said devices to bore a circular series of holes spaced evenly apart in one core and to simultaneously staple a similarly spaced series of tufts in the holes of a previously bored core, while the carriage is stationary, means for moving the carriage and cores endwise after each circular series of holes has been bored in one core and a circular series of tufts has been stapled into the other core, and means for shortening the circumferential spacing movements of the cores to one half the normal spacing movement during the step following the completion of one series of holes and tufts and before the commencement of the next circular series of holes and tufts, to effect spiral arrangement of the holes and tufts in the cores.

4. In a brush making machine having a main shaft and vertically reciprocating means operated by said shaft for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having spindles mounted thereon for supporting two cylindrical brush cores side by side in horizontal position beneath the boring and stapling devices, respectively, means for rotating said cores simultaneously step by step in time with the boring and stapling devices to permit a circular series of spaced holes to be bored in one core and a similar series of tufts to be applied to the other core, comprising gears mounted on the carriage for rotating said spindles in unison in the same direction, a shaft mounted on the carriage and extending longitudinally thereof for driving said gears, a pinion keyed to said latter shaft and through which said shaft is slidable, a ratchet wheel geared to said pinion, a ratchet lever having a pawl normally engaging the ratchet wheel, and means operated by the main shaft for rocking said lever and pawl to move the ratchet wheel a given distance during each rotation of the main shaft to effect rotary step by step movement of the brush cores.

5. In a brush making machine having a main shaft and vertically reciprocating means operated by said shaft for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having spindles mounted thereon for supporting two cylindrical brush cores side by side in horizontal position beneath the boring and stapling devices, respectively, means for rotating said cores simultaneously step by step in time with the boring and stapling devices to permit a circular series of spaced holes to be bored in one core and a similar series of tufts to be applied to the other core, comprising gears mounted on the carriage for rotating said spindles in unison in the same direction, a shaft mounted on the carriage and extending longitudinally thereof for driving said gears, a pinion keyed to said latter shaft and through which said shaft is slidable, a ratchet wheel geared to said pinion, a ratchet lever having a pawl normally engaging the ratchet wheel, means operated by the main shaft for rocking said lever and pawl to move the ratchet wheel a given distance during each rotation of the main shaft to effect rotary step by step movement of the brush cores, and means for automatically holding the pawl out of engagement with the ratchet wheel during a part only of the forward movement of the pawl after a circular series of holes has been bored and a similar series of tufts has been applied to the cores, respectively, and before the boring and tufting devices next operate on the cores.

6. In a brush making machine having vertically reciprocating means for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having means for supporting two cylindrical cores side by side in horizontal position beneath the boring and stapling mechanisms, respectively, means for rotating said cores simultaneously step by step in time with the movements of the boring and stapling devices to permit said devices to bore a circular series of holes spaced evenly apart in one core and to simultaneously staple a similarly spaced series of tufts in the holes of a previously bored core, means for moving the carriage and cores endwise after each circular series of holes has been bored in one core and a circular series of tufts has been stapled into the other core comprising a feed-screw journalled in stationary bearings and engaging a threaded member on the

carriage, a ratchet wheel, gearing operable by the ratchet wheel for rotating the feed screw, a ratchet lever and pawl, means operable by the main shaft for moving said lever and pawl, means for normally holding the pawl out of operative engagement with the ratchet wheel and means for permitting the pawl to engage the ratchet wheel to cause longitudinal movement of the carriage and cores after each circular series of bores and tufts has been completed.

7. In a brush making machine having vertically reciprocating means for simultaneously boring holes in one brush core and stapling tufts into a previously bored core, a carriage having means for supporting two cylindrical cores side by side in horizontal position beneath the boring and stapling mechanisms, respectively, means for rotating said cores simultaneously step by step in time with the movements of the boring and stapling devices to permit said devices to bore a circular series of holes spaced evenly apart in one core and to simultaneously staple a similarly spaced series of tufts in the holes of a previously bored core, means for moving the carriage and cores endwise after each circular series of holes has been bored in one core and a circular series of tufts has been stapled into the other core comprising a feed-screw journalled in stationary bearings and engaging a threaded member on the carriage, a ratchet wheel, gearing operable by the ratchet wheel for rotating the feed screw, a ratchet lever and pawl, means operable by the main shaft for moving said lever and pawl, means for normally holding the pawl out of operative engagement with the ratchet wheel and means for permitting the pawl to engage the ratchet wheel to cause longitudinal movement of the carriage and cores after each circular series of bores and tufts has been completed, said last-mentioned means including a cam wheel operated by the means for rotating the cores.

CHARLES C. FISHER,
Executor of the Estate of Charles E. Fisher, Deceased.