Jan. 18, 1955 W. A. AYRES 2,699,745

SEWING MACHINE

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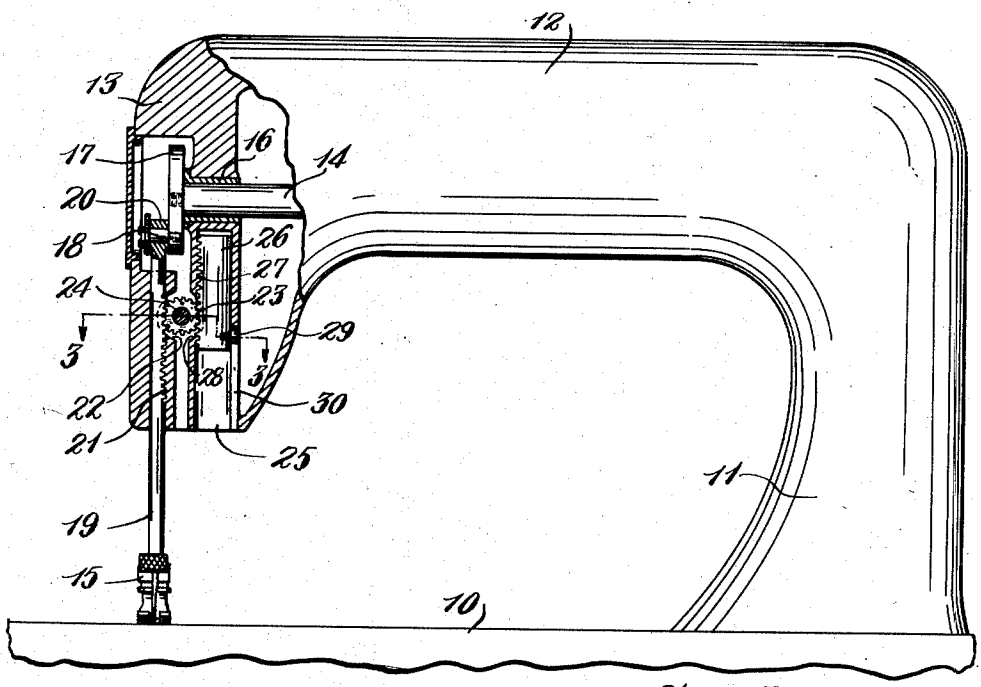


FIG. 1

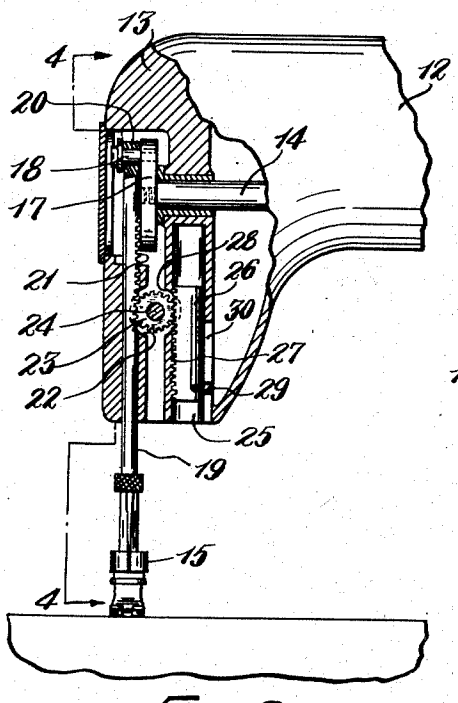


FIG. 2

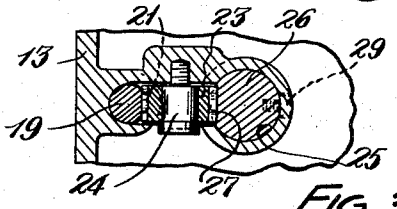


FIG. 3

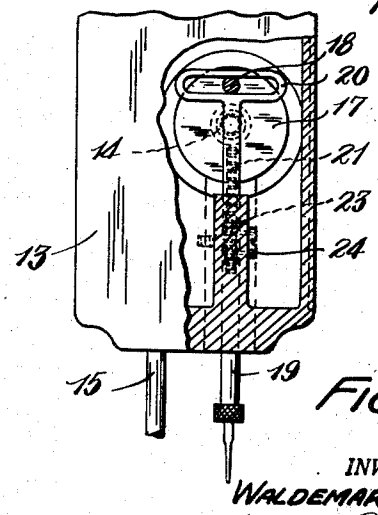


FIG. 4

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SEWING MACHINE

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4 Claims. (Cl. 112—218)

This invention relates to a sewing machine and more particularly to an improved and novel arrangement for dynamically balancing the needle bar and the actuating mechanism therefor.

One of the limitations to the operating speeds of a sewing machine is the objectionable vibrations set up by a moving part, such as the reciprocating needle bar, operating at high speeds. The magnitude of the vibrations limits the operating speeds of the sewing machine and necessitates the use of slower operating speeds to maintain the vibrations at a minimum and to lessen the operating noises present in the machine.

The broad object of the invention is to provide a dynamically balanced needle bar mechanism in a sewing machine.

Another object is to provide in a sewing machine an improved and novel arrangement for dynamically balancing the needle bar and operating mechanism therefor which substantially eliminates vibrations in the sewing machine head occasioned by the reciprocation of the needle bar, even though the machine is operating at high speeds and thus produces a quieter and more efficient sewing machine.

Another object is to provide in a sewing machine an arrangement, such as defined in the previous objects, and which is simple, compact and does not substantially increase the size of the sewing machine head.

Further and additional objects and advantages not hereinbefore referred to will become apparent hereinafter during the detailed description of an embodiment of the invention which is to follow and which embodiment is illustrated in the accompanying drawing wherein,

Fig. 1 is a view, partially in front elevation and partially in section, of a sewing machine head equipped with a needle bar and operating mechanism therefor embodying the invention; the sectional portion of the head disclosing the construction of the needle bar and its operating mechanism with the needle bar being shown as in the lowermost point of its vertical reciprocating movement.

Fig. 2 is a fragmentary view similar to the left hand portion of Fig. 1 but showing the needle bar at the uppermost point of its vertical reciprocating movement.

Fig. 3 is a transverse sectional view taken substantially on irregular line 3—3 of Fig. 1 looking in the direction of the arrows, and

Fig. 4 is a fragmentary partial end elevation and partial section of the sewing machine head, the end elevation and the section being taken looking from or on line 4—4 of Fig. 2 as indicated by the arrows.

The sewing machine head shown in the drawing and embodying the invention comprises a bed **10** which supports the hollow bracket arm or gooseneck having a vertical member or standard **11** and a horizontal member **12** on the free end of which is that portion generally designated as the face and indicated at **13**.

It will be understood that the hook and feed mechanisms and the shafts for operating the same are carried by the bed **10** as is conventional and that said shafts are operatively connected to the main shaft **14** that is rotatably mounted in suitable bearings in the horizontal member **12** of the gooseneck as will also be well understood in the art. Any suitable power means for operating the sewing machine can be employed and is not shown herein since it will be well understood.

The face **13** at the free end of the horizontal member **12** of the gooseneck mounts the usual presser foot **15** which need not be referred to further herein. The main shaft **14** to the left of its bearing **16** has secured thereto a disk **17** which carries an eccentric pin **18** on its left hand side as viewed in Figs. 1 and 2. The needle bar **19** is mounted in the face **13** for vertical reciprocation and carries at its upper end a Scotch yoke **20** which may be integral with the needle bar or separate therefrom but secured thereto. The eccentric pin **18** extends through the opening of the Scotch yoke **20** and it will be evident that rotation of the main shaft **14** and disk **17** causes vertical reciprocation to be imparted to the needle bar because of the movement of the pin **18** in the Scotch yoke **20**.

The needle bar **19** is provided on one side thereof and for a portion of its length with gear teeth forming a rack **21**, a portion of which is always located in a recessed opening **22** formed internally in the face portion **13**. An idler gear **23** is mounted within the face portion **13** of the headstock on a horizontal pin or stub shaft **24** secured in the face portion and said idler gear **23** extends into the recess **22** and constantly meshes with the rack **21** on the needle bar **19**. The face portion **13** of the gooseneck is provided internally with a cylindrical chamber **25** in which slides a counterweight or counterbalancing plunger **26** provided with gear teeth forming a rack **27**, a portion of which is always located in a recess or opening **28** formed internally of the gooseneck and into which the idler gear **23** extends so as to customarily mesh with the rack **27**.

The counterbalancing plunger **26** has secured thereto a guiding element **29** which may take any desired form but is shown as a headed screw secured to the plunger **26**. The element **29** extends into a vertically extending slot **30** formed interiorly of the face portion **13** of the gooseneck, wherefore the plunger **26** is held against rotating movement in the chamber **25** while being free for vertical reciprocating movement therein.

It will be seen that the chamber **25** extends vertically parallel to the needle bar **19** and that the plunger or member **26** is mounted in the chamber so as to reciprocate therein in out of phase relationship to the reciprocation of the needle bar **19** and that the movement of the needle bar is transmitted to the plunger **26** through the idler gear **24** which meshes with the rack **21** on the needle bar and the rack **27** on the plunger **26**. The needle bar **19** and the member **26** are located in the vertical plane which passes axially through the main shaft **14**.

The mass of the plunger **26** is predetermined in relation to the mass of the needle bar **19** and its operating mechanism so that its out of phase reciprocation with respect to the reciprocation of the needle bar functions to dynamically balance the latter and thus to reduce to a minimum vibrations in the gooseneck occasioned by the reciprocating needle bar. Consequently the operation of the needle bar even at high speeds will not create extreme vibration in the gooseneck and will result in quieter operation and greater efficiency of the sewing machine.

Although a preferred embodiment of the invention has been illustrated and described herein it will be understood the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described my invention, I claim:

1. In a sewing machine head having a reciprocating needle bar and mechanism for reciprocating said bar, means for dynamically balancing the reciprocating needle bar to minimize vibration in the sewing machine head and comprising guide means formed in said head and parallel to said needle bar, a member mounted in said guide means for reciprocation therein and correlated in mass to said needle bar, and means operatively interconnecting said bar and member to reciprocate the latter simultaneously with the bar but out of phase therewith and including rack teeth formed on the adjacent sides of said bar and member, and an idler gear mounted in said head intermediate said bar and member and meshing with said rack teeth.

2. In a sewing machine head having a main shaft rotatably mounted in the horizontal arm of the head and extending into the face portion at the free end of said

arm, said shaft having secured to it within said face portion a disk provided with an eccentric pin, said face portion being provided with a vertically extending bore, a needle bar mounted in said bore for reciprocation therein and provided at its upper end with a Scotch yoke into which said eccentric pin extends, a vertically extending chamber in said face portion and parallel to said bore and needle bar, a member slidably mounted in said chamber and correlated in mass to said needle bar, and an operative connection between said bar and member and located in said face portion of the head and causing the reciprocating movement of the needle bar to impart out of phase reciprocation to said member and including rack teeth formed on the adjacent sides of said bar and member while said face portion is provided with interior openings communicating with said bore and chamber and exposing said rack teeth, while an idler gear is mounted in said face portion intermediate said bar and member and extends into said openings and constantly meshes with said rack teeth.

3. In a sewing machine head as defined in claim 2 and wherein said bore and said chamber are located in the vertical plane passing axially through said shaft.

4. In a sewing machine head as defined in claim 2 and wherein the wall of said chamber is provided with a longitudinally extending slot while said member has secured thereto a guiding element extending into said slot and maintaining said member against rotation in said chamber but allowing reciprocation thereof.

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