March 19, 1968 J. D. GUBBAY ET AL 3,373,709

SEWING MACHINE THROAT PLATE LOCATING AND SECURING MEANS

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Fig.1.

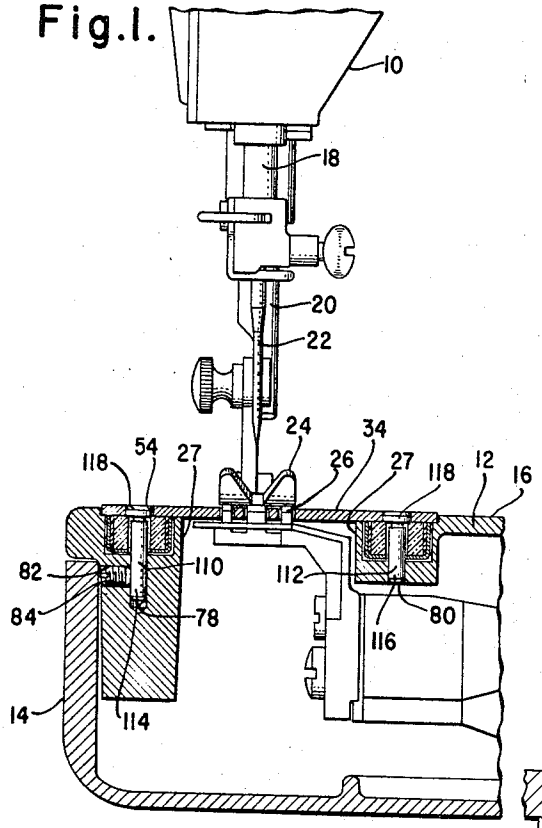


Fig.6.

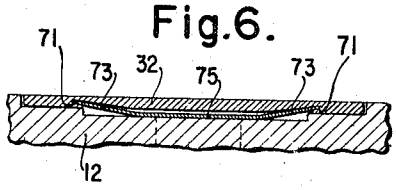


Fig.3.

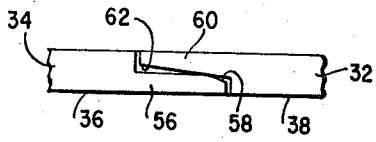


Fig.4.

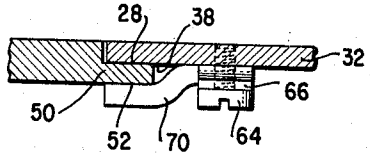
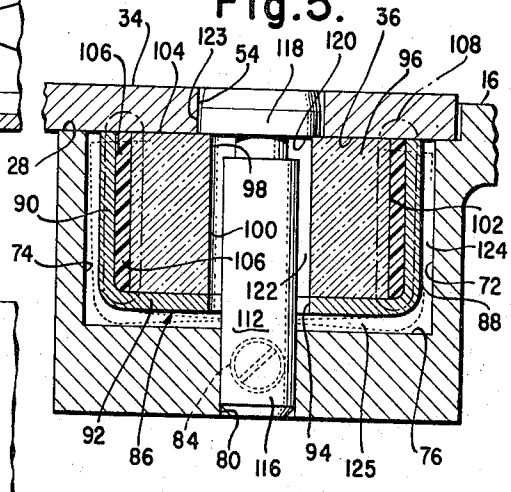


Fig.5.



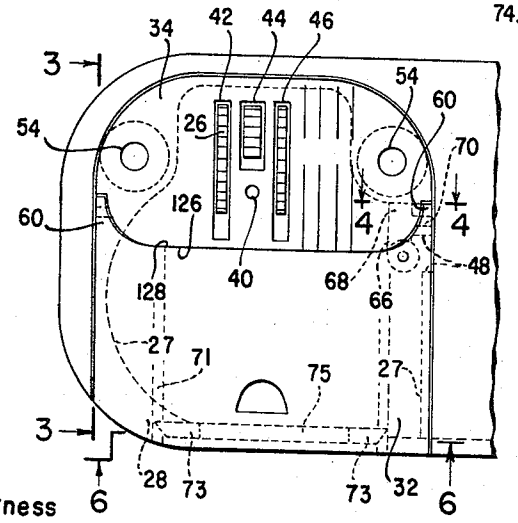


Fig.2.

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SEWING MACHINE THROAT PLATE LOCATING AND SECURING MEANS

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ABSTRACT OF THE DISCLOSURE

A device mounted in a cavity in the bed of a sewing machine for releasably securing a throat plate to the bed above the cavity. The device includes a ring-like magnet mounted in a cup, loosely mounted on a stud secured within the cavity beneath the throat plate, which throat plate is attracted to the magnet and thereby held in place on the bed.

The present invention relates to sewing machines and particularly to improved apparatus for locating and securing a throat plate in a sewing machine.

An object of this invention is to provide a novel and improved magnetic throat plate locating and fastening apparatus which provides a sewing machine operator with a means for easily and quickly exchanging throat plates.

Another object of this invention is to provide apparatus utilizing a magnetic device which holds the throat plate in a seat in the sewing machine bed and which prevents undesirable vertical vibration of the throat plate regardless of the material being sewn or the speed of sewing machine operation.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment 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 in which:

FIG. 1 is a fragmentary elevational view, partly in section, of a sewing machine incorporating the present invention,

FIG. 2 is a plan view of a portion of the sewing machine bed illustrated in FIG. 1,

FIG. 3 is an enlarged view taken substantially along line 3—3 of FIG. 2, showing the cooperative relation of the slide cover plate with the throat plate,

FIG. 4 is an enlarged view taken substantially along line 4—4 of FIG. 2, showing the cooperative relation of the slide cover plate with the throat plate,

FIG. 5 is a cross sectional view of one of the magnetic cup units shown in FIG. 1 but enlarged to illustrate the details of construction, and

FIG. 6 is a sectional view taken along line 6—6 of FIG. 2.

With reference to the drawings there is illustrated a head 10 of a conventional sewing machine frame. The head 10 is supported by a bracket arm and standard (not shown) in vertically spaced relation above a bed 12 which

is provided with a removable bottom cover 14. The bed 12 is formed with an upper surface 16 which constitutes the work supporting surface of the machine frame. The bed illustrated in the accompanying drawings is of the cylinder bed variety but the throat plate of this invention is adapted as well for use with sewing machines of the flat bed variety. The head 10 supports an endwise reciprocatory needle-bar 18 and a presser-bar 20 which in turn carry, respectively, a needle 22 and a presser-foot 24. Carried within the bed 12 is a loop taker (not shown), which may be of a conventional type, that cooperates in the formation of stitches with the needle 22. The bed 12 is also provided with a work-feeding mechanism including a serrated work-engaging feed dog 26 which is opposed by the presser-foot 24.

The bed 12 is provided with an opening designated generally by the numeral 27 beneath the needle and presser-foot. The opening 27 is bordered at the top adjacent the work supporting surface 16, by a recessed ledge 28, which ledge supports a slide plate 32, adapted to slide over the front portion of the opening 27, and a throat plate 34 adapted to cover the rear portion of the opening 27, beneath the presser-foot 24. The throat plate 34 and slide plate 32 are formed, respectively, with undersurfaces 36 and 38 adapted to rest upon the recessed ledge 28. The throat plate 34 is provided with a circular needle aperture 40 and elongated feed dog slots 42, 44 and 46 which receive the feed dog 26. FIG. 2 discloses a break 48 in the recessed ledge 28 designed to assist the operator in mounting the slide plate, while FIG. 4 shows a cantilevered portion 50 of the bed 12 having an undersurface 52 adapted to facilitate the accommodation of the slide plate as will be described hereinbelow.

The throat plate 34 includes a pair of spaced positioning pin openings 54, one of which may be slightly elongated to facilitate removal of the throat plate, and a recessed slide plate receiving projection 56 (FIG. 3), formed one on each side of the throat plate, having a downwardly sloped surface 58 formed on the free end thereof. The slide plate 32 has formed one on each side, on its throat plate contacting end, a throat plate engaging horn 60 (FIGS. 2 and 3) having an upwardly sloped underside 62. Secured to the underside 38 of the slide plate 32 by a screw 64 is a clamp 66 (FIGS. 2 and 4) formed with a throat plate engaging finger 68, and at right angles to the finger, a lug 70. Formed in the undersurface 38 of the slide plate 32 are a pair of parallel slots 71 (FIG. 2) which slidingly receive the end portions of arm 73 of a spring 75 secured to the bed 12. The spring 75 and slots 71 arrangement is conventional and is utilized to hold the slide plate 32 on the bed 12.

With the throat and slide plates in their operative positions, as shown more clearly in FIGS. 2–4, the horns 60 overlie the projections 56, while the finger 68 of the clamp 66 engages the underside 36 of the throat plate 34 (FIG. 2) and the lug 70 engages the undersurface 52 of the cantilevered portion 50 (FIG. 4) of the bed. The throat plate 34, therefore, is sandwiched between the right side (FIG. 2) horn 60 of the slide plate 32 and the finger 68 while directly beneath the right side horn 60, the cantilevered portion 50 of the bed is sandwiched between the lug 70 and the slide plate 32, which rests upon the ledge 28. The throat plate and slide plate, therefore,

are held or clamped to the cantilevered portion **50** against any appreciable vertical motion. The lug **70** also serves to assist the spring **75** in holding the slide plate **32** on the bed **12** when the slide plate is pulled away from the throat plate **34**.

The bed **12** has formed therein beneath the throat plate **34** a pair of magnet receiving cavities **72** preferably cylindrical in shape and spaced from each other one on either side of the opening **27**. The cavities **72** each include a wall **74** and a floor **76** and formed in the floors **76** are cylindrical positioning pin holes **78** and **80** preferably coaxial with the cavities **72**. Tapped screw holes **82** formed in the bed **12** open into each of the pin holes **78** and **80** and are adapted to accommodate set screws **84**.

The cavities **72** are adapted each to receive a magnetic cup unit **86**, shown more clearly in FIG. 5. Each magnetic cup unit **86** includes a cylindrical soft iron cup **88** having a wall **90**, and a floor **92** formed with a circular positioning pin aperture **94**. The cup **88**, in turn, receives a sintered axially magnetized cylindrical or ring-like magnet **96** arranged concentric with the wall **90** and formed with a bore **98**, an inner surface **100**, an outer surface **102** and a throat plate contacting surface **104**. The space between the outer surface **102** of the magnet **96** and the wall **90** of the cup **88** is filled with a suitable plastic material **106** that serves to center and secure the magnet within the cup. The soft iron cup **88** provides for an improved flux path by completing the magnetic circuit as indicated by dot-dash lines **108** in FIG. 5, thereby increasing the holding power of the magnet **96** and minimizing the magnet's loss of remanence.

The magnetic cup units **86** receive non-magnetic positioning or locating pins **110** and **112** in a loose diametrical fit. The pins **110** and **112** are formed with cylindrical shanks **114** and **116** and include circular heads **118** having underfaces **120**. As seen more clearly in FIG. 5, the diameter of the positioning pin shank is less than that of the magnet bore **98**, thereby leaving a space **122** between the wall of the pin shank and the inner surface **100** of the magnet **96**. However, the diameter of the positioning pin head **118** is larger than the diameter of the magnet bore **98** so that the throat plate contacting surface **104** of the magnet **96** seats against the underface **120** of the head **118** when the unit is in its operative position. It is noted that the diameter of each of the pin openings **54** in the throat plate **34** is greater than the diameter of the head **118**, thereby leaving a space **123** between the head **118** and the wall of the hole **54**. The lower portion of the shanks **114** and **116** are received by, respectively, holes **78** and **80** and may be secured against vertical movement by the set screws **84**. In their operative positions the pins are adjusted vertically so that the underface **120** of each head **118** is level with the recessed ledge **28**.

As seen more clearly in FIG. 5 a space **124** is formed between the wall **74** of the cavity **72** and the outer surface of the iron cup wall **90** and another space **125** is formed between the underside of the iron cup floor **92** and the floor **76** of the cavity **72**. The effect of the spacings and the loosely mounted magnet described above is to provide a so-called "floating magnet," i.e., one that is free to move a predetermined distance vertically and also to tilt or rock about its vertical axis a predetermined degree, as indicated by the dotted lines in FIG. 5, thereby providing for automatic universal adjustment of the magnet within the cavity **72**.

The present invention provides a quick, simple and accurate way to exchange throat plates and secure them in their operative postions. Thus, to exchange one throat plate with another, an operator need only pull the slide plate **32** away from the throat plate **34** a short distance, pick up the seated throat plate with her fingers (the force of the magnets being relatively easily overcome by the operator), slide another throat plate into the vicinity of the rear portion of the opening **27**, at which point the force of the magnets will pull the throat plate into its proper operative position, and push the slide plate forward until edges **126** and **128** of the throat and slide plates, respectively, contact each other. The positioning pins **110** and **112** serve to locate the throat plate **34** on the recessed ledge **28** so that the needle aperture **40** is axially aligned with the needle **22**, thereby insuring adequate clearance for the needle as it enters and leaves the needle aperture during the endwise reciprocation of the needle. Since, in the present invention, there are no levers to push or pull, or knobs to turn, or screws to adjust and, therefore, no tools to handle, the throat plate exchange operation is reduced to its barest simplicity and is accomplished without any fumbling and within the quickest possible time.

It has been found that the surface **104** of the magnet **96** must press flush up against the undersurface **36** of the throat plate **34** along its entire contacting surface for the magnet to impart the maximum holding power. Even a slight gap between surfaces reduces the magnetic strength appreciably and increases the demagnetization process appreciably. However, the cost of keeping the surfaces **30** and **36** within the flatness tolerances required (in this instance, approximately .05 millimeter) is relatively high. The present invention obviates this problem by providing a magnetic cup unit that automatically adjusts itself to the angle of a throat plate that is canted from the horizontal in any radial direction due to unevenness or imperfections in the surface **30** or **36** or due to any foreign material that inadvertently comes between the surfaces. The force of attraction that the magnet **96** has for the throat plate **34** is strong enough to hold the throat plate in an acceptable operative position under virtually all sewing conditions. This is so even though vibrations are set up in the throat plate as a result, particularly, of the high speeds utilized by most sewing machines today. However, it is conceivable that under some sewing conditions, including the normal throat plate vibration, the force of attraction that the magnet **96** has for the throat plate **34** could be overcome. To obviate such an occurrence, even though remote, the overlying slide plate horns **60** and throat plate projections **56** together with the clamp **66** have been designed to limit throat plate vibration to an acceptable minimum.

Due to the relatively uncomplicated design of the component parts of the present invention, the cost of manufacture thereof is substantially reduced over that of comparable sysems designed to locate and secure the throat plates. In addition to the cost reduction, the ease with which the operator may exchange throat plates further enhances the value of the present invention in the sewing machine art.

Having thus set forth the nature of this invention, what we herein claim is:

1. A throat-plate securing means for a sewing machine having an endwise reciprocatory needle and a bed formed with an opening to receive said throat-plate and with at least a pair of cavities located adjacent to the opening, said securing means including at least a pair of magnet assemblies located in the cavities, said magnet assemblies comprising a soft iron open-topped cup, a ring-like magnet located within said cup and secured thereto along the inner surface of said cup wall, and means for securing said magnet assemblies in said cavities comprising a stud, means for securing said stud to the bed, said stud having an enlarged head overlying the top surface of said ring-like magnet and a reduced shank extending through said ring-like magnet and having a diameter less than that of the hole in the magnet and each of said magnet assemblies being spaced from the surface of its respective cavity when the throat plate is mounted in the bed opening thereby to permit self-adjustment of the magnet thereby to bring the top surface of said ring-like magnet into contact with the undersurface of said throat plate.

2. A throat-plate securing means in accordance with claim 1 in which the throat plate is formed with positioning holes and the enlarged head of each of the magnet assembly securing studs is dimensioned to fit its respective one of said throat-plate positioning holes.

3. A throat-plate securing means in accordance with claim 1 in which there is included a slide plate received by the opening in said bed and positioned adjacent to said throat plate, and clamping means secured to said slide plate for limiting vertical vibration of said throat plate.

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