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(54) **Multi-needle automatic sewing machine.**

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Description

This invention is concerned with automatic sewing machine comprising two needle holders each for supporting a needle, a needle drive bar, indexing means for shuttling the needle holders relative to the needle drive bar whereby each of said holders can be moved between an active position, in which it is aligned with the needle drive bar, and an inactive position, out of such alignment, thread take-up means arranged "upstream" of the needle holders along the thread supplied to the needles, and thread control means for controlling the thread supplied to the needles, whereby to ensure that the thread supplied to the needle supported by the holder in the inactive position does not interfere with the thread supplied to the needle supported by the holder in the active position.

There is described in DE—A 2938894 an automatic sewing machine of the above-mentioned type wherein a plurality of needle holders are provided, arranged side-by-side, and the thread control means comprises a hinged member provided with a central aperture for allowing operating movement of the needle holder in the active position, and extending laterally at both sides of the aperture for co-operation with needles supported by needle holders in inactive positions. Mounted on the hinged member are two chambers, one at either side of the central aperture, and at the base of each chamber is provided a tube having a plurality of orifices, the tube being connected to a source of compressed air. Whenever a new needle holder is to be brought into the active position, the compressed air is switched on, causing the thread ends associated with the needle holders in the inactive positions to be blown into the chambers. Associated with each chamber, furthermore, is a pivotted flap which is displaced by the compressed air, but which returns under gravity to a position in which it clamps the thread ends against the walls of the chambers.

For ensuring that the thread end of the needle holder which is to leave the active position is brought into the chamber and subjected to the compressed air, a presser foot of the machine is moved heightwise beyond its normal uppermost position to carry the thread end into the chamber. In so doing, however, the press foot clearly can only enter into the central aperture between the two chambers, so that it is only when the presser foot has returned to its normal condition and the needle holders have been indexed that the thread end from the previously active needle holder can be drawn into the chamber. Furthermore, clamping of the thread end then takes place only after the compressed air is switched off.

It is clear therefore that in this machine the thread end from the previously active needle is uncontrolled until after the next needle holder has been moved into its active position.

It is the object of the present invention therefore to provide an improved automatic sewing machine in which the control of the thread end, as the needle holders are shuttled, is enhanced.

This object is achieved in accordance with the present invention, in an automatic sewing machine as set out in the first paragraph above, in that two control means are provided, one associated with each needle holder, each such means comprising a thread nipping device which is arranged at the inactive position of its associated needle holder and which co-operates with said holder, when the latter is moved to its inactive position, to clamp the thread against the holder to secure it against being pulled out of the eye of the needle, a thread end removal device, which is also arranged at said inactive position and which draws the thread and extending beyond the thread nipping device to an out-of-the-way position, and thread pull-back means which is arranged "upstream" of the thread take-up means along the thread supplied to the needle and which comprises a movable guide element and actuating means for moving the guide element between a first position, in which it is adjacent the thread take-up means and in which it is disposed when its associated needle holder is in its active position, and a second position, in which it is spaced from the thread take-up means and in which it is disposed when its associated needle holder is in its inactive position.

It will thus be appreciated that, using a machine in accordance with the invention, by the provision of separate thread control means one associated with each needle holder, the thread end is nipped before the shuttling of the two needle holders is completed, and thereafter, upon completion of the shuttling movement, the thread end can be drawn to an out-of-the-way position, while the thread "upstream" of the thread nipping device is equally subjected to a control which ensures that it does not interfere with the thread supplied to the active needle.

In the machine in accordance with the invention, preferably the needle holders are supported for transverse sliding movement in a support or needle holder cage, and the thread nipping device of each thread control means preferably comprises a clamp element which is also carried on said support; in one embodiment, the clamp element comprises a wheel co-operative with a clamping surface of its associated needle holder. It will thus be appreciated that, by this arrangement, the thread can be engaged by the thread nipping device before the previously active needle holder reaches its inactive position, thereby further enhancing the control of the thread.

Conveniently in the machine in accordance with the invention actuation of the indexing means is prevented except when the needle holders are in heightwise alignment with one another. This means that the needle holder in its inactive position is always positioned at the same height, or substantially so, in relation to the support by which it is supported. In addition, locating means is preferably provided for locating each needle holder in its inactive position and holding it

therein, whereby its position transversely of the machine is established. Further locating means may also be provided for locating each needle holder in its active position and holding it therein.

With the needle holder located both heightwise and transversely in its inactive position, furthermore, it is made possible to position the thread end removal device of each thread control means in a fixed position in relation to the needle holder. Thus, the thread end removal device of each thread control means comprises a vacuum tube which is mounted on said support for the needle holders and which opens adjacent the eye of the needle supported by the needle holder in its inactive position against the direction of feed of the thread through the eye. Alternatively, in another embodiment said thread end removal device may comprise a thread-wiping finger which is movable from a first, thread-engaging, position adjacent the eye of the needle supported by the needle holder in its inactive position and a second, retracted position, and a co-operating plate against which the finger holds the end of the thread as it moves away from its first position. In this latter case, the thread end removal device is conveniently mounted on a frame portion of the machine.

The thread pull-back means of the machine in accordance with the invention serves to ensure that the thread "upstream" of the thread snipping device associated with the inactive needle holder so that the "inactive" thread is held in an out-of-the-way position in relation to the "active" thread. This is achieved essentially by holding the inactive thread in tension during the stitching operation by the active needle, and to this end the actuating means of the thread pull-back means preferably comprises a pressurizable cylinder which can act both to maintain the tension in the inactive thread and also to release the tension when the needle supplied with said thread is active. In a machine in accordance with the invention, furthermore, it has been found desirable to provide adjustment means for regulating the first position of the guide element of the thread pull-back means, thus to adjust the position of said element when it is maintaining the inactive thread in tension.

It will be appreciated that the machine in accordance with the invention thus has the facility to control the inactive thread and maintain it so as not to interfere with the active thread not only in the vicinity of the needle eye and "downstream" thereof, but also "upstream" beyond the take-up means. Furthermore, the control of the inactive thread is put into effect as soon as the needle holder is moved towards its inactive position and, by first nipping the thread against the needle holder, it is ensured that the thread is retained in the needle prior to the other elements of the thread control means being actuated.

There now follows a detailed description, to be read with reference to the accompanying drawings, of one machine in accordance with the invention, together with a modification thereof. It will be appreciated that this machine and its modification has been selected for description merely by way of non-limiting example.

In the accompanying drawings:—

Figure 1 is a side elevational view of an automatic sewing machine in accordance with the invention;

Figure 2 is an exploded view of a part of a needle support and indexing mechanism of the machine shown in Figure 1;

Figure 3 is an elevational view of one end of the machine of Figure 1;

Figure 4 is a partial perspective view, showing details of a thread monitor arrangement in one operational mode;

Figure 5 is a view similar to Figure 4, but in a subsequent operational mode;

Figure 6 is a view taken along the lines VI—VI of Figure 1;

Figure 7 is a partial sectional view of the thread monitor arrangement.

Figure 8 is a partial sectional view, showing details of needle holders and the indexing mechanism in a first operational mode;

Figure 9 is a view similar to Figure 8, but in a subsequent operational mode;

Figure 10 is a partial perspective view of a modification of the machine in accordance with the invention, taken from the front to the left thereof, and showing details of a thread-wiping mechanism;

Figure 11 is a front elevational view of the parts shown in Figure 10; and

Figure 12 is a partial perspective view of the parts shown in Figure 10 and 11, looking forwardly towards the thread-wiping mechanism, at the left hand side thereof.

The machine in accordance with the invention now to be described is an automatic sewing machine 20 capable of sewing two different threads into an item to be stitched. The threads may be of a different colour, texture, or size, depending upon the requirements of the item being sewn. The sewing machine 20 comprises a housing 22 disposed on a work support table 24. A stitching mechanism 26 is disposed at one end of the housing 22 and is connectively associated therethrough by a drive shaft 28 to a drive means 30 at the other end of the housing 22. An indexing mechanism 32 is connected to the stitching mechanism 26 to effectuate shuttling therein. A thread monitor generally designated 34 controls the thread feed and usage and checks for irregularities associated therewith.

The stitching mechanism 26 is shown more clearly in Figure 2, which mechanism comprises a needle-holding cage 36 which mounts against the lower side of the housing 22, and which cage 36 has a pair of opposed channels 38 which each slidingly receive a shoulder 40 of a needle holder indexer 42. A first needle 44 and a second needle 46 are each secured in a needle holder 48, 40 respectively, slidably received in an opening 52 within the needle holder indexer 42. The holder indexer 42 has an extension 54 which slides under

a bracket 56 one end of which is secured to the needle-holding cage 36. The other end of the bracket 56 pivotally supports an indexing cylinder 58, which comprises a part of the indexing mechanism 32. The indexing cylinder 58 has a piston (not shown) and a piston rod 60 which is pivotally connected to one end of an indexing lever 62. The other end of the indexing lever 62 is swingably connected to the extension 54 of the needle holder indexer 42. An elbow 64 disposed near the midpoint of the indexing lever 62 is pivotally attached to the bracket 56.

A needle bar 86, shown in Figure 2, has an arrangement of flanges 88 on the lower end thereof, which flanges 88 slidingly mate successively with a pair of opposed channels 90 on the upper end of each needle holder 48, 50. Thus, under the action of the indexing mechanism 32 the needle holders 48, 50 can slide relative to the needle bar 86 to bring a selected one of the needles 44, 46 into an active position in alignment with the needle bar 86. The upper end of the needle bar 86 is pivotally connected to the lower end of a connecting rod 92 (Figure 3) which is journalled on a crank shaft 94, on the end of the drive shaft 28, shown also in Figures 1 and 6.

A presser foot 82 is disposed adjacent the active position for the needles 44 and 46, and is reciprocably held by a presser foot bar 84 which extends through a fitting in the needle-holder cage 36.

The thread monitor 34, shown in Figures 4, 5 and 7, comprises an axis 96, journalled into a ferrule 97 supported in the housing 22, the axis 96 having a pair of thread-engaging wheels 98 rotatively disposed thereon. A disk 100, having perforations arranged on its periphery, is secured to a side of each wheel 98, in a manner similar to the arrangement shown in U.S. patent 3,843,883, which is now incorporated herein by reference. The peripheral perforations are counted by a photoelectric device 102 adapted with an encoder, not shown, to monitor the thread usage. The photoelectric device 102 is pivotally mounted on a shaft 104 secured to the housing 22, and may be swung out of the way to permit thread to be wound around the thread-engaging wheels 98, which pivoting out of the way is shown in dashed lines in Figures 4 and 5. An adjustment knob 106 is threadably received on the distal end of the shaft 96, which knob 106 may be rotated to compress a spring 108 or biasing member between the knob 106 and an annular non-rotative housing 110 disposed on the axis 96 and against a friction disk 112 adjacent the outer thread-engaging wheel 98. A roller thrust bearing 114 is disposed between the contiguous sides of the inner and outer thread-engaging wheels 98, and a second friction disk 116 is disposed against the inner side of the inner thread-engaging wheel 98 and into abutting contact with a non-rotative portion of the ferrule 97 as shown in Figure 7.

The machine in accordance with the invention also comprises thread control means for controlling a thread 160 (or 170) supplied to the needle 44 (or 46) which is in an inactive position, during the operation of the needle in the active position. To this end, the thread control means comprises thread-nipping means generally designated 66, comprising a first thread-nipper, in the form of a biasing element or resilient wheel 68 mounted on a first bracket 70 and secured to the needle-holder cage 36, and a second thread-nipper in the form of a biasing element or resilient wheel 74 mounted on a second bracket 76 and also secured to the needle-holder cage 36. The first thread-nipper 68 is disposed adjacent inactive position of the first needle 44 and the second thread-nipper 74 is disposed adjacent the inactive position of the second needle 46. In addition, the thread control means comprises thread end removal means generally designated 72 comprising two vacuum tubes 78 having their distal ends disposed adjacent the inactive position of each needle 44, 46 respectively, as shown in Figures 1 and 2. The tubes 78 are connected to a manifold 80 which is secured to the needle-holder cage 36. The manifold 80 is connected to a vacuum source (not shown).

The thread control means further comprises a take-up lever 120 (Figures 4 and 5) which extends through slot 122 in the housing 22 and has a distal portion 124 with two orifices through which the two threads 160, 170 pass. The take-up lever 120 is shown in both its upper and its lower position in both Figures 4 and 5. Also the thread control means comprises thread pullback means generally designated 126, shown in Figures 1, 3 and 4, which comprises one associated with each needle 44, 46 a first and a second pressurizable cylinder 128, 130, attached to a bracket arrangement 132 secured to the housing 22. Each pressurizable cylinder 128, 130, actuatable by proper means (not shown), is a double-acting pressurizable cylinder, and each has an upper piston rod 134 and a lower piston rod 136 extending from their upper and lower ends respectively. A guide ring 138 is arranged on the distal end of each lower piston rod 136.

The drive shaft 28 (Figures 1 and 6) is turned by the drive means 30, which includes a motor (not shown) and is attached to a drive belt 140, which travels about a pulley 142 on the drive shaft 28. A disk 144 is disposed on the drive shaft 28 adjacent the pulley 142. The disk 144 has a wedge-shaped detent 146 arranged therein, as shown in Figure 6. A pressurizable cylinder 148 is attached to the frame 22 of the sewing machine 20, by a bracket 150 secured generally under the drive shaft 28. The cylinder 148 has a movable piston rod 152 extending therefrom. A wedge-shaped extension 154 is attached to the distal end of the movable piston rod 152, mateable with the wedge-shaped detent 146 in the disk 144 on the drive shaft 28.

In the operation of the machine in accordance with the invention, the two thread filaments 160, 170 (Figures 4 and 5) are unwound from their respective spools (not shown) and extend through openings in a guide bracket 172 attached to the frame 22 above the thread monitor 34. The threads 160, 170 each pass through a thread

retainer 174, 176 beneath the guide bracket 172 and are each wound around one of the thread-engaging wheels 98 while the photoelectric device 102 is pivoted out of the way therefrom (as shown by the phantom lines in Figures 4 and 5). The threads 160, 170 are then drawn around a guide spring 178 and through the guide rings or loops 138 on the distal end of each of the lower piston rods 136 on the thread pullback means 126, thence through their respective orifices on the distal portion 124 of the take-up lever 120, each thence through a channel 180 in the front shoulder 40 of the needle-holder indexer 42. The threads then extend through an opening on a tab 49 on the lower portion of the needle holders 48, 50, and through the eyes of their respective needles 44, 46.

The stitching mechanism 26 may be activated, once the desired needle 44 or 46 is shuttled to the active position, the remaining needle 44 or 46 at the same time being shuttled to the inactive position. The active (or stitching) position is located directly beneath the needle bar 86. The respective inactive positions of the two needles 44, 46 are immediately adjacent the active position, one at either side thereof (see Figures 8 and 9). Thus each needle 44 or 46 may be shuttled from its respective inactive position to the active position, while the other needle 44 or 46 is shuttled to its respective inactive position from the active position by actuation of the indexing cylinder 58, upon receipt of a proper signal, causing pivotal movement of the indexing lever 62 about its pivot point in the elbow 64 thereof. The extension 54 of the needle holder indexer 42, being attached to the indexing lever 62, pulls or pushes the needle holders 48 and 50 accordingly, with their respective needles 44, 46 arranged therewith. The channels 90 on each needle holder 48, 50 respectively are pulled or pushed onto the flanges 88 of the needle bar 86 according to the direction of motion of the needle holder indexer 42, which is a function of whether the piston rod 60 of the indexing cylinder 58 is being extended or retracted. As seen in Figures 8 and 9 each of the needle holders 48, 50 has a channel therethrough and a detent 184 through which its associated needle 44, 46 may pass. A ball 186 is biased by a spring 188 within the centre of the needle bar into the detent 184, to properly locate and help secure the needle holder 48 or 50 precisely in the active position while stitching. Each inactive position has a biased ball 190 arranged between a locator plate 192 and the needle holder cage 136 to mate with the detent 184, to properly locate and hold secure the needle holder 48 or 50 in its inactive position while the other needle holder 48 or 50 is in the active position, as shown between the Figures 8 and 9.

Referring again to Figure 4, the thread pullback means 126 is shown including a pair of adjustable bolts or stops 194 attached to the upper portion of the bracket 132. They are utilized to regulate the amount of upward travel of the upper piston rods 134, which are contiguous with and hence regulate the amount of upward travel of the lower piston rods 136 and their guide rings 138 attached thereto. The guide ring 138 on the lower piston rod 136 on whichever pressurizable cylinder 128 or 130 is holding the thread 160 or 170 for the active needle 44 or 46 is lower than the ring 138 holding up and out of the way the thread 160 or 170 for the needle in the inactive position. In the case shown in Figure 4, the second needle 46 is in the inactive position and the needle holder cage 36 has been shuttled to the right by proper actuation of indexing cylinder 58 by proper means (not shown). The thread 170 for the second needle 46 is caught between the tab extension 49 on the lower portion of the second needle holder 50 and the second resilient elastomeric wheel 74, thus keeping the inactive thread 170 taut and out of the way. The tail of the inactive thread 170 shown in Figure 4 has been sucked into its respective vacuum tube 78, which vacuum is maintained in both tubes 78 by proper vacuum generating means (not shown). The lower piston rod 136 and its guide ring 138 of the first cylinder 128 is shown in phantom in its upper position and is shown in full lines where it would be in its lower position where it guides the thread 160 for the first needle 44 shown here as being in the active position.

Figure 5 shows the lower piston rods 136 holding the threads 160, 170 wherein the inactive needle in this view is the first needle 44 having the tail of its thread 160 sucked into the vacuum tube 78 and the thread 160 above the eye of the first needle 44 being trapped between the tab extension 49 on the lower portion of the first needle holder 48 and the first resilient elastomeric wheel 68, thus keeping the inactive thread 160 taut and out of the way.

The needle holders 48, 50 are not permitted to be shuttled by activation of the indexing cylinder 58 until the active needle holder 48 or 50 is brought into heightwise alignment with the other inactive needle holder 48 or 50, whereupon the indexing cylinder 58 may be activated by the proper mechanism (not shown) to effectuate the shuttle. The proper alignment occurs when the wedge-shaped extension 154 is caused to be inserted into the wedge-shaped detent 146 on the disk 144 by actuation of its pneumatic cylinder 148. This brings the rotational movement of the drive shaft 28 to a stopped position within ±.5° of the desired angular position. The drive shaft 28 in turn effectuates the positioning of the needle bar 86, permitting, through proper circuitry, the pressurization of the indexing cylinder 58 to complete the needle shuttle, and thus allows automatic stitching by the successive needle as required of the machine 20.

In a modification of the machine, instead of vacuum tubes 78, the thread control means may comprise a thread-wiping mechanism generally designated 200. The mechanism 200 is arranged on the side of the machine opposite from the machine operator, and comprises two articulated hook-shaped fingers 202 and 204 (Fig-

ures 10 and 12). A drive means for the fingers comprises pressurizable double-acting cylinder 206, secured to the housing 22, by a bracket 207, arranged adjacent the stitching mechanism 26. Alternatively, the drive means may comprise a solenoid arrangement, in place of the pressurizable cylinder. The first articulated finger 202 is secured to the distal end of a first shaft 208 (Figures 10), and the second articulated finger 204 is secured to the distal end of a second shaft 210 (Figure 12). The drive means also includes a piston, not shown, arranged within the cylinder 206, having a piston rod 212 extending upwardly and outwardly therefrom. A first transverse bracket 214 is secured to the distal end of the rod 212. The upper end of each shaft 208 and 210 is respectively secured in a bore 216 in the bracket 214. The other, lower, end of each shaft 208 and 210 is slidably received in a bore 218 in a second transverse bracket 220 to which the lower end of the cylinder 206 is attached.

A pair of wiper plates 222 and 224 extend downwardly from the second bracket 220 immediately adjacent and generally parallel to each articulated finger 202 and 204. Each wiper plate 222 and 224 has a distal edge 226 which is generally parallel to the needles 44 and 46. The distal ends of the fingers 202 and 204 are biased against their respective wiper plates 222 and 224, the finger 202 or 204 holding the end of the thread 160 or 170 of the now inactive needle 44 or 46 thereagainst.

The pressurizable cylinder 206 is serviced by a first and a second pressurizable fluid supply conduit 230 and 232 which channel pressurizable fluid from a proper regulatable pressurizable source, not shown, to the cylinder 206.

In operation of the modification, the thread-wiping mechanism 200 is pressurized by effecting pressurized fluid to be channelled through conduit 230 to cause the piston rod 212 to move downwardly in the cylinder 206, from its position shown in phantom lines in Figure 11 and designated "A" and "B" to the lower position shown in full line drawing therein, prior to the needles 44 and 46 shifting by actuation of the indexing mechanism 32. The fingers 202 and 204 extend to a position, shown in Figure 11, wherein the lowest portion or trough of the fingers 202 and 204 are beneath the needles 44 and 46. The thread from whichever needle is the "to-be-active" needle 44 or 46, is then released from between its respective resilient wheel 68 or 74 and distal portion of its respective needle holder 48 or 50 as the needles and needle holders are caused to shift with respect to the resilient wheels 68 and 74. The thread 160 or 170 from the remaining "to-be-inactive" needle 44 or 46 is secured as it passes between its respective resilient wheel 68 or 74 and its respective needle holder 48 or 50. The wiper fingers 202 and 204 are then retracted by pressurized fluid entering the cylinder 206 through the conduit 232, and the end of the thread, which has been cut by known means, in the now inactive needle is pulled out of the workpiece due to its being caught by its respective returning finger 202 or 204. This return motion of the retracting finger does not pull the thread from the inactive needle because the respective resilient wheel 68 or 74 holds (pinches) the thread against its respective needle holder 48 or 50, and because each wiper finger 202 and 204 passes by its respective needle 44 or 46 on the side opposite from which the thread enters from above, to keep the inactive needle threaded.

The retracted wiped position of finger 202 is shown in Figure 11 by the dashed lines indicated at "B", the thread 160 being shown wiped or pinched against its respective wiper plate 222, in this case.

In a modified form, the fingers 202 and 204, may have slightly different configurations, and they may be actuated independently by independent means such as a pair or pressurizable cylinders or the like.

Claims

1. Automatic sewing machine comprising

two needle holders (48, 50) each for supporting a needle (44, 46),

a needle drive bar (86),

indexing means (58) for shuttling the needle holders (48, 50) relative to the needle drive bar (86) whereby each of said holders (48; 50) can be moved between an active position, in which it is aligned with the needle drive bar (86), and an inactive position, out of such alignment,

thread take-up means (120) arranged "upstream" of the needle holders (48, 50) along the thread (160, 170) supplied to the needle (44, 46), and

thread control means (66, 72, (200), 126) for controlling the thread (160, 170) supplied to the needles (44; 46), whereby to ensure that the thread (160; 170) supplied to the needle (44; 46) supported by the holder (48; 50) in the inactive position does not interfere with the thread (170; 160) supplied to the needle (46, 44) supported by holder (50; 48) in the active position,

characterised in that two thread control means (66, 72 (200), 126) are provided, one associated with each needle holder (48, 50), each such means comprising

a thread nipping device (66) which is arranged at the inactive position of its associated needle holder (48; 50) and which co-operates with said holder (48; 50), when the latter is moved to its inactive position, to clamp the thread (160; 170) against the holder (48; 50) to secure it against being pulled out of the eye of the needle (44; 46),

a thread end removal device (72; 200), which is also arranged at said inactive position and which draws the thread end extending beyond the thread nipping device (66) to an out-of-the-way position, and

thread pull-back means (126) which is arranged "upstream" of the thread take-up means (120) along the thread supplied to the needle (44; 46) and which comprises

a movable guide element (136, 138) and

actuating means (128; 130) for moving the guide element (136, 138) between a first position, in which it is adjacent the thread take-up means (120) and in which it is disposed when its associated needle holder (48; 50) is in its active position, and a second position, in which it is spaced from the thread take-up means (120) and in which it is disposed when its associated needle holder (48; 50) is in its inactive position.

2. Machine according to Claim 1 characterised in that the needle holders (48, 50) are supported for transverse sliding movement in a support (36) and in that the thread nipping device (66) of each thread control means (66, 72 (200), 126) comprises a clamp element (68; 74) also carried on said support (36).

3. Machine according to Claim 2 characterised in that the clamp element (68; 74) comprises a wheel (68; 74) co-operative with a clamping surface (49) of its associated needle holder (48; 50).

4. Machine according to any one of the preceding Claims characterised in that actuation of the indexing means (58) is prevented except when the needle holders (48, 50) are in heightwise alignment with one another.

5. Machine according to Claim 4 characterised in that locating means (184, 190) is provided for locating each needle holder (48; 50) in its active position and holding it therein.

6. Machine according to Claim 5 characterised in that further means (184, 186) is provided for locating each needle holder (48; 50) in its active position and holding it therein.

7. Machine according to any one of Claims 4 to 6 when tied to either one of Claims 2 and 3 characterised in that the thread end removal device (72; 200) of each thread control means (66, 72 (200), 126) comprises a vacuum tube (78) which is mounted on said support (36) for the needle holders (48, 50) and which opens adjacent the eye of the needle supported by the needle holder (48; 50) in its inactive position against the direction of feed of the thread (160; 170) through the eye.

8. Machine according to any one of Claims 4 to 6 when tied to either one of Claims 2 and 3 characterised in that the thread end removal device (72; 200) of each thread control means (66, 72 (200), 126) comprises a thread-wiping finger (202; 204), which is movable from a first, thread-engaging, position adjacent the eye of the needle supported by the needle holder (48; 50) in its inactive position and a second, retracted position, and a co-operating plate (222; 224) against which the finger (202; 204) holds the end of the thread (160; 170) as it moves away from its first position.

9. Machine according to any one of the preceding Claims characterised in that adjustment means (194) is provided for regulating the first position of the guide element (136, 138) of the thread pull-back means (126).

Patentansprüche

1. Automatische Nähmaschine mit zwei Nadelhaltern (48, 50) zur Aufnahme jeweils einer Nadel (44, 46), einer Nadelantriebsstange (86), einer Schrittschalteinrichtung (58), um die Nadelhalter (48, 50) relativ zur Nadelantriebsstange (86) hin- und herzubewegen, wobei jeder der Nadelhalter (48; 50) zwischen einer aktiven Stellung, in welcher er mit der Nadelantriebsstange (86) ausgerichtet ist, und einer inaktiven Stellung bewegbar ist, in welcher er mit ihr nicht ausgerichtet ist, mit einer Fadenaufnahmeeinrichtung (120), die laufaufwärts der Nadelhalter (48, 50) entlang des den Nadeln (44, 46) zugeführten Fadens (160, 170) angeordnet ist, und mit einer Fadensteuereinrichtung (66, 72 (200), 126) zur Steuerung des den Nadeln (44, 46) zugeführten Fadens (160, 170), um zu gewährleisten, daß der Faden, welcher der vom Nadelhalter (48; 50) getragenen Nadel (44; 46) zugeführt ist, in der inaktiven Stellung den Faden (170; 160) nicht stört, welcher der vom Halter (50; 48) getragenen Nadel (46; 44) in dessen aktiver Stellung zugeführt wird, dadurch gekennzeichnet, daß zwei Fadensteuereinrichtungen (66, 72 (200), 126) vorgesehen sind, die je einem Nadelhalter (48, 50) zugeordnet sind, daß jede dieser Steuereinrichtungen eine Fadenfestspannvorrichtung (66) umfaßt, welche in der inaktiven Stellung des zugehörigen Nadelhalters (48; 50) angeordnet ist und mit diesem zusammenwirkt, wenn letzterer in seine inaktive Stellung bewegt ist, um den Faden (160; 170) gegen den Halter (48; 50) festzuspannen und ihn so gegen ein Herausziehen aus dem Öhr der Nadel (44; 46) zu sichern, daß eine Wegzieheinrichtung (72; 200) vorgesehen ist, die ebenfalls in der inaktiven Stellung angeordnet ist und das über die Festspannvorrichtung (66) hinausstehende Fadenende aus dem Weg zieht, daß eine Rückzieheinrichtung (126) angeordnet ist, die laufaufwärts der Fadenaufnahmeeinrichtung (120) entlang des der Nadel (44; 46) zugeführten Fadens angeordnet ist und ein bewegbares Führungselement (136, 138) und eine Betätigungseinrichtung (128; 130) aufweist, um das Führungselement (136, 138) zwischen einer ersten Stellung, in welcher es nahe der Fadenaufnahmeeinrichtung (120) liegt und in welcher es sich befindet, wenn der zugehörige Nadelhalter (48; 50) sich in seiner aktiven Stellung befindet, und einer zweiten Stellung zu bewegen, in welcher es von der Fadenaufnahmeeinrichtung (120) beabstandet ist und in welcher es sich befindet, wenn der zugehörige Nadelhalter (48; 50) seine inaktive Stellung einnimmt.

2. Maschine nach Anspruch 1, dadurch gekennzeichnet, daß die Nadelhalter (48, 50) in einem Halter (36) gleitend querverschiebbar gelagert sind und daß die Fadenfestspannvorrichtung (66) jeder Fadensteuereinrichtung (66, 72 (200), 126) ein Klemmelement (68; 74) aufweist, das ebenfalls an dem Halter (36) getragen ist.

3. Maschine nach Anspruch 2, dadurch gekennzeichnet, daß das Klemmelement (68; 74) ein Rad (68; 74) aufweist, das mit einer Klemmfläche (49) des zugeordneten Nadelhalters (48; 50) zusammenwirkt.

4. Maschine nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Schrittschalteinrichtung (58) gesperrt wird, wenn nicht die Nadelhalter (48, 50) auf gleicher Höhe miteinander ausgerichtet sind.

5. Maschine nach Anspruch 4, dadurch gekennzeichnet, daß eine Einrichtung (184, 190) vorgesehen ist, die jeden Nadelhalter (48; 50) in seine inaktive Stellung bringt und ihn dort festhält.

6. Maschine nach Anspruch 5, dadurch gekennzeichnet, daß eine weitere Einrichtung (184, 186) vorgesehen ist, die jeden Nadelhalter (48; 50) in seine aktive Stellung bringt und ihn dort festhält.

7. Maschine nach einem der Ansprüche 4 bis 6 in Verbindung mit einem der Ansprüche 2 und 3, dadurch gekennzeichnet, daß die Einrichtung (72; 200) zum Wegziehen der Fadenenden in jeder Fadensteuereinrichtung (66, 72 (200), 126) ein an dem Halter (37) für die Nadelhalter (48, 50) angebrachtes Saugrohr (78) aufweist, das sich nahe dem Öhr der vom Nadelhalter (48; 50) getragenen Nadel in dessen inaktiver Stellung entgegen die Zuführrichtung des Fadens (160; 170) durch das Öhr mündet.

8. Maschine nach einem der Ansprüche 4 bis 6 in Verbindung mit einem der Ansprüche 2 und 3, dadurch gekennzeichnet, daß die Vorrichtung zum Entfernen des Fadenendes (72; 200) jeder Fadensteuereinrichtung (66, 72 (200), 126) einen Fadenwischfinger (202; 204) aufweist, der aus einer ersten Lage nahe dem Öhr der vom Nadelhalter (48; 50) getragenen Nadel in seiner inaktiven Stellung, in welcher der Wischfinger am Faden angreift, in eine zweite zurückgezogene Lage bewegbar ist, und daß eine mit diesem zusammenwirkende Platte (222, 224) vorgesehen ist, gegen welche der Finger (202, 204) das Ende des Fadens (160; 170) beim Verlassen der ersten Lage festhält.

9. Maschine nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Einstelleinrichtung (194) vorgesehen ist, um die erste Lage des Führungselements (136, 138) der Fadenwegzieheinrichtung (126) einzustellen.

Revendications

1. Machine à coudre automatique comprenant deux porte-aiguilles (48, 50) portant chacun une aiguille (45, 46), une barre à aiguille (86), des moyens d'avance (58) servant à imprimer un mouvement alternatif aux porte-aiguilles (48, 50) par rapport à la barre d'entraînement des aiguilles (86), grâce à quoi chacun des porte-aiguilles (48, 50) peut être déplacé entre une position active, dans laquelle il est aligné avec la barre (86) d'entraînement des aiguilles, et une position inactive, écartée de cet alignement, des moyens de relevage du fil (120) disposés en "amont" des porte-aiguilles (48, 50), le long du fil (160, 170) amené aux aiguilles (44, 46), et des moyens régulateur du fil (66, 72 (200), 126) destinés à réguler le fil (160, 170) fourni aux aiguilles (44, 46) pour faire en sorte que le fil (160, 170) fournit à l'aiguille (44, 46) portée par le porte-aiguille (48, 50) placé dans la position inactive n'interfère pas avec le fil (170, 160) fourni à l'aiguille (46, 44) portée par le porte-aiguille (58, 40) placé dans la position active, caractérisée en ce qu'il est prévu deux moyens régulateurs de fil (66, 72 (200), 126), un associé à chacun des porte-aiguille (48, 50), chacun de ces moyens comprenant: un dispositif pince-fil (66) qui est disposé à la position inactive de son porte-aiguille associé (48, 50) et qui coopère avec ce porte-aiguille (48, 50), lorsque ce dernier est amené à sa position inactive, pour serrer le fil (160, 170) contre le porte-aiguille (48, 50) et le fixer de façon qu'il ne soit pas extrait du chas de l'aiguille (44, 46), un dispositif d'évacuation de l'extrémité de fil (72, 200), qui est également monté à la position inactive et qui tire l'extrémité du fil s'étendant au-delà du dispositif pince-fil (66) jusqu'à une position à l'écart, et, des moyens de recul du fil (126) qui sont disposés "en amont" des moyens de relevage du fil (120) le long du fil fourni à l'aiguille (44, 46) et qui comprennent un organe de guidage mobile (136, 138) et des moyens d'actionnement (128, 130) pour déplacer l'organe de guidage du fil (136, 138) entre une première position, dans laquelle il est adjacent aux moyens de relevage du fil (120) et dans laquelle il est disposé lorsque le porte-aiguille associé (48, 50) se trouve dans sa position active, et une deuxième position, dans laquelle il est espacé des moyens de relevage du fil (120) et dans laquelle il est disposé lorsque le porte-aiguille associé (48, 50) se trouve dans sa position inactive.

2. Machine selon la revendication 1, caractérisé en ce que les porte-aiguilles (48, 50) sont supportés pour décrire un mouvement de coulissement transversal dans un support (36) et en ce que le dispositif pince-fil (66) de chacun des moyens régulateurs de fil (66, 72 (200), 126) comprend un organe de serrage (68, 74) également porté par le support (36).

3. Machine selon la revendication 2, caractérisée en ce que l'organe de serrage (68, 74) comprend une roue (68, 74) qui coopère avec une surface de serrage (49) appartenant au porte-aiguille (48, 50) associé.

4. Machine selon l'une des revendications précédentes, caractérisée en ce que l'actionnement des moyens d'avance (58) est empêché sauf lorsque les porte-aiguilles (48, 50) sont alignés en hauteur l'un sur l'autre.

5. Machine selon la revendication 4, caractérisée en ce que des moyens de positionnement (184, 190) sont prévus pour placer chaque porte-aiguille (48, 50) dans sa position inactive et l'y maintenir.

6. Machine selon la revendication 5, caractérisée en ce que d'autres moyens (184, 186) sont prévus pour positionner chaque porte-aiguille (48, 50) dans sa position active et l'y maintenir.

7. Machine selon l'une des revendications 4 à 6, lorsqu'elle est rattachée à l'une des revendications 2 et 3, caractérisée en ce que le dispositif d'évacuation de l'extrémité de fil (72, 200) de chaque moyen régulateur de fil (66, 72 (200), 126) comprend un tube à vide (78) qui est monté sur le support (36) des porte-aiguilles (48, 50) et qui débouche à proximité du chas de l'aiguille supportée par le porte-aiguille (48, 50) en position inactive, en sens inverse de la direction d'introduction du fil (160, 170) dans le chas.

8. Machine selon l'une des revendications 4 à 6, lorsqu'elle est rattachée à l'une des revendications 2 et 3, caractérisée en ce que le dispositif d'évacuation de l'extrémité de fil (72, 200) de chaque moyen régulateur de fil (66, 72 (200), 126) comprend un doigt frotteur de fil (202, 204) qui peut se déplacer entre une première position d'attaque du fil, adjacente au chas de l'aiguille portée par le porte-aiguille (48, 50) en position inactive, et une deuxième position rétractée, et une plaque coopérante (222, 224) contre laquelle le doigt (202, 204) maintient l'extrémité du fil (160, 170) lorsqu'il s'éloigne de sa première position.

9. Machine selon l'une des revendications précédentes, caractérisée en ce que des moyens de réglage (194) sont prévus pour régler la première position de l'organe de guidage (136, 138) des moyens de recul du fil (126).

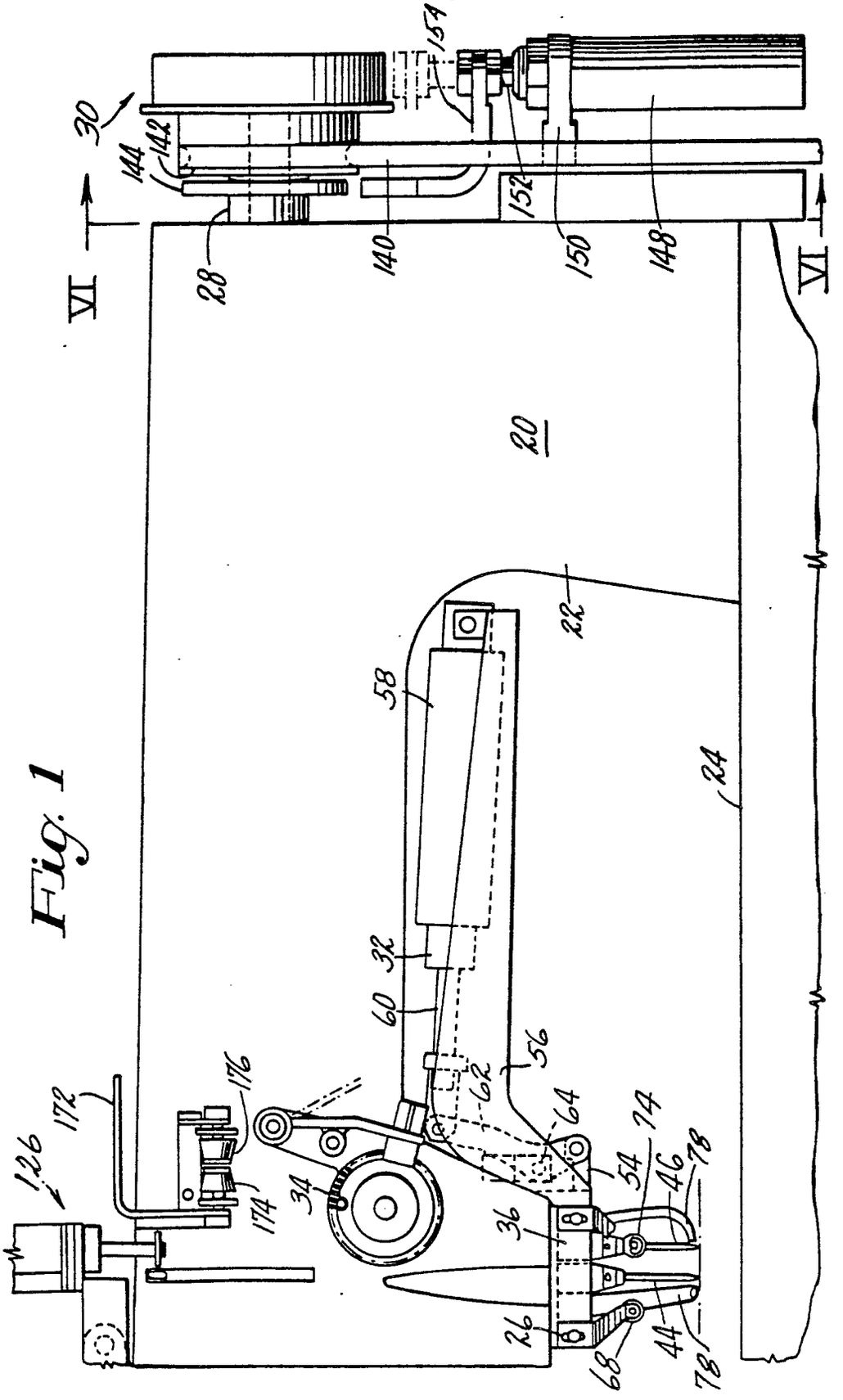
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Fig. 1

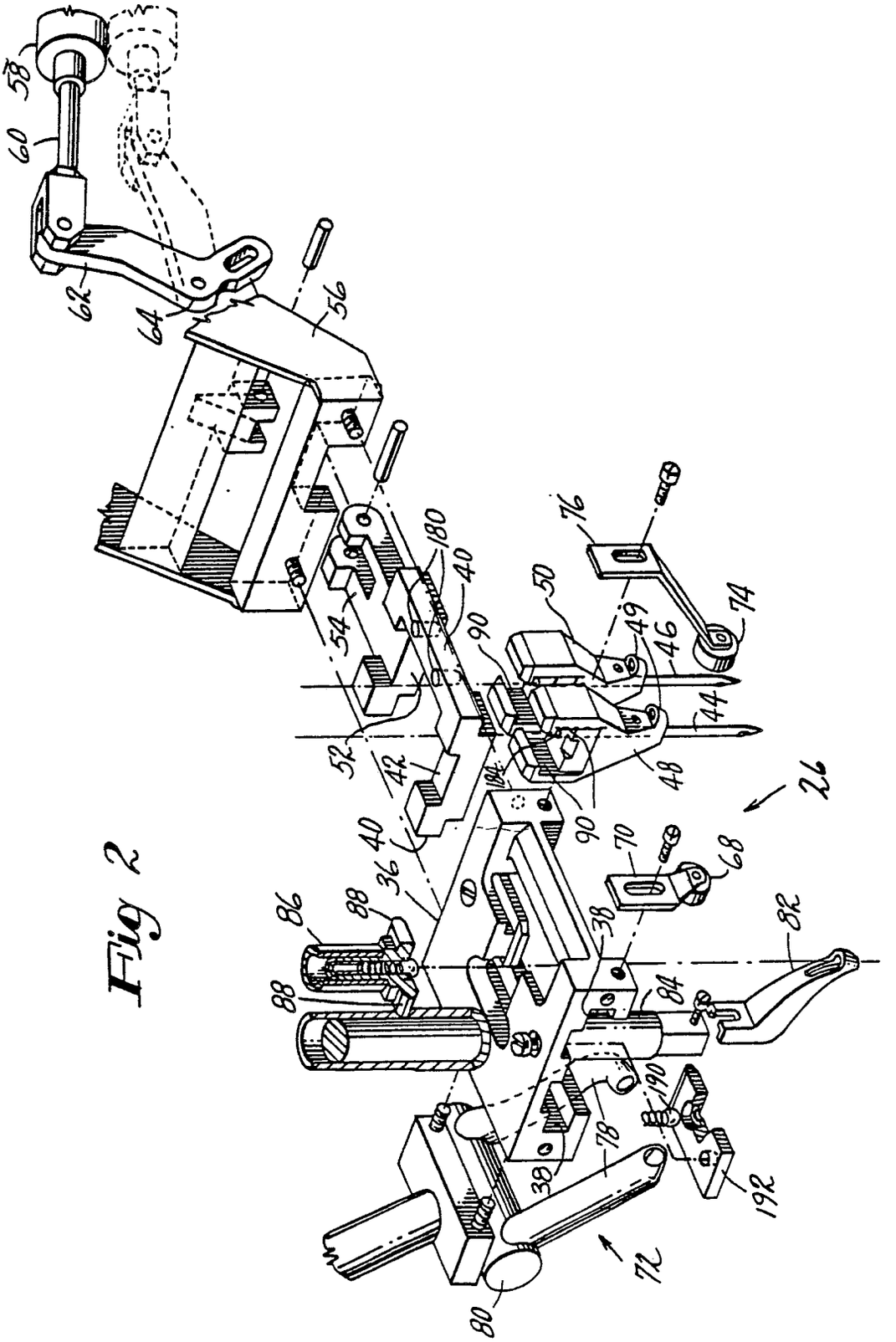
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Fig 2

Fig. 3

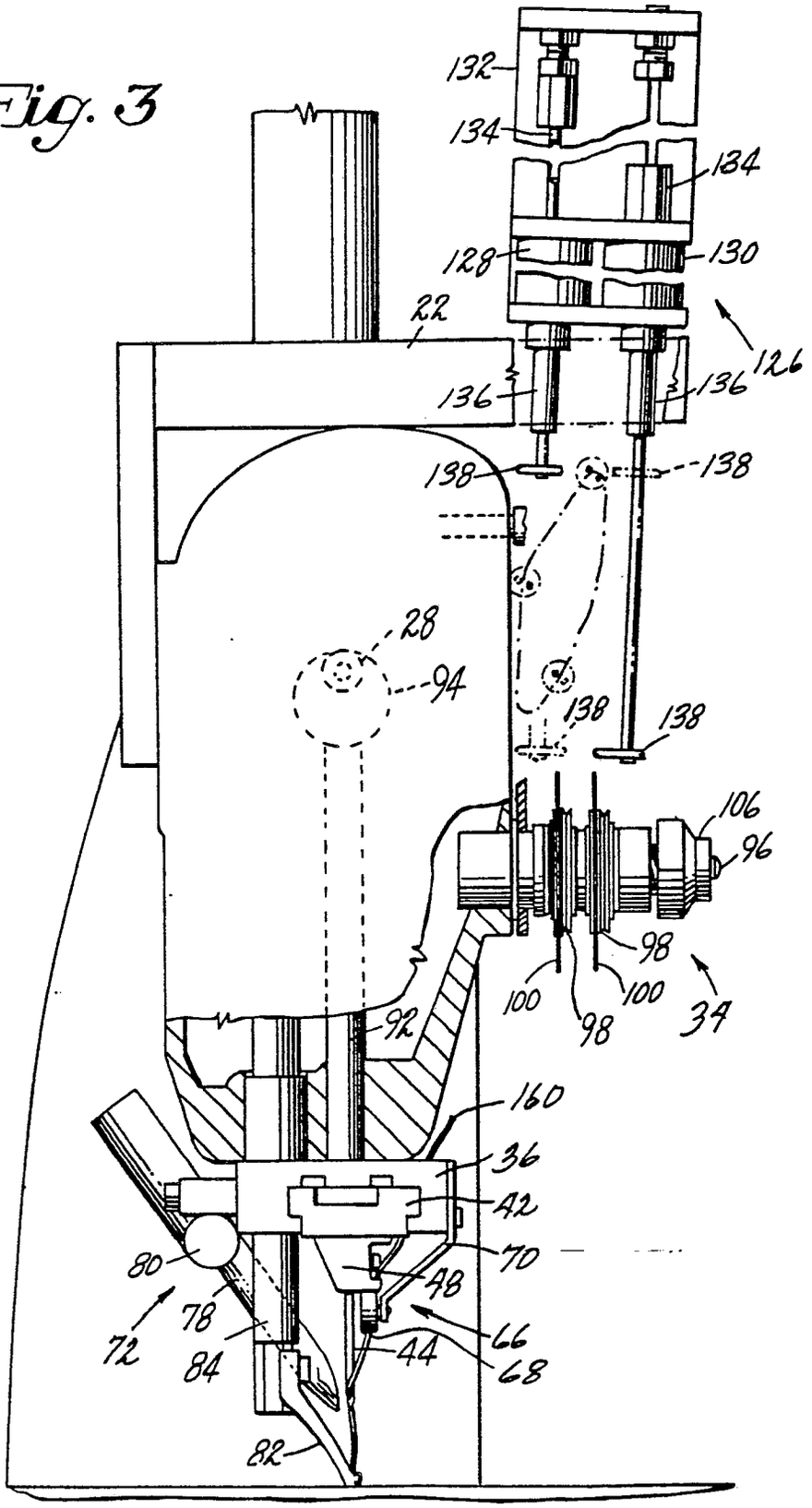
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Fig. 4

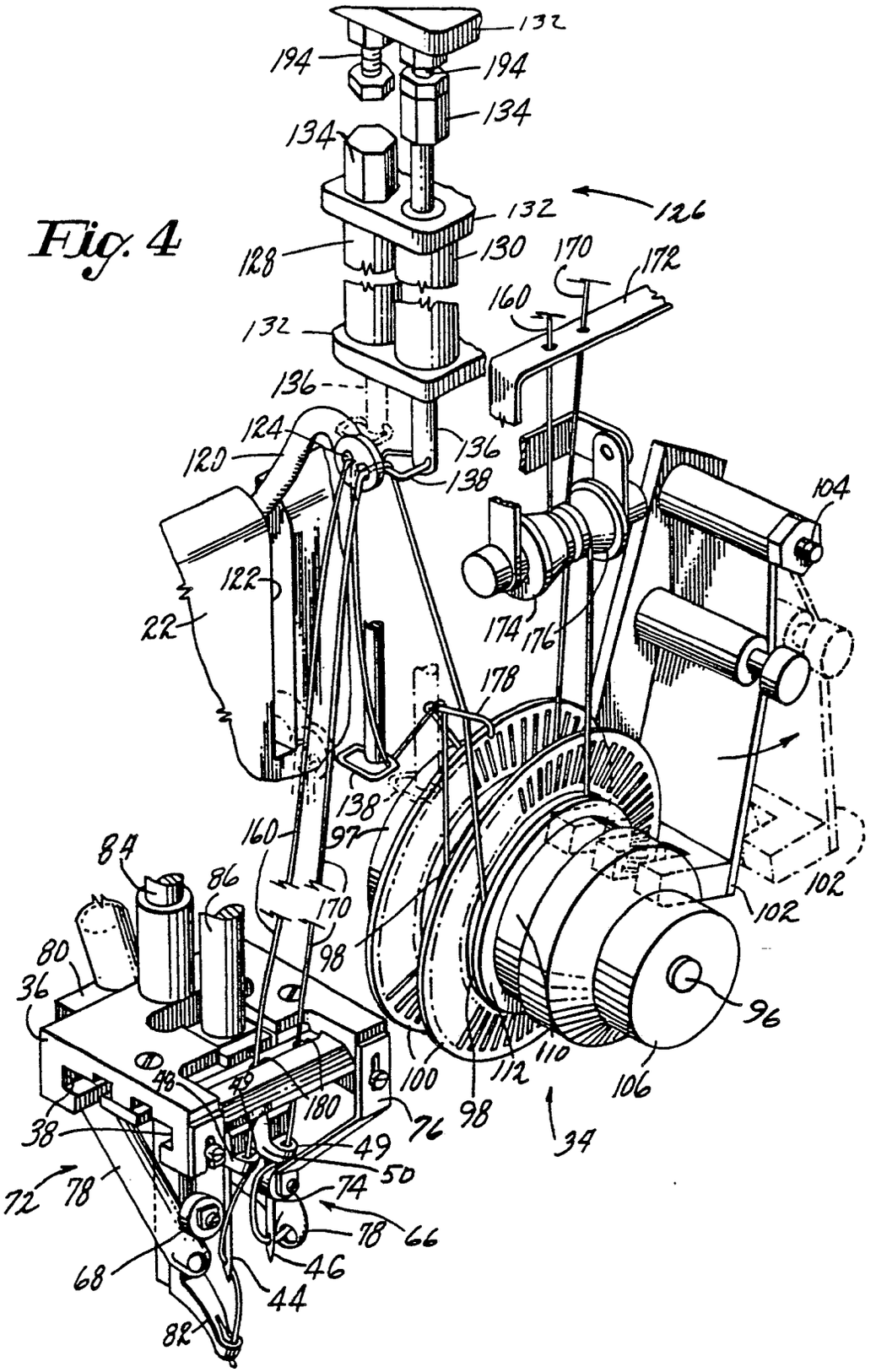
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Fig. 5

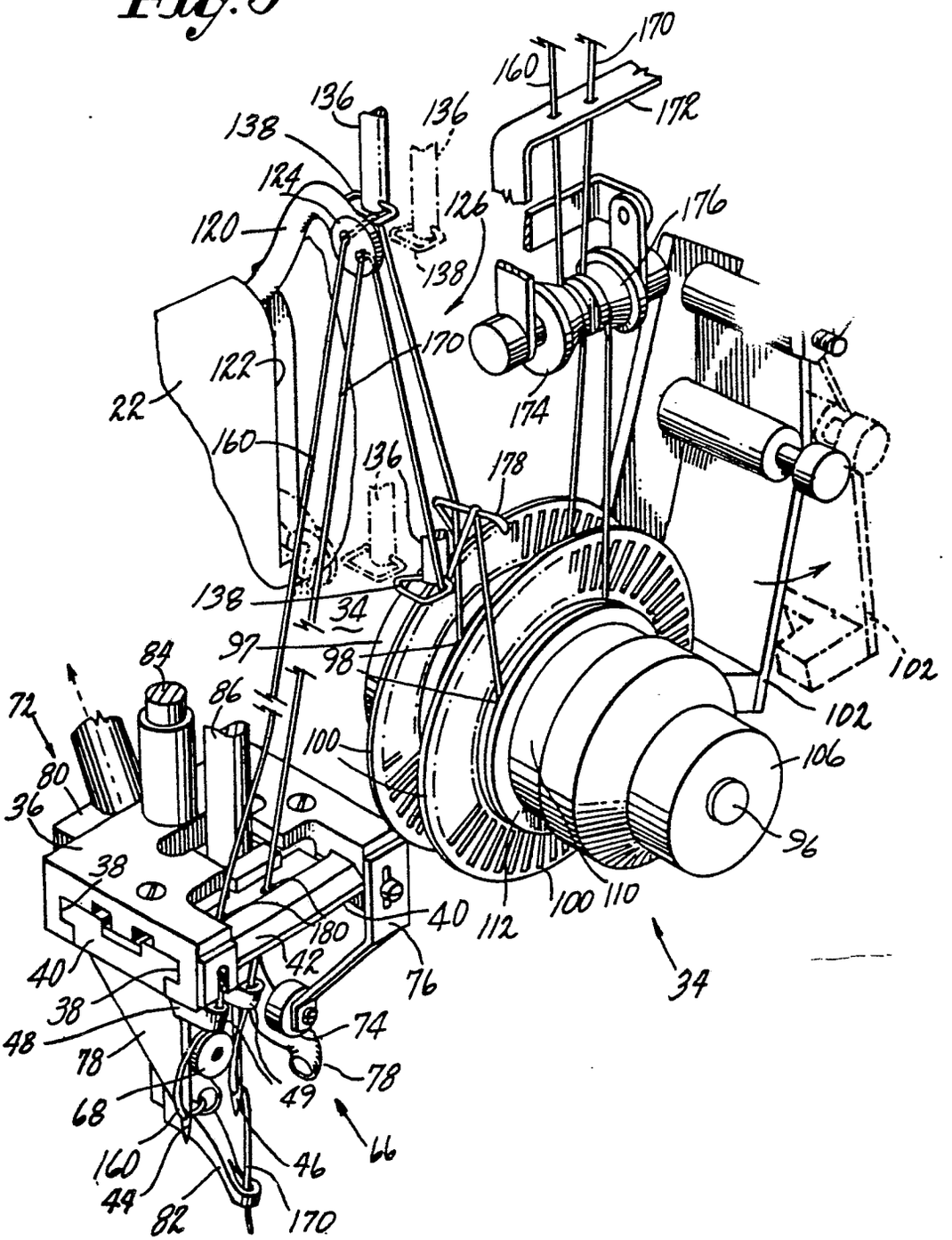
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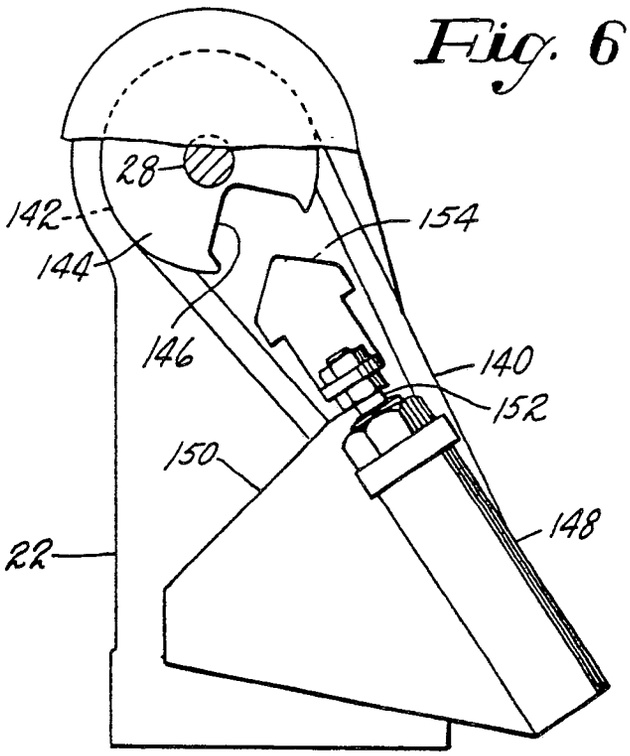
Fig. 6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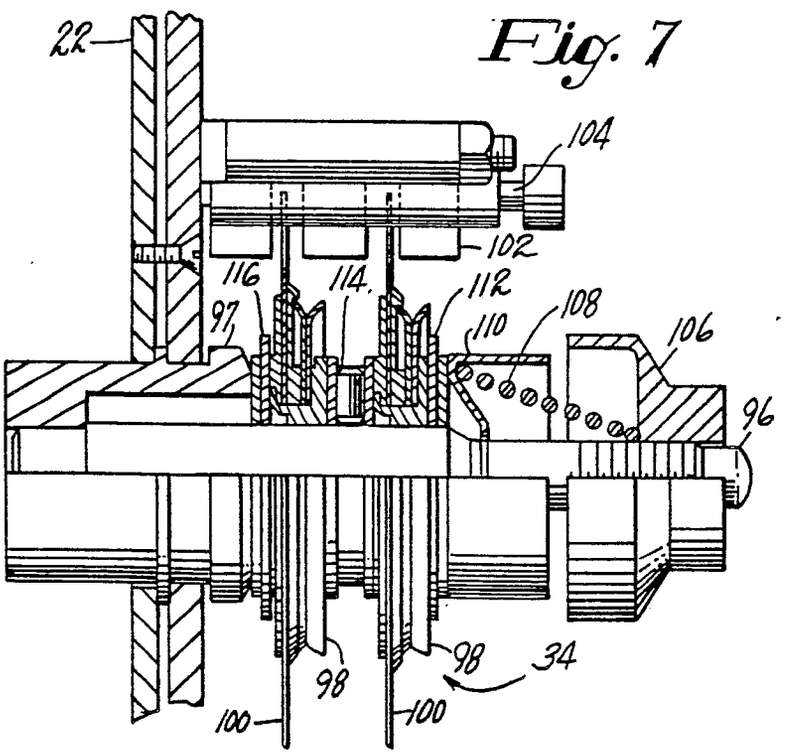
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Fig. 8

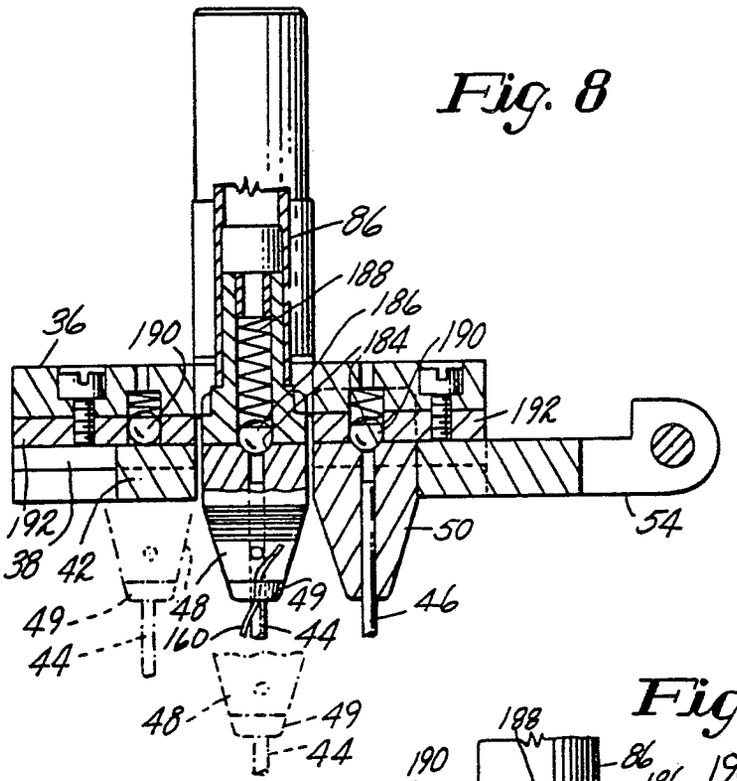
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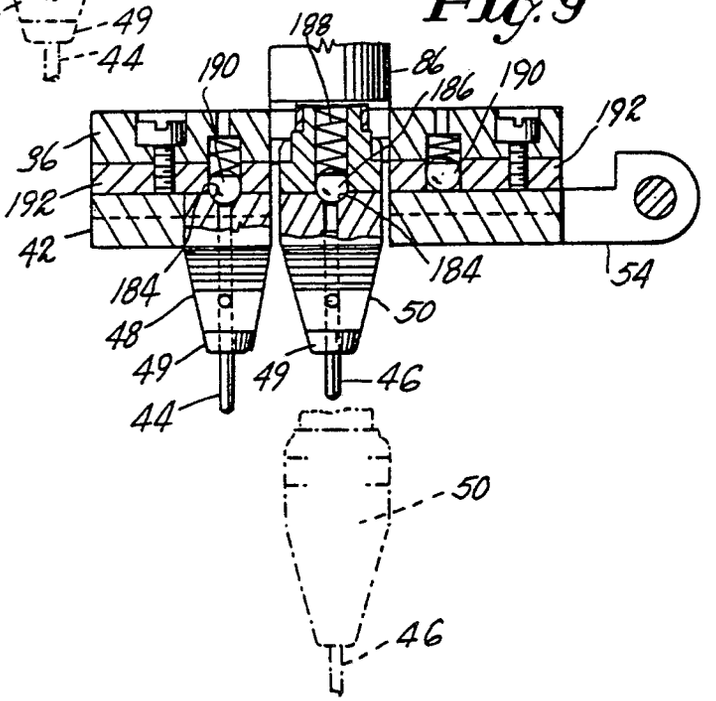
Fig. 9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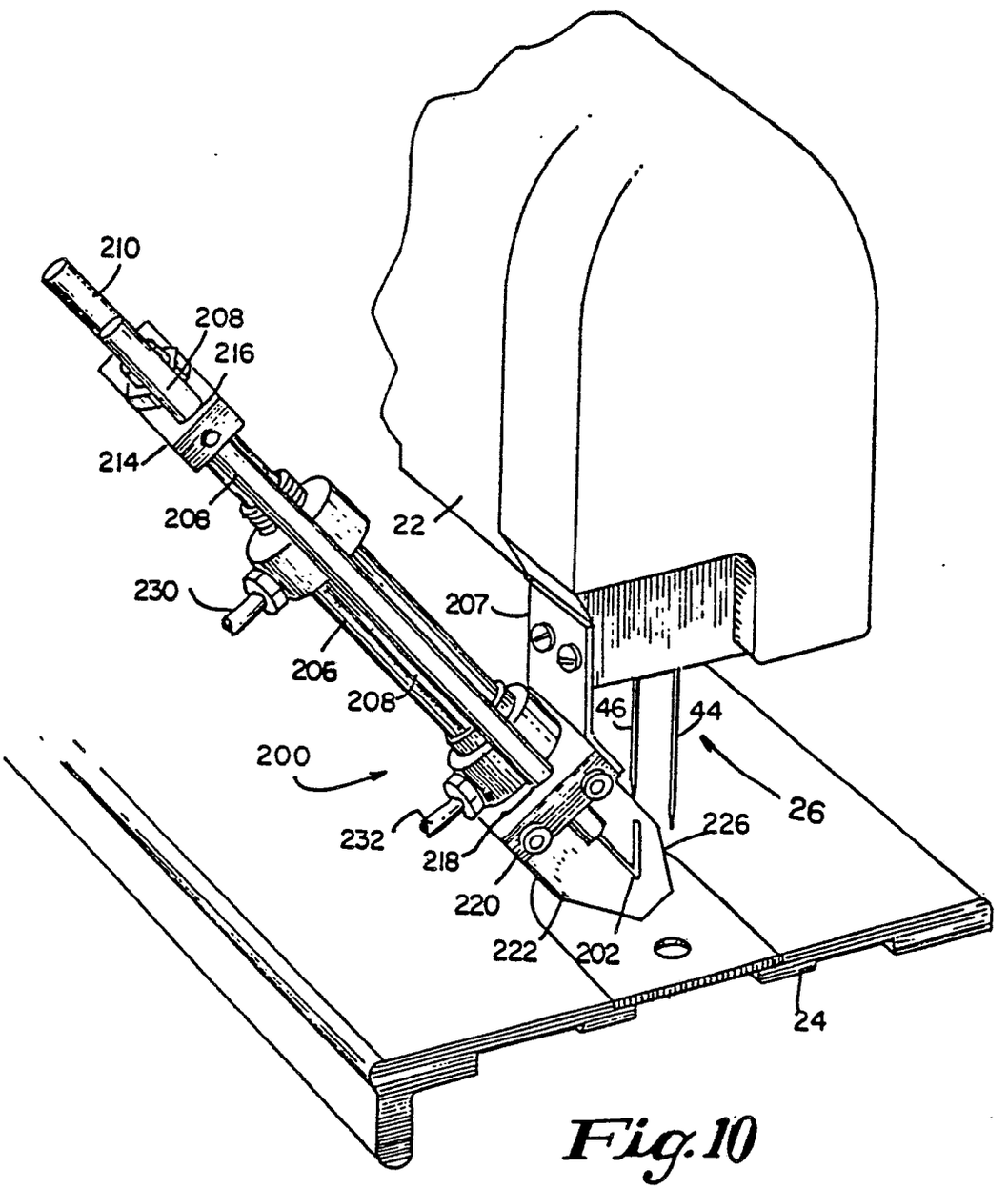
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Fig. 10

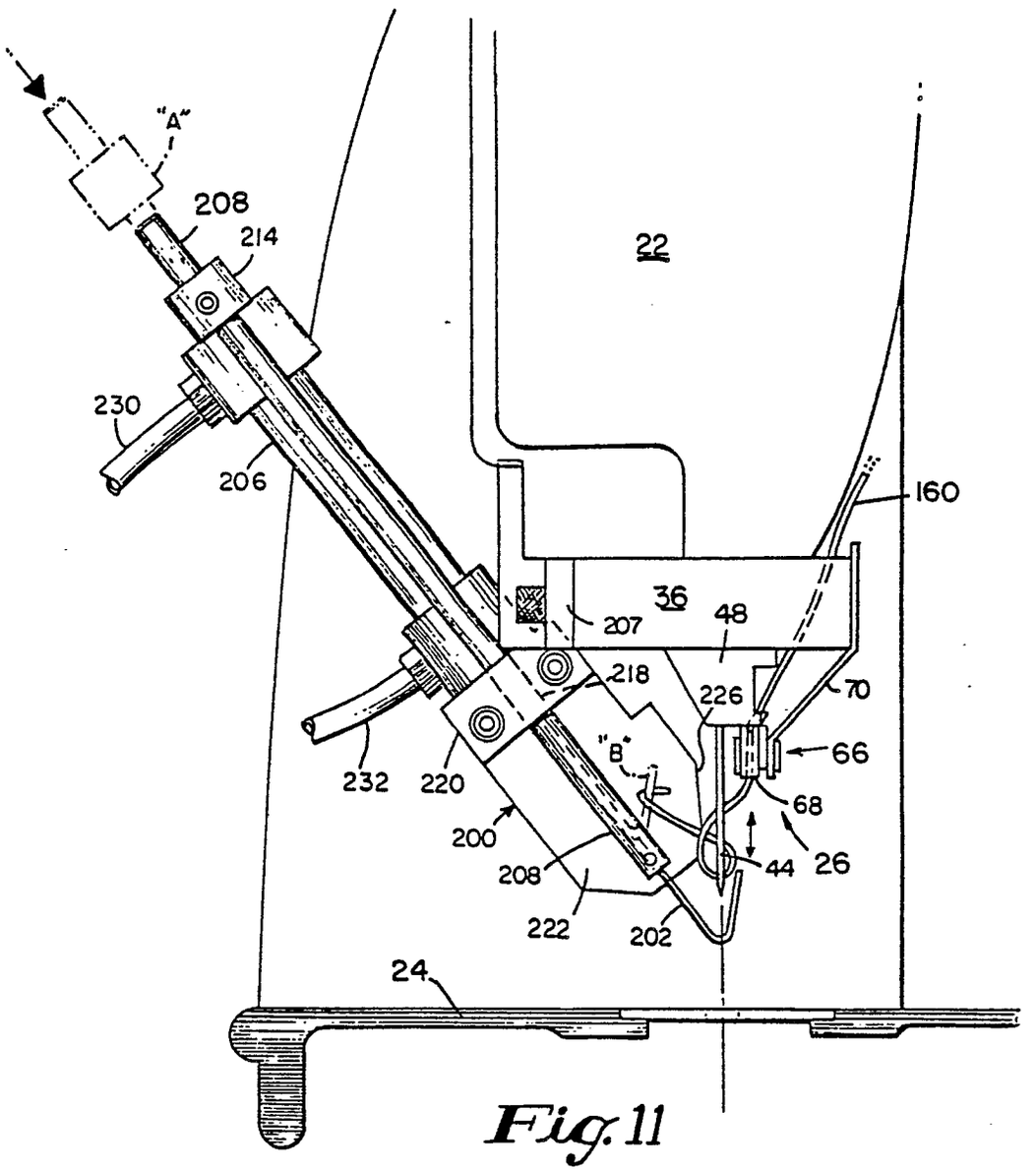
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Fig. 11

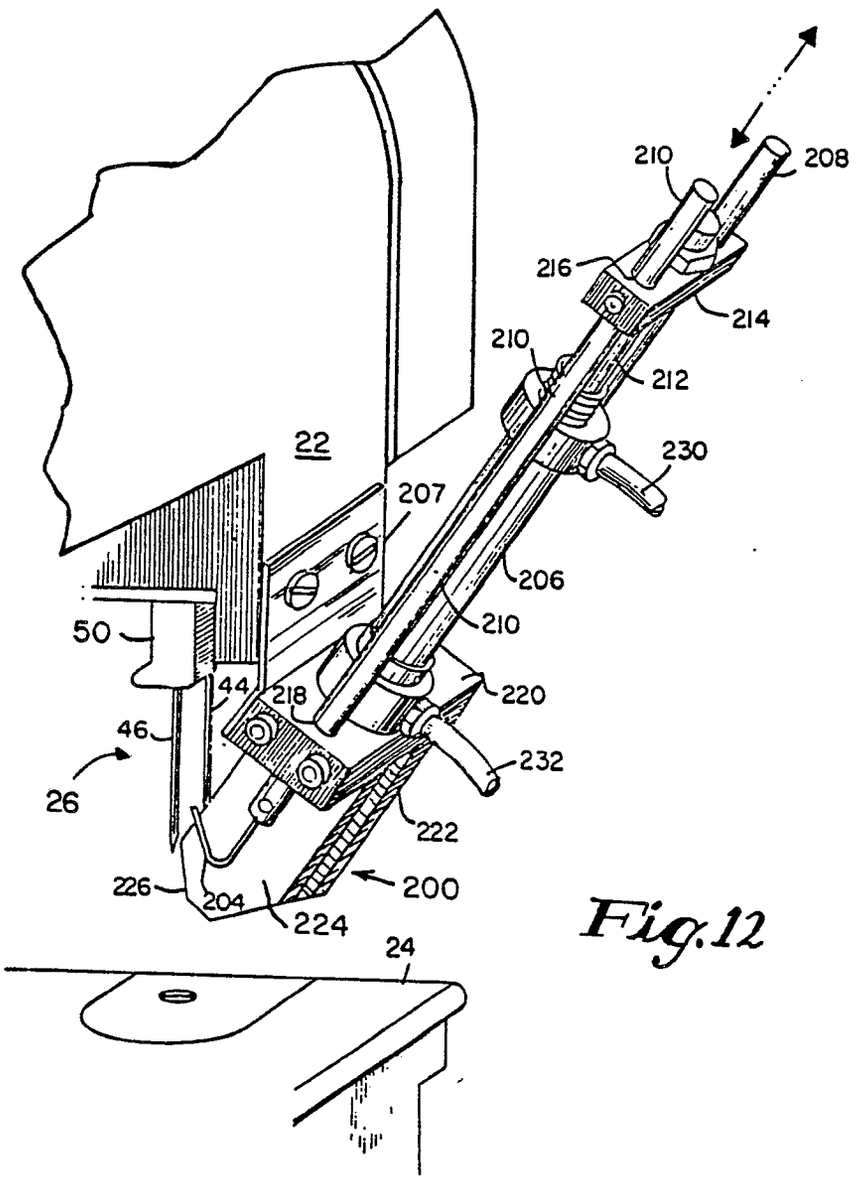
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Fig.12