

[72] Inventor **Ronald M. Kaplan**
Cedar Grove, New Jersey
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 [73] Assignee **The Singer Company**
New York, New York
a corporation of New Jersey

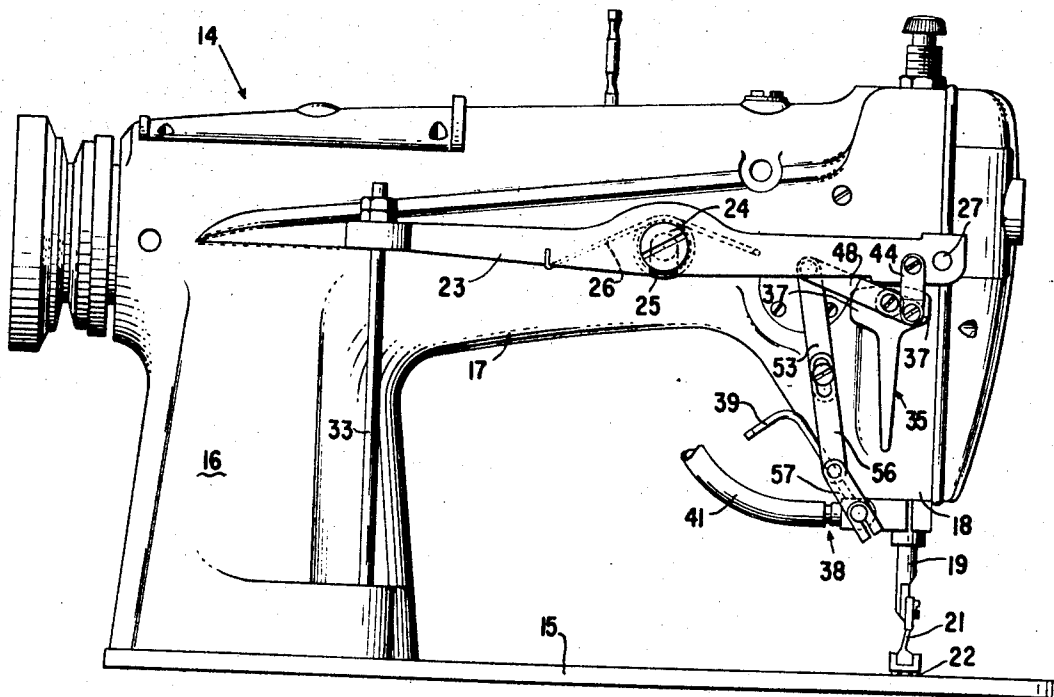
Primary Examiner—Richard J. Scanlan, Jr.
Attorney—Marshall J. Breen, Chester A. Williams, Jr. and E.
 Donald Paris

[54] **VACUUM NEEDLE THREADER AND THREAD
 WIPER MECHANISM**
 14 Claims, 12 Drawing Figs.

[52] U.S. Cl. 112/225
 [51] Int. Cl. D05b 55/02
 [50] Field of Search 112/225;
 223/99; 7/1; 33/99

[56] **References Cited**
UNITED STATES PATENTS
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ABSTRACT: A combination needle threader and thread wiper mechanism for a sewing machine including a thread-end receiving tubular lever pivotally mounted to swing in a vertical plane on the presser bar bushing. The tubular lever is connected pneumatically to a vacuum pump through a series of intermediate conduits and is connected mechanically to the knee-shift presser lifter. When the presser bar is raised by activation of the knee-shift presser lifter or otherwise, with the machine stopped and the needle in its up position, the tubular lever automatically is pivoted so that its free end is aligned with the eye of the needle. The needle then can be threaded by bringing the end of the needle thread near to the eye of the needle, whereupon the end of the thread will be drawn through the eye by vacuum pressure. The mechanism also functions as a thread wiper by holding the end of the needle thread, thereby preventing the thread from remaining under the presser foot, when it is lowered, until the first stitch is formed in a sewing operation.



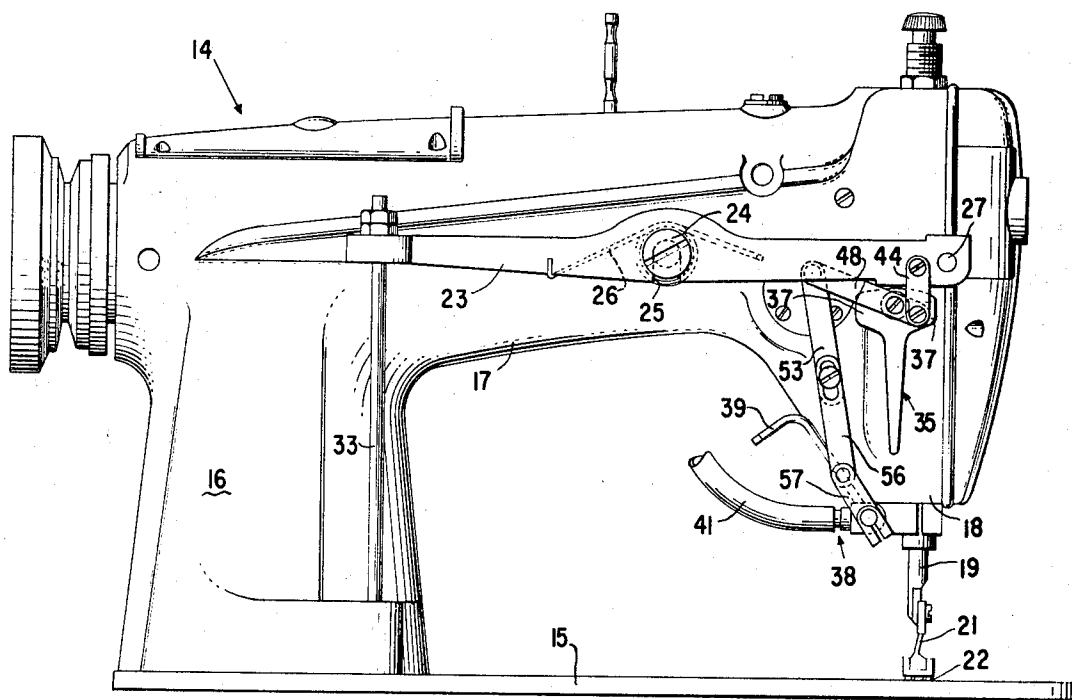


Fig. 1

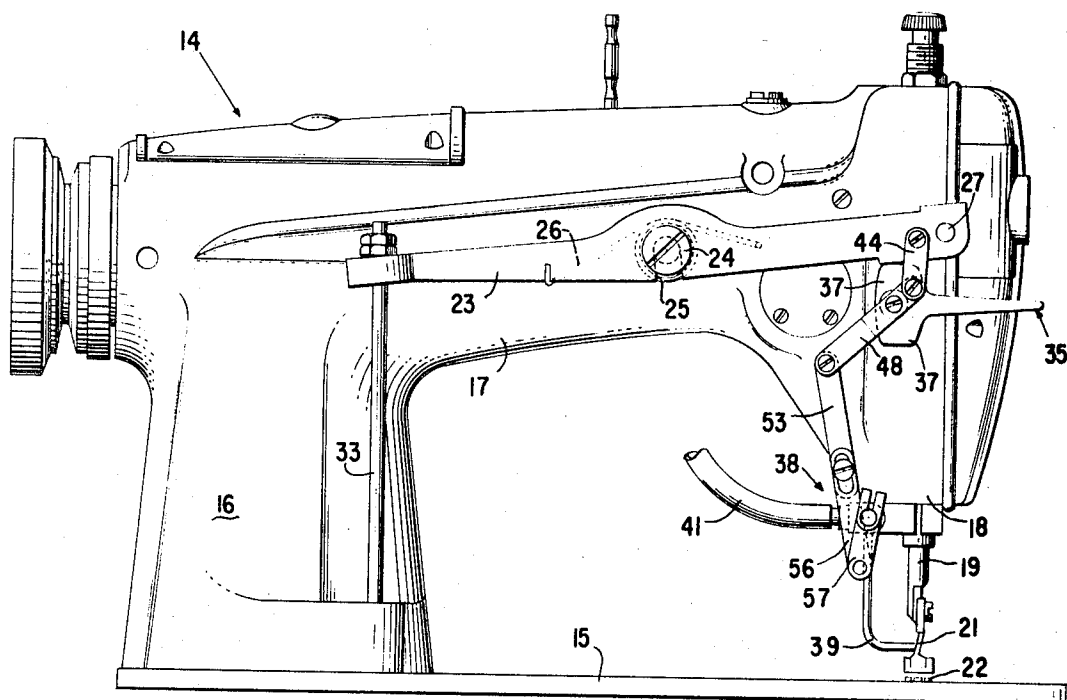
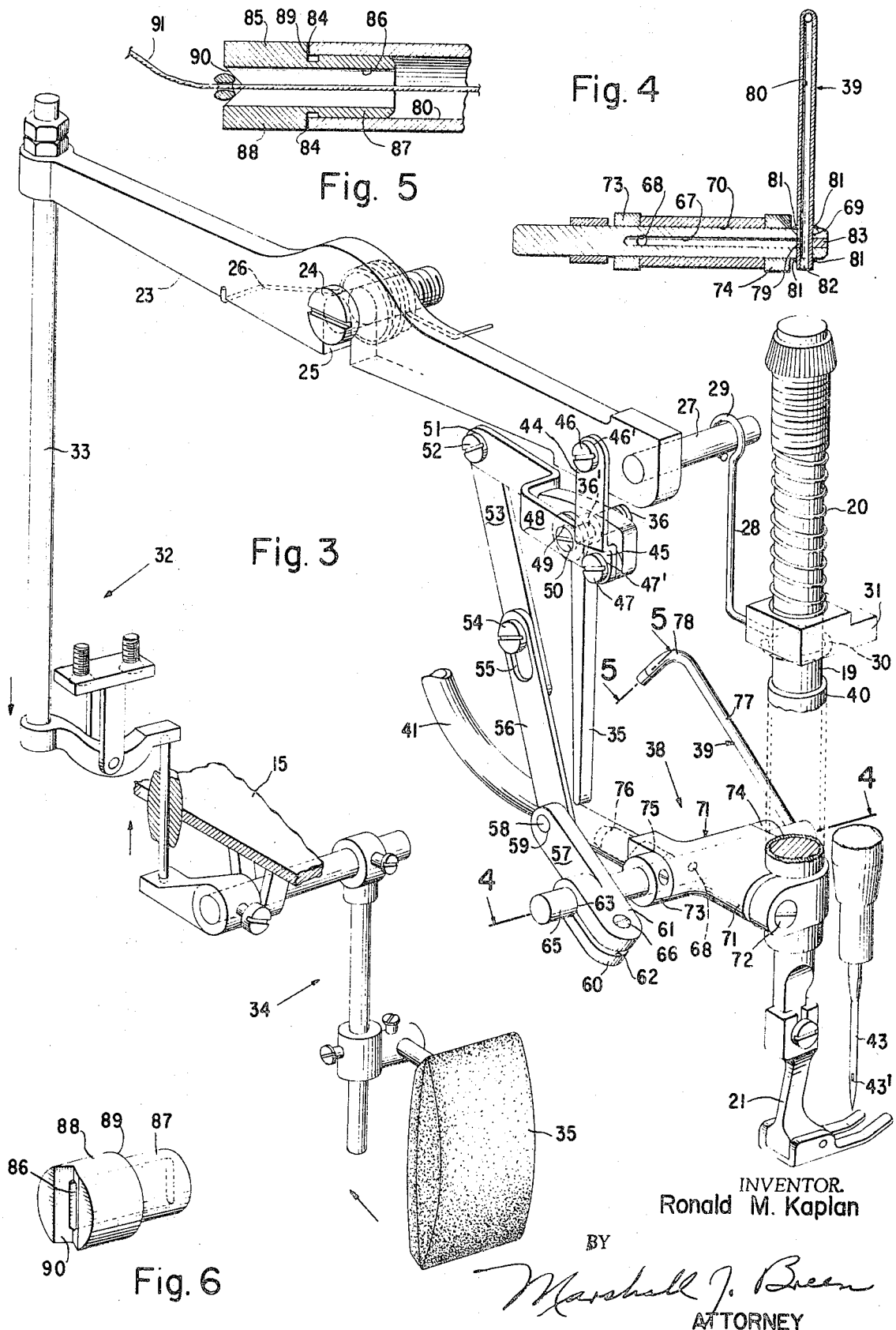


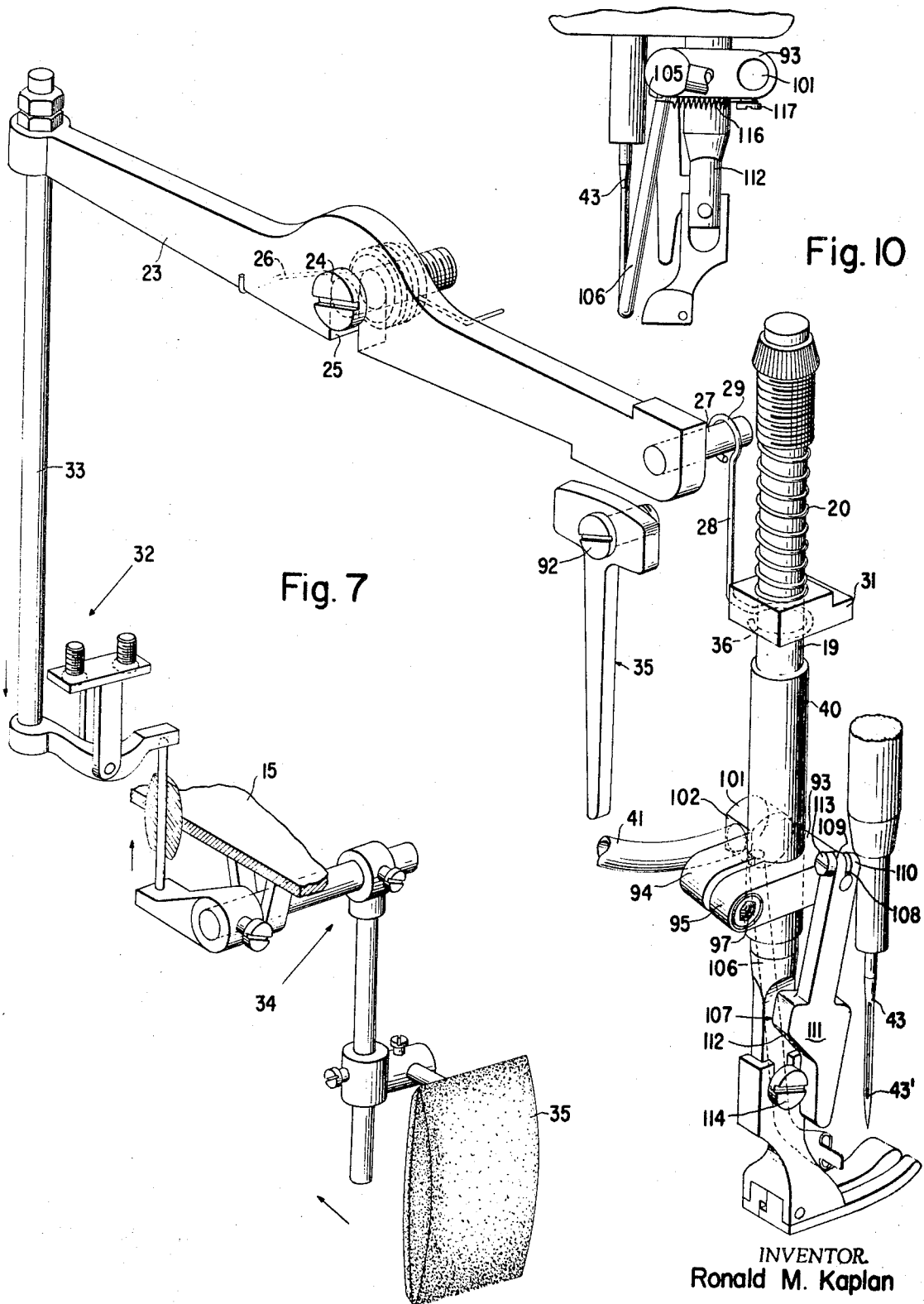
Fig. 2

INVENTOR.
Ronald M. Kaplan

BY

Marshall J. Green
ATTORNEY





INVENTOR.
Ronald M. Kaplan

BY
Marshall J. Beem
ATTORNEY

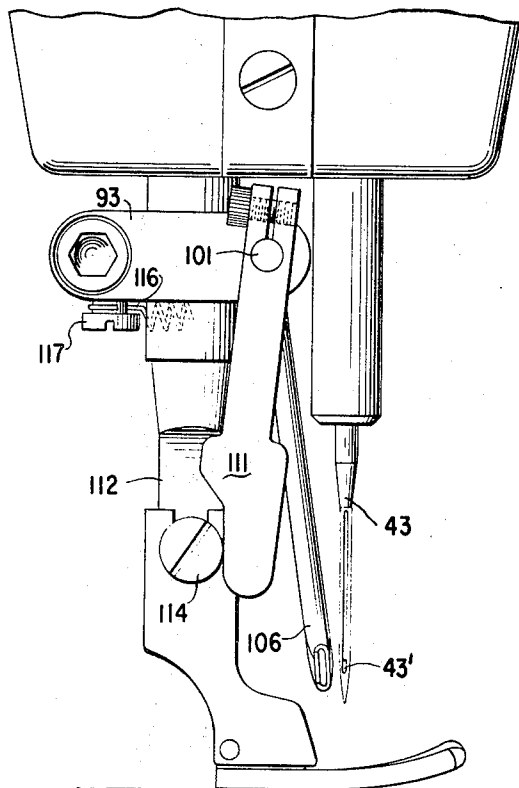


Fig. 8

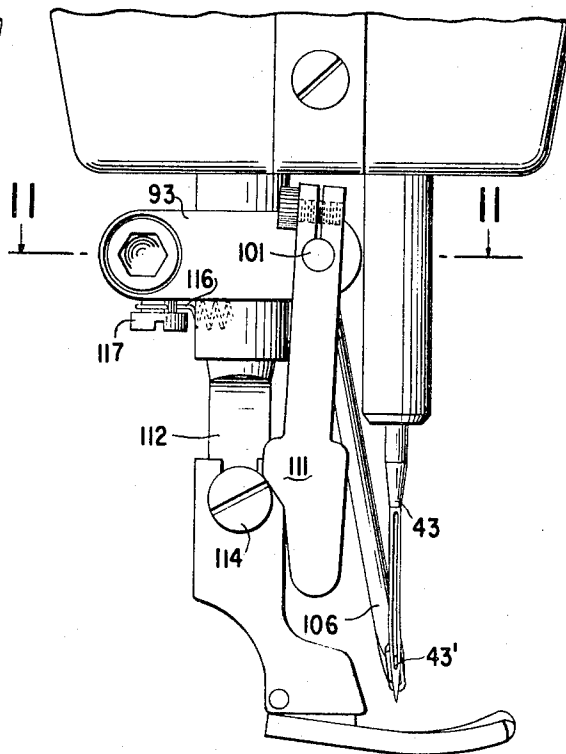


Fig. 9

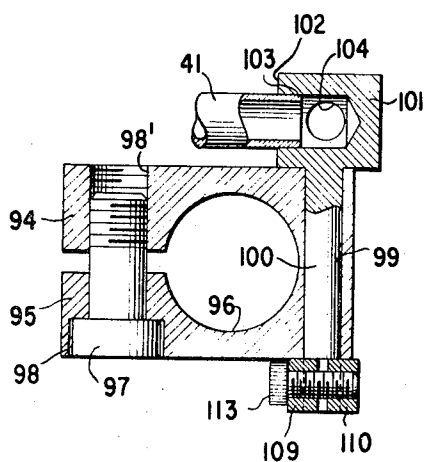


Fig. 11

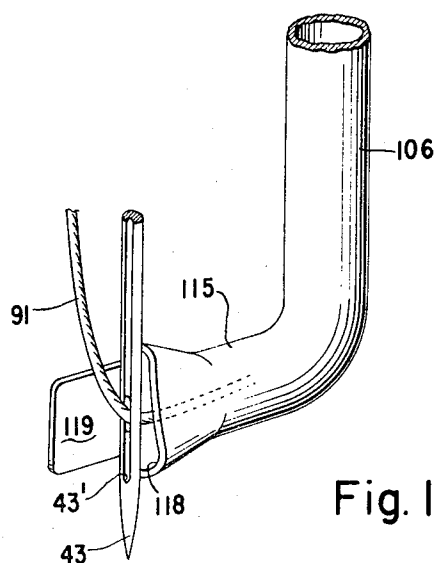


Fig. 12

INVENTOR
Ronald M. Kaplan

BY

Marshall J. Brown
ATTORNEY

VACUUM NEEDLE THREADER AND THREAD WIPER MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to a mechanism for pneumatically threading a needle and also functioning as a thread wiper after the needle has been threaded, and for accomplishing the same in an efficient and desirable manner.

2. Description of the Prior Art

It is known in the art to provide a sewing machine with a vacuum needle threader including a tubular lever pivotally mounted on the head of the machine and constructed so that the lever manually may be stored in a substantially upright position. Heretofore thread wiper means have been provided for attachment to a sewing machine for withdrawing the free end of the needle thread from the work and moving it to one side of the path of reciprocation of the needle at the completion of a stitching cycle. Generally, this type of thread wiper comprises a deflecting finger which passes between the needle and the work to engage the thread and wipe the free end of the needle thread to one side. Some of the prior art thread wipers are operable so that when the workclamp is lifted upon completion of a stitching cycle, a finger automatically is caused to wipe the free end of the thread to one side of the path of reciprocation.

Despite the presence in the art of mechanisms such as the above, there still exists a substantial need for a mechanism that will combine the functions of a needle threader and thread wiper while utilizing a minimum number of parts in order to provide an economically desirable mechanism and to minimize the complexity thereof. The latter feature is particularly desirable in view of the location of the mechanism in the immediate vicinity of needle where the possibility of interference with the thread and the material worked on is of a very critical nature. Also, to eliminate the need for a relatively high amount of skill or dexterity on the part of the operator and to minimize the amount of effort required by the operator during the sewing operation, the need exists for a mechanism that will operate automatically when the operator performs one of the required normal sewing operations, such as raising the presser foot.

SUMMARY OF THE INVENTION

This invention relates to the art of sewing, and more particularly to a novel and improved automatically operable combined needle threading and thread wiping mechanism adapted for attachment to a sewing machine, and which mechanism pneumatically performs these operations in an efficient, desirable, and relatively simple manner.

The present invention overcomes the above prior art deficiencies and more by providing in one embodiment a combined needle threader and thread wiper mechanism including a tubular lever pivotally mounted on the presser bar bushing of a sewing machine, preferably of the industrial type, for swinging movement in a vertical plane. The tubular lever is connected by pneumatic means to a vacuum pump or other suitable means for producing a pneumatic pressure differential and is connected by mechanical means to a knee-shift presser lifter, whereby when the presser foot is raised, the tubular lever automatically will be pivoted downward with its free end aligned with the eye of the needle, which is in its up position.

Another embodiment of the combined needle threader and thread wiper mechanism comprises a horizontal pin journaled in a clamp on the lower portion of the presser bar bushing and having an actuating lever with a cam surface connected to and depending from the pin on the side of the presser foot wherein the presser foot clamping screw is threaded. A thread-end receiving tubular lever operably is connected to and depends from the pin on the other side of the presser foot so that when the presser foot is raised in the usual manner after the machine is stopped, the head of the presser foot clamping screw con-

tacts the cam surface on the actuating lever which causes the tubular lever to swing forward from its stored position, whereby the free end of the lever will be aligned with the eye of the needle, which is in its up position. A source of vacuum pressure is connected by suitable means to the tubular lever, whereupon the pressure will draw the thread through the eye of the needle into the free end of the lever. A spring secured to the tubular lever returns it to its stored position when the head of the presser foot clamping screw is withdrawn from engagement with the cam surface as the presser foot is lowered.

Accordingly, it is a principal object of this invention to provide for use with a sewing machine an improved combination needle threader and thread wiper mechanism that is of relatively simple construction and is dependable in performing its intended functions.

Another object of this invention is to provide a combination needle threader and thread wiper mechanism for a sewing machine which automatically is operable when the operator performs a required normal sewing operation.

It also is an object of this invention to provide for a sewing machine, a novel and improved combination needle threader and thread wiper mechanism of the pneumatic type, which operates automatically when the presser foot of the sewing machine is raised.

A further object of the present invention is to provide for a sewing machine, a novel and improved needle threader of the pneumatic type which automatically is moved from a stored position to an operative position with a minimum amount of effort and dexterity on the part of the operator.

Having in mind the above and other objects that will be evident from an understanding of the disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiments of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction, and advantages of it when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a rear elevational view of a conventional sewing machine having attached thereto a preferred embodiment of the present invention comprising the novel combination needle threader and thread wiper mechanism disposed in its stored inoperative position;

FIG. 2 is a rear elevational view of a conventional sewing machine having attached thereto a preferred embodiment of the present invention comprising the novel combination needle threader and thread wiper mechanism disposed in its operative position;

FIG. 3 is an enlarged perspective view of the novel and improved combination needle threader and thread wiper mechanism shown in FIG. 1 together with its related sewing machine parts;

FIG. 4 is a sectional view of the mounting arrangement and construction of the novel and improved combination needle threader and thread wiper mechanism taken substantially on the line 4-4 of FIG. 3;

FIG. 5 is an enlarged sectional view of the free end of the tubular lever taken substantially on the line 5-5 of FIG. 3;

FIG. 6 is a perspective view of the adapter per se, shown secured to the free end of the tubular lever in FIG. 5;

FIG. 7 is a perspective view illustrating a modification of the combination needle threader and thread wiper mechanism shown in FIGS. 1 to 6;

FIG. 8 is an end elevational view of the needle threader and thread wiper mechanism of FIG. 7 mounted on a sewing machine with its presser foot lowered;

FIG. 9 is like FIG. 8, except that the presser foot is raised;

FIG. 10 is an end elevational view of the needle threader and thread wiper mechanism as seen from the rear of FIG. 9;

FIG. 11 is a sectional view taken substantially on the line 11-11 of FIG. 9; and

FIG. 12 is an enlarged perspective view of the free end of the tubular lever, illustrated in FIGS. 7—11, in its operative position relative to the sewing needle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the illustrated embodiments of the present invention, the sewing machine may be of any conventional industrial type, for example, such as the machine disclosed in the U.S. Pat. of Kaier, No. 2,250,992. As shown in the drawings, the machine, generally designated 14, has a frame including a bed 15 having an upper work-supporting surface, a standard 16 rising vertically from one end of the bed 15 and from which is cantilevered a bracket arm 17 that terminates in a head 18 overhanging the work-supporting surface of the bed 15. A standard spring-depressed presser bar 19 carrying a presser foot 21 at its lower end is mounted in the head 18 for endwise sliding movement.

To hold the presser foot 21 in engagement with the work-supporting surface of the machine, the presser bar 19 is biased downwardly in a conventional manner by a spring 20, best shown in FIG. 3. The presser foot 21 functions in the usual manner, that is, it acts in opposition to the feed dog 22 of the sewing machine to hold the work in operative engagement therewith and to prevent flagging of the work. In order to introduce the work, the presser foot is lifted. This end is accomplished in the present embodiment by a presser mechanism including a presser lifter lever 23 disposed horizontally at the rear of the machine bracket arm 17 and pivotally mounted in a conventional fashion by means of a pivot stud in the form of a pivot screw 24, which mounts the lever 23 in an open-ended slot 25 formed therein. A spring 26 is coiled about the pivot stud 24 and is constructed and arranged so that the lever 23 continuously is biased in a clockwise direction (as seen in FIGS. 1, 2, and 3) about the stud 26. The lever 23 also includes a pin 27 located at the head end thereof which extends through an aperture formed in the lever into the head 18 and operatively is connected within the head to the presser bar 19 by means of a presser bar mover 28, as shown in FIG. 3. As illustrated, the mover 28 has a right angle configuration with each of its free ends 29 and 30 being provided with a split circular engaging portion, wherein the end 29 operably is connected to the pin 27 while the end 30 is disposed about the presser bar 19 directly below a spring abutment block 31 also disposed about the presser bar. As best shown in FIG. 3, the standard end of the lever 23 is provided with operator actuated means of a conventional nature, generally designated 32, for imparting pivotal movement to the lever and comprising a pull rod 33 connected to the standard end of the lever 23 and extending through the bed 15 of the sewing machine where it is operatively connected with an operator-controlled treadle or, as illustrated in FIG. 3, with a knee-operated mechanism 34 comprising a knee-shift pad 35 adapted for engagement by the operator when it is desired to raise the presser foot 21 carried by the presser bar 19. Thus, to operate the presser lifter mechanism, the operator urges the knee pad 35 to the left as seen in FIG. 3, which actuates the pull rod 33 through a standard mechanical connection and causes it to move in a downward direction as shown by the arrows. Such movement of the rod 33 exerts a counterclockwise force at the standard end of the lever 23 which causes the lever to pivot about the pivot stud 24 in a direction opposing the presser bar spring 20 thereby to lift the presser bar 19 and the presser foot 21 carried thereby. The foregoing mechanism, which operates in the usual manner, does not per se form part of the present invention and has been described only to the extent necessary for a proper understanding of this invention. Reference may be had to the above-mentioned Kaier U.S. Pat. No. 2,250,992 and the U.S. Pat. No. 3,036,536 of Ritter, assigned to the assignee of the present invention for further details regarding the construction, arrangement, and operation of the operator-actuated knee-shift mechanism and the presser lifter mechanism actuated by the former.

In addition to the aforescribed presser lifter mechanism, the machine is illustrated as provided with the usual operator hand influenced cam lever 35 disposed below the head end of the lever 23 and being fulcrummed on a headed screw 36 having a threaded axial bore 36', and being formed with cam lobes 37 which act to turn the lever 23 and thereby to raise and lower the presser foot 21 when the operator influenced cam lever 35 is turned, for example, as illustrated in FIG. 2.

The novel vacuum needle threader and thread wiper mechanism, generally designated as 38 and illustrated in FIGS. 1, 2, and 3, includes a tubular lever 39 pivotally mounted to swing in a vertical plane on the presser bar bushing 40 and connected pneumatically to a standard vacuum pump of suitable construction by means of a conduit comprising a length of flexible tube 41. The lever 39 is constructed and arranged so that when the presser foot 21 is raised by activation of the knee-shift presser lifter 34, with the machine stopped and the take-up lever in the up position, the lever automatically will be pivoted from its retracted inoperative or stored position, shown in FIG. 1, downwardly to its operative position, shown in FIG. 2, with the free end of the lever aligned with the eye 31 of the needle 43. Naturally, the needle may be moved vertically if it is not properly aligned with the free end of the lever. At the head end of the lever 23, a substantially vertically disposed metal link 44 having a relatively short stepped-down-portion 45 is pivotally secured at one end to the lever 23 by a headed screw 46, which passes through a nonthreaded opening 46' provided in the link 44 and is threaded into a threaded bore (not shown) in the lever, and at its opposite end by a second headed screw 47, which latter screw passes through a second nonthreaded opening 47' in the link 44 and is threaded into an aperture (not shown) formed at one end of a lever arm 48 located directly behind the portion 45 of the link 44. The lever 48 comprises a stepped configuration and is provided with a nonthreaded aperture 49 located adjacent the threaded aperture (not shown) provided in the link 48 for receiving the screw 47. The aperture 49 receives a headed screw 50 which threads into the threaded axial bore 36' of the screw 36 thereby mounting the lever 48 relative to the frame of the machine while allowing for pivotal movement thereof as illustrated by its different positions in FIGS. 1 and 2, respectively. At the opposite end of the lever arm 48, there is provided a second nonthreaded aperture 51 for receiving the shank of a headed screw 52 which threads into an aperture (not shown) formed in a connecting link 53 having a planar surface located in a plane directly behind the lever arm 48. Spaced from the lower or other end of the connecting link 53, there is provided a threaded aperture (not shown), which mounts the link 53 for sliding and pivotal movement in a slot or elongated opening 55 formed in the adjacent overlying end of a second connecting link 56, as best illustrated in FIG. 3. The lowermost end of the second connecting link 56 is secured to a bifurcated lever 57 by means of a screw 58 threaded into a bore 59 formed in the lever 57. The opposite end of the lever 57 is provided with a pair of spaced legs 60 and 61 defining a narrow open-ended channel 62 that terminates in a bore 63 disposed substantially perpendicular relative to the longitudinal axis of the lever 57. The above-described linkage arrangement is secured to the combined needle threader and thread wiper mechanism 38 so that any movement thereof will be transmitted to the tubular lever 39. To accomplish this result, the bore 63 receives one end of a needle threader shaft 65, which is mounted for movement with the lever 57 by means of a set screw 66 threaded between the legs 60 and 61. As shown in FIG. 4, the shaft 65 is provided with an internal channel or bore 67 that extends in an axial direction from one end thereof and terminates a fixed distance from the opposite end. The shaft 65 further is provided with a first pressure receiving aperture 68 located adjacent the closed end of the channel 67 and extending from the outer surface of the shaft to the internal channel 67. A second through-aperture 69 having an axis disposed transverse to that of the aperture 68 extends between opposing sur-

faces of the shaft and is adapted to mount the tubular lever 39 as described below. The needle threader shaft 65 is journaled in a bore 70 provided in a needle threader clamp 71 having a bifurcated portion 71' which is clamped to the presser bar bushing 40 by means of a screw 72 disposed in a counterbore and threaded between the legs of the bifurcated portion 71'. At either end of the needle clamp bore 70, there is provided a set collar 73 and 74 secured by set screws, respectively, to the shaft 65 for preventing endwise or axial movement thereof relative to the bore 70. When the lever 39 is in its down position adjacent the needle, the aperture 68 is aligned with a threaded opening 75 provided in an adjacent projecting portion of the clamp 71, the opening 75 being adapted to receive an adapter member 76 for holding the conduit 41 in position, thereby connecting the source of vacuum (not shown) to the internal channel 67 of the shaft 65 through the adapter 76, the opening 75, and the aperture 68. When the lever 39 is stored, as in FIG. 3, the aperture 68 is not in register with the opening 75. At the end of the needle threader shaft 65 opposite from the lever 57, the shaft carries in the aperture 69 the tubular lever 39 comprising a substantially hollow, preferably metal, air tube having a pivotally mounted main body portion 77 that terminates in a curved hooklike needle threading end portion 78. The tube 39 is disposed in the needle threader shaft opening 69 so that a lateral opening 79 provided therein extends through one side of the tube wall into register with the hollow portion or bore 80 provided in the tube 39 and is aligned with the shaft channel 67. The tube 39 is secured in its proper position on the shaft 65 relative to the channel 67 by suitable means, preferably by brazing the shaft and the tube at adjacent surfaces designated by the reference numeral 81. The adjacent open end of the tubular bore 80 is plugged by suitable means, such as a rubber member, as shown at 82 and the open end of the needle threader shaft 65 similarly is plugged as shown at 83 to prevent any vacuum leakage. The needle threading end 78 of the tube 39 has secured thereto, preferably by means of brazing as at 84 (see FIG. 5), a cylindrical metal needle threader adapter 85 having an elongated narrow opening 86, which acts as an orifice for the tube 39, extending the length thereof, as best illustrated in FIG. 5. The adapter 85 comprises a narrow neck portion 87 whose outside dimensions are such as to allow it to enter the bore 80 in the tube 39 and a relatively wide thread receiving portion 88 having at the end nearest the tube 39 an annular shelf 89 which limits the extent to which the adapter can be inserted into the bore 80 of the tube 39. The outer end of the adapter is formed with a notch 90 whose construction is such that the orifice 86 will be aligned with the eye 43' of the needle 43 when the tubular lever 39 is brought into its operative position, shown in FIG. 2. The sloping walls of the notch 90, which partially envelop the needle 43, are disposed relative to each other so as to bring the needle eye 43' as close as possible to the vacuum pressure transmitted through the conduit 41, the opening 68, the channel 67, the bore 80, and the orifice 86.

The foregoing construction and arrangement provides a novel and improved combination needle threader and thread wiper mechanism whose operation is set forth below. The tube 39 is mounted on the presser bar bushing 40 to swing in a vertical plane such that when the presser foot is raised by activation of the knee-shift presser lifter 32 or other suitable means, such as the cam lever 35, the presser lifter lever 23 is pivoted in a counterclockwise direction as seen in FIGS. 1, 2, and 3 causing the linkage arrangement to assume their respective positions substantially as shown in FIG. 2. Movement of the link 53 causes the link 56 to move in a downward direction thereby causing the lever 57 to swing downward in a counterclockwise direction. Since the needle threader shaft 65 is secured for turning movement with the bifurcated lever 57, it likewise turns counterclockwise causing the opening 68 to be aligned with the opening 75 that receives the source of vacuum pressure from the conduit 41. Simultaneously, the tubular lever 39 carried by the needle shaft 65 is pivoted downward into its operative position, shown in FIG. 2, with its

free end comprising the notch 90 in the needle threader adapter 85 being disposed about the needle eye 43'. Thus, with the tube 39 in its down or operative position and assuming that the needle is unthreaded, the needle can be threaded by bringing the end of the needle thread 91 (see FIG. 5) near to the eye 43' of the needle 43 whereupon the end of the thread will be sucked through the needle eye 43' into the orifice 86 by the vacuum pressure as shown in FIG. 5. The tube 39 also acts as a thread wiper in that after one sewing operation is completed and the thread has been severed, the tube 39 will, when it is located in its operative down position, by means of the vacuum pressure suck the thread end into the orifice 86 and hold it out of the way until the new work has been placed in position.

A modification of the present invention is illustrated in FIGS. 7 through 12. In FIG. 7 the linkage arrangement of the embodiment, shown in FIGS. 1 through 6, has been eliminated and replaced by a different relatively less complex construction. The same reference numerals refer to similar parts in the first embodiment. The cam lever 35 is pivotally mounted to the machine frame by means of a headed screw 92. A bifurcated needle threader clamp 93 having legs 94 and 95 is provided with a vertical bore 96 for receiving the presser bar bushing 40 (see FIG. 11) and is clamped to the bushing by means of a screw 97 disposed in a counterbore 98 in the leg 95 and is threaded into the bore 98' formed in the leg 94. A further continuous cylindrical opening 99 located at the end of the clamp 93 opposite from the bores 98 and 98' and disposed horizontal relative to the bore 96 receives a tube holder shaft 100 having an enlarged slatted end 101 including a flat surface 102 located at one side of the clamp bore 99 and a cylindrical portion extending from the other side of the clamp bore 99. The enlarged end 101 of the tube holder shaft 100 is provided with a horizontally disposed aperture 103 extending from the surface 102 inwardly and being adapted to receive the free end of the conduit 41 therein, which is connected at its other end to the source of vacuum pressure. As shown, the conduit 41 extends into the opening 103 up to a second vertically disposed opening 104. The second vertical aperture 104 is disposed substantially perpendicular relative to the opening 103 and extends upward from the lower surface 105 of the end 101 into communication with the opening 103. The vertically disposed opening 104 is adapted to receive and hold by suitable means, such as brazing, and end of a metal hollow needle threader air tube 106. At the other extended end of the holder shaft 100, there is clamped an actuating lever 107 having a bifurcated end 108 comprising a pair of legs 109 and 110, and a cam portion 111 is provided at the opposite end of the lever 107 comprising a cam surface 112 whose function will be described hereinafter. The bifurcated end 108 of the lever 107 is clamped to the extended end of the holder shaft 100 by means of a headed screw 113 which passes through an opening in the leg 109 and threads into a bore provided in the leg 110, as best shown in FIG. 11. In its inoperative or stored position, the lever 107 is disposed as shown in FIG. 8, that is, with the cam surface 112 of the lever 107 located at a spaced predetermined distance above the head of the standard presser foot clamping screw 114 and the pivotal axis of the lever 107 disposed at an angle relative to a vertical plane passing into the paper as seen in FIG. 8. The orifice end 115 of the tube 106 is located to the right and slightly to the rear of the needle 43 when viewed from the front of the sewing machine. The tube 106 normally is maintained in this position relative to the needle by a spring 116 having one end wrapped around a screw 117 threaded into the lower surface of the clamp 93 and its other end wrapped around the tube 106 as illustrated in FIG. 10. The tube 106 is brought into its forward operative position (see FIG. 9) by raising the presser bar, which in turn causes the presser foot screw 114 to move upward along the cam surface 112 of the actuation lever 107. As the head rides along the sloping portion of the cam surface, the coaction between the head of the screw 114 and the cam surface 112 is such that the lever 107 will pivot to the right as

seen in FIGS. 8 and 9 thereby causing the tube holder shaft 100 to turn counterclockwise and since the tube 106 is mounted for movement with the shaft, it also will move forward toward the needle, that is, to the right from the position shown in FIG. 8 into the position shown in FIGS. 9 and 12 so that its orifice 118 will be laterally aligned with the needle eye 43'.

The free orifice end 115 of the tube 106, which is tapered inwardly toward the outer end thereof as shown in FIGS. 8, 9, and 12, has an oblong shape with an opening in the form of a slit provided therein. A shoulder or flange 119 extends from one edge of the orifice 118 and functions as a thread guiding surface.

The needle threader and thread wiper mechanism illustrated in FIG. 7 through 12 and described above operates as set forth below. When the presser foot 21 is raised after the machine is stopped with the needle 43 in its up position (see FIGS. 8 and 9), the head of the presser foot clamping screw 114 bears against the cam surface 112 provided on the actuating lever 107 causing the lever through the shaft 101 to swing the vacuum tube 106 forward from its stored position (FIG. 8) so that the orifice 118 of the vacuum tube is aligned with the eye 43' of the needle 43, as shown in FIG. 12. The needle then can be threaded by bringing the end of the needle thread 91 near to the needle eye using the flange 119 as a surface for guiding the thread adjacent the needle eye whereupon the end of the thread is drawn through the eye by vacuum pressure supplied through the tube. The tapered construction of the orifice end 115 facilitates entrainment of the thread lying adjacent the needle eye. When the presser foot is lowered, the cam surface 112 on the actuating lever 107 permits the spring 116 to return the vacuum tube to its stored position behind the needle. The device also acts as a thread wiper by operating to withdraw the thread from the material upon completion of a sewing operation and holding the end of the needle thread until the first stitch is formed in a sewing operation.

It will be understood that various changes in the details, materials, arrangements of parts and operating conditions, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principles and scope of the invention as expressed in the claims.

I claim:

1. In a sewing machine having:
 - a. a frame provided with a head;
 - b. a needle bar movable in said head;
 - c. a needle carried at one end by said needle bar and having a thread-carrying eye formed at its other end;
 - d. a presser bar assembly movably mounted on said head;
 - e. lifting means mounted on said frame and operatively connected to said presser bar assembly for moving said assembly to a raised position; and
 - f. a vacuum needle threader mechanism for assisting in introducing a thread into said needle eye, said mechanism including:
 1. a lever mounted for pivotal movement on said presser bar assembly and disposed in a normally retracted inoperative position, said lever adapted to be located in an operative position adjacent said needle;
 2. an orifice extending through the end of said lever remote from the pivotal connection;
 3. conduit means for connection to said orifice and adapted to be connected to a source of vacuum; and
 4. actuating means operably connected with said lever and said presser bar assembly lifting means, said actuating means being constructed and arranged such that when said presser bar assembly is moved to a raised position by said lifting means said lever automatically is placed in its operative position with the orifice at the remote end of said lever being disposed substantially adjacent said needle eye.
2. The combination claimed in claim 1 wherein:
 - a. a member for pivotally mounting said lever is secured to said presser bar assembly; and

b. said actuating means includes a shaft journaled in said mounting member and carrying at one end said lever, whereby upon actuation of said actuating means by placing said assembly in its raised position said shaft will be turned so that said lever locates in its operative position adjacent said needle eye.

3. The combination claimed in claim 2 wherein:

- a. said shaft is formed with an internal axially disposed opening adapted to be connected to said source of vacuum through said conduit means; and
- b. an aperture providing an inlet to said orifice is formed in said lever at the end thereof adjacent its pivotal connection, said aperture being aligned with said internal shaft opening.

4. The combination claimed in claim 1 wherein:

- a. an adapter having a bore formed therein and a groove provided at its free end is secured at the end of said lever remote from its pivotal connection and is disposed relative thereto with said bore in register with said orifice; and
- b. said groove being constructed and arranged so that when said lever is located in its operative position adjacent said needle, said needle eye is disposed substantially within said groove to facilitate entrainment of the thread lying adjacent said needle eye through said eye into said bore.

5. The combination claimed in claim 1 wherein the end of said lever remote from its pivotal connection is tapered toward the outermost edge to facilitate entrainment of the thread lying adjacent said needle eye through said eye.

6. The combination claimed in claim 5 wherein a flange for guiding the thread through said needle eye is provided at the tapered end of said lever.

7. The combination claimed in claim 1 wherein:

- a. said actuating means includes a shaft journaled on said presser bar assembly and carrying said lever at one end thereof; and
- b. a mechanical linkage including at least one member connected between said lifting means and the end of said shaft opposite from said lever, said member being secured to the opposite end of said shaft, said mechanical linkage being constructed and arranged so that when said lifting means is actuated by the operator the path of movement of said linkage is such that said member causes said shaft to turn thereby to swing said lever from its retracted inoperative position to an operative position adjacent said needle.

8. The combination claimed in claim 1 wherein:

- a. said presser bar assembly includes a presser foot;
- b. means for securing said presser foot to said presser bar;
- c. said actuating means includes an actuating member mounted for pivotal movement with said lever, said actuating member being provided with a cam surface at the end remote from its pivotal connection; and
- d. said cam surface being constructed and arranged relative to said securing means so that when said presser foot is placed in its raised position by said lifting means, said securing means causes said actuating member to pivot, whereby said lever simultaneously is pivoted from its retracted position to its operative position adjacent said needle.

9. The combination claimed in claim 8 wherein a spring is secured at one end to said lever and at its other end to said presser bar assembly for exerting a bias on said lever that urges it into its normal retracted position.

10. The combination claimed in claim 8 wherein:

- a. a tube holder having first and second intersecting apertures is journaled on said presser bar assembly;
- b. said first aperture having said lever disposed therein; and
- c. said second aperture being adapted to receive said conduit means, whereby said conduit means is connected to said orifice through said first and second apertures.

11. The combination claimed in claim 1 wherein:

- a. mounting means is journaled on said presser bar assembly;

- b. said lever is secured for pivotal movement with said mounting means and is located in its normal inoperative position directly behind said needle; and
- c. said actuating means including an actuating member secured to said mounting means for pivotal movement therewith; said actuating member having a cam surface disposed for coaction with said presser bar assembly, whereby when said assembly is located in its raised position said cam surface cooperates therewith causing said mounting means to turn, thereby to move said lever from an inoperative position to an operative position adjacent said needle.
- 12. In a sewing machine having:
 - a. a frame provided with a head;
 - b. a needle carrying needle bar movable in said head with said needle having an eye formed at its lower end;
 - c. a presser bar movably mounted in a stationary bushing in said head and normally being disposed in a lowered operative position, said presser bar being adapted for placement into a raised position;
 - d. operator actuated lifting means mounted on said frame and operatively connected to said presser bar assembly for selectively locating said presser bar in its raised position.
 - e. a vacuum needle threader mechanism for assisting in introducing a thread into said needle eye, said mechanism comprising:
 - 1. mounting means secured to said presser bar bushing and including a horizontal shaft journaled therein;
 - 2. a lever mounted for pivotal movement with said shaft and disposed in a normally upward direction in stored inoperative position, said lever adapted for swinging movement into a substantially vertical, downward disposed operative position adjacent said needle;
 - 3. an orifice provided in said lever and extending through the end of said lever remote from its pivotal connection;
 - 4. conduit means for connection to said orifice and adapted for connection to a source of vacuum;
 - 5. linkage means comprising a series of interconnected links and members having respective predetermined paths of movement, said linkage means being connected at one extreme to said lifting means and at the other extreme to said shaft, said links and members being constructed and arranged so that upon raising the presser bar and linkage means will cause said shaft to turn in a direction that automatically will swing said lever into its operative position with the orifice at the remote end being aligned with said needle eye, whereby said needle readily may be threaded by placing said thread adjacent said needle eye whereupon it will be drawn through said eye and into said orifice upon operation of the source of vacuum.
- 13. In a sewing machine having:
 - a. a frame provided with a head;
 - b. a needle carrying needle bar journaled for endwise reciprocation in said head with said needle having an eye formed adjacent its lower end;
 - c. a presser bar mounted for endwise movement in a stationary bushing in said head and being normally disposed in a lowered operative position, said presser bar being adapted to be placed in a raised position;
 - d. a presser foot;
 - e. screw means having an enlarged portion for securing said

- presser foot to said presser bar with said enlarged portion being located at one side of said presser bar;
- f. a vacuum needle threading mechanism for assisting in introducing a thread into said needle eye, said mechanism including:
 - 1. mounting means secured to said presser bar bushing and including a horizontal shaft journaled therein;
 - 2. a lever mounted for pivotal movement secured to said shaft and disposed in a normal retracted stored position behind said needle and adapted to be swung forward to an operative position adjacent said needle;
 - 3. an orifice provided in said lever and extending through the end of said lever remote from its pivotal connection;
 - 4. conduit means for connection to said orifice and adapted for connection to a source of vacuum;
 - 5. an actuating member secured at one end to said shaft and provided at its lower end adjacent said enlarged portion of said screw with a cam surface normally disposed in an inoperative position corresponding to the retracted stored position of said lever, said cam surface of said member being adapted to operatively engage said enlarged portion when said presser bar is located in its raised position and being constructed and arranged relative to said enlarged portion so that when said presser bar is raised said actuating member is caused to move in a forward direction, which turns said shaft and thereby automatically swings said lever forward to its operative position with said orifice at the remote end of said lever being aligned with said needle eye, whereby said needle readily may be threaded by placing said thread adjacent said needle eye whereupon it will be drawn through said eye and into said orifice upon operation of said source of vacuum.
- 14. In a sewing machine having a frame provided with a head, a needle bar movable in said head, a needle carried at one end by said needle bar and having a thread-carrying eye formed at its other end, a presser bar assembly movably mounted on said head, lifting means mounted on said frame and operatively connected to said presser bar assembly for moving said assembly to a raised position, and a vacuum needle threader mechanism for assisting in introducing a thread into said needle eye, said vacuum needle threader mechanism including a mounting member secured to said presser bar assembly, a tubular lever pivotally mounted on said mounting member and being disposed in a normally stored position when the machine is operating, means for providing a constant source of vacuum, conduit means adapted for connection between said last-named means and said mounting member, valve means having said tubular lever secured for movement therewith and being journaled in said mounting member and adapted for movement between a first inoperative needle threading position and a second operative needle threading position, said valve means disposed adjacent said conduit means and being adapted to receive said source of vacuum from said last-named means, means for operably securing said lifting means to said valve means so that when said presser bar assembly is raised said valve means simultaneously moves from said first inoperative needle threading position wherein the vacuum source is disconnected from said tubular lever to said second operative needle threading position whereupon the tubular lever is located in a position adjacent said needle and said vacuum source is connected to said tubular lever through said conduit means and said valve means.