Dec. 9, 1958 F. W. LANGE ET AL 2,863,410

CLUTCH MECHANISM FOR A SEWING MACHINE DRIVE

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Fig. 1.

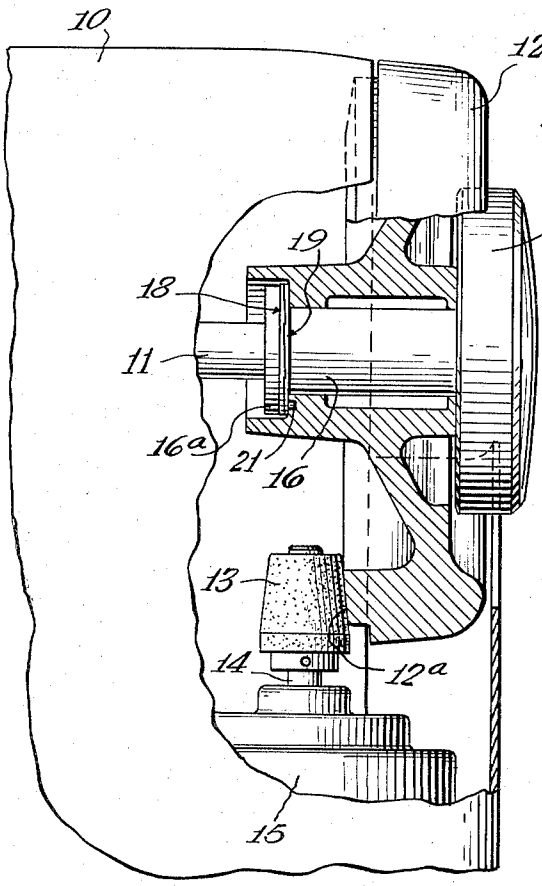


Fig. 3.

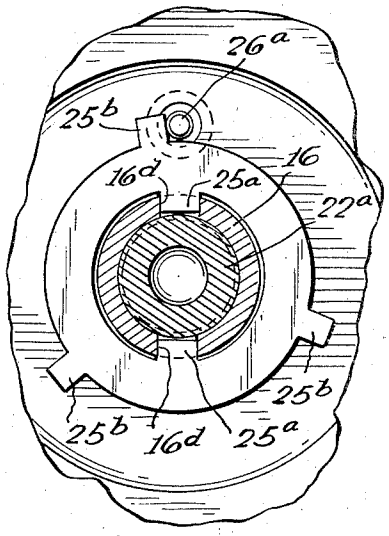


Fig. 4.

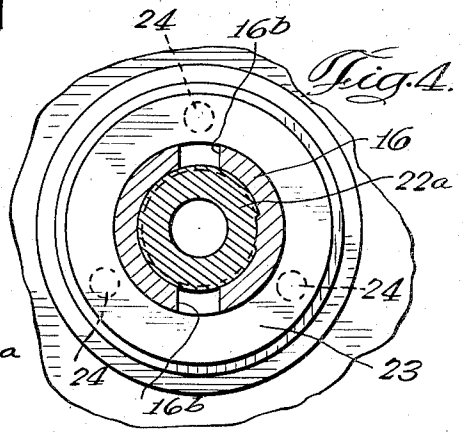
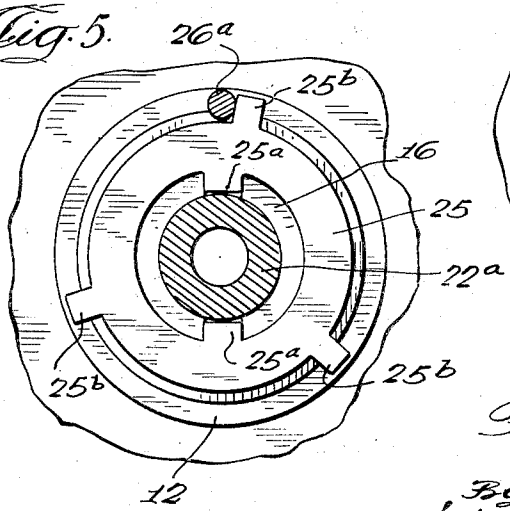


Fig. 5.

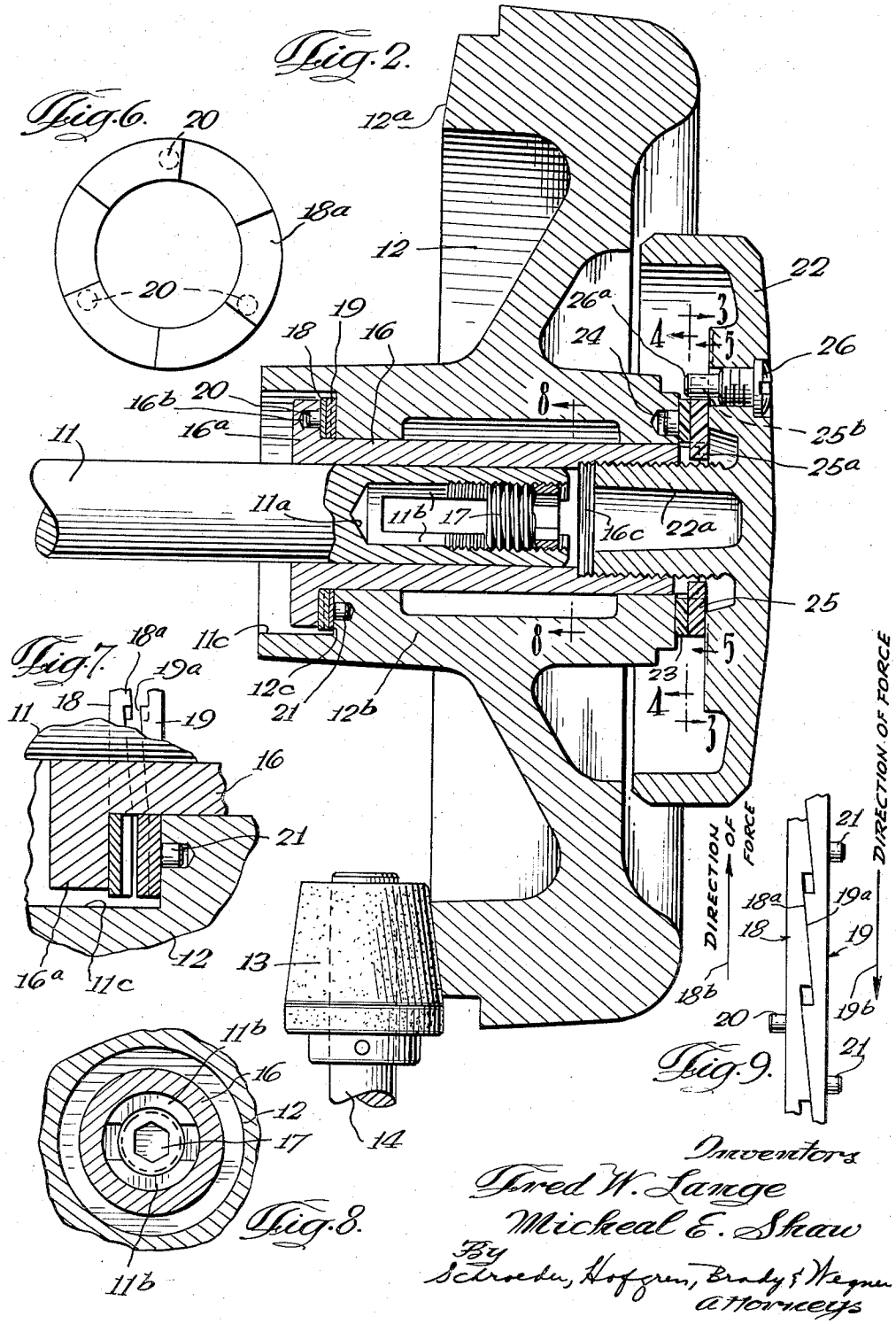


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CLUTCH MECHANISM FOR A SEWING MACHINE DRIVE

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2,863,410

CLUTCH MECHANISM FOR A SEWING MACHINE DRIVE

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Application February 3, 1955, Serial No. 485,859

3 Claims. (Cl. 112—220)

This invention relates to a clutch apparatus for operably connecting and disconnecting a drive element to a driven element.

The invention is particularly but not exclusively applicable to a sewing machine. In the ordinary sewing machine there is provided a drive shaft for operating the working parts of the machine. Thus, the drive shaft which is usually driven by a motor or other driving means serves to operate the needle drive, the shuttle, the cloth feed apparatus, the thread take-up lever and other operating parts. In order to rotate the drive shaft, there is customarily provided a drive wheel thereon with the motor or similar means driving through this wheel. The wheel is also ordinarily used for operating the bobbin winding mechanism of the machine for winding the bobbin with thread.

In order to prevent rotation of the drive shaft and thus operation of the parts of the sewing machine when the bobbin is being wound, it is customary to provide a clutch mechanism for releasably securing the drive wheel to the drive shaft. Then when the sewing machine is operating in its normal manner, the clutch mechanism serves to bind the wheel to the shaft. When the wheel is rotated to wind the bobbin or for other non-sewing purposes, the clutch can be released so that the drive wheel will rotate freely on the shaft and without rotating the shaft. The invention here is concerned primarily with an improved releasable clutch apparatus and associated parts of the sewing machine.

The improved clutch apparatus of this invention comprises a clutch member operably attached to the shaft for rotation therewith, a clutch member operably attached to the drive wheel for rotation therewith, the clutch members including cooperating locking portions for releasably attaching together the clutch members and thus the shaft and wheel for rotation as a unit, and means for thusly releasably engaging the clutch members.

The invention will be described as illustrated in the embodiment shown in the drawings. Of the drawings:

Fig. 1 is a fragmentary end elevational view partially in section of a sewing machine head embodying the invention.

Fig. 2 is a sectional elevational view showing the drive wheel, drive shaft, releasable clutch apparatus and associated parts of the sewing machine.

Fig. 3 is a fragmentary sectional elevation, taken substantially along line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional elevation, taken substantially along line 4—4 of Fig. 2.

Fig. 5 is a fragmentary sectional elevation, taken substantially along line 5—5 of Fig. 2.

Fig. 6 is a side elevational view showing the operating face of one of the clutch members forming a part of the improved clutch apparatus.

Fig. 7 is an enlarged fragmentary sectional view showing the clutch members in separated arrangement.

Fig. 8 is a fragmentary sectional view, taken substantially along line 8—8 of Fig. 2.

Fig. 9 is a fragmentary side elevational view of the clutch members in cooperating contact with each other.

The sewing machine head illustrated in the accompanying drawings is of the ordinary household type and preferably employs the driving arrangement illustrated in the copending application of Frank S. Howard, Serial No. 288,253, filed May 16, 1952. The sewing machine head comprises a frame 10 having a substantially horizontal drive shaft 11 in the upper portion thereof and a drive wheel 12 mounted on the shaft 11. The wheel 12 is rotated by a rubber driving spindle 13 bearing against an inner surface portion 12*a* of the wheel. The spindle 13 is mounted on a motor shaft 14 which forms a part of and is rotated by an electric motor 15. Means such as a spring (not shown) is provided urging the motor and thus the spindle 13 outwardly against the surface portion 12*a* of the drive wheel 12. In the normal sewing operations, rotation of the spindle 13 rotates the wheel 12 which in turn rotates the drive shaft 11 and operates the parts of the sewing machine. In the embodiment shown, the motor 15 rotates the wheel 12 in a counterclockwise direction as viewed from the right-hand end of Figs. 1 and 2.

The end of the drive shaft 11 is provided with an elongated cylindrical bearing member 16 fastened to the shaft. This end of the shaft is hollow to provide a hollow chamber 11*a* and this hollow end is split into a plurality of branches 11*b* which are internally taper threaded. The tapered threaded internal surface portions of these branches 11*b* taper inwardly and toward each other, as illustrated in Fig. 2. There is also provided a headless taper screw 17 which engages the threads on the branches 11*b* to exert a great expanding force thereon. This screw is screwed inwardly to force the shaft branches 11*b* outwardly and bind them tightly against the bearing member 16 so that the bearing member and the shaft 11 are connected for rotation as a unit.

The inner end of the bearing member 16 is provided with an outwardly extending annular flange 16*a*. The drive wheel 12 is provided with an enlarged essentially annular inner portion 12*b* which is mounted on the bearing member 16. The inner end of this enlarged portion 12*b* is provided with a hollow chamber 11*c* which surrounds the flange 16*a*.

The wheel 12 is slidable longitudinally on the bearing member 16. This sliding movement is provided in order to selectively lock and release the wheel on the bearing member 16 and thus on the shaft 11.

In order to secure a positive lock, the wheel base or inner portion 12*b* and the bearing member 16 are provided with interlocking clutch members having locking portions which cooperate to attach together the shaft and the wheel for rotation as a unit when desired. In the embodiment shown, the clutch apparatus includes a first clutch member 18 mounted on the flange 16*a* and facing the drive wheel 12 and a second clutch member 19 mounted on the wheel 12 and facing the flange 16*a*. Both clutch members are located within the space provided by the hollow chamber 11*c* and are positioned between the flange 16*a* and the adjacent surface portion 12*c* of the wheel 12.

The first clutch member 18 is in the form of an annular ring that may be fastened to the flange 16*a* by means of a plurality of rearwardly extending studs 20 engaging similarly shaped openings 16*b* in the flange 16*a*. The second clutch member 19 may be similarly fastened to the wheel 12*b* by studs 21 engaging similar openings in the wheel. The clutch members 18 and 19 may also be made integral with their respective parts of the ap-

paratus. Each clutch member **18** and **19** is provided with a series of cooperating locking portions. In the embodiment shown, these locking portions comprise a series of shallow projecting detents **18***a* and **19***a*, as illustrated most clearly in Figs. 6 and 7. These detents have upper inclined surfaces of relatively large area, all inclined in the same direction around the axis, with the maximum height of each detent being relatively small so that the slope of each detent upper surface is relatively shallow. With this construction when the wheel **12** has been moved inwardly to its greatest extent as illustrated in Fig. 2, the detents **18***a* and **19***a* engage each other as they are arranged to internest, thereby locking securely the wheel **12** to the bearing member **16** and thus to the drive shaft **11** for rotation as a unit. When the wheel has been moved outwardly a distance sufficient to disengage the detents **18***a* and **19***a* as illustrated in Fig. 7, the wheel **12** is then free to rotate on the bearing member **16**. Thus, in the illustrated embodiment, the maximum height of each detent **18***a* and **19***a* is less than a normal minimum axial movement of the wheel **12** along the bearing member **16**.

The detents **18***a* and **19***a* in the embodiment shown are helical cam lobes that have engaging cam surfaces **18***a* and **19***a* mating and operating to urge the cam members **18** and **19** away from each other by a wedging action as illustrated by the lines of force indicated at **18***b* and **19***b*.

In order to move the wheel **12** longitudinally on the bearing member **16** to engage and disengage the detents **18***a* and **19***a*, the outer end of the bearing member **16** which extends beyond the outer end of the shaft **11** is internally threaded as indicated at **16***c*. There is then provided a rotatable knob **22** having an inwardly projecting shank **22***a* similarly threaded and engaging the threads **16***c*. This knob **22** when rotated moves inwardly and outwardly relative to the shaft **11** and moves the drive wheel **12** along the bearing member **16**.

In order to provide low friction surfaces, there is provided a first bearing member **23** having a low coefficient of friction. This first bearing member is attached to the outer annular surface of the wheel **12** that surrounds the outer end of the bearing member **16**. The bearing member **23** is attached to the wheel by a plurality of studs **24** engaging similar openings in the wheel **12**.

There is also provided a second bearing member **25** bearing against the outer surface of the first bearing member **23**, as illustrated in Fig. 2. This second bearing member **25** is provided with diametrically located inwardly extending ears **25***a* engaging similarly shaped slots **16***d* on the outer end of the bearing member **16**. The second bearing member **25** is also provided with three outwardly extending projections **25***b* spaced substantially 120° apart around the outer periphery thereof. The knob **22** is provided with a stop bolt **26** extending through the knob and having a projecting shank portion **26***a* located adjacent to the outer edge of the bearing member **25** and between two adjacent projections **25***b*. This shank portion **26***a* engaging the pair of adjacent projections **25***b* determines the extent of rotational movement of the knob **22**.

When the knob **22** is rotated slightly less than 120° or from its position against one bearing member projection **25***b* to the next bearing member projection **25***b*, the knob is moved inwardly or outwardly relative to the bearing member **16** and thus the shaft **11**. This movement is caused by the threaded engagement of the knob shank **22***a* with the bearing member **16**. These threads have a pitch such that they cause movement of the wheel **12** a sufficient distance to release the detents **18***a* and **19***a* as shown in Fig. 7 when the knob is rotated in a counterclockwise direction, as viewed from the right-hand end of the embodiment shown in Figs. 1 and 2. Then, when the knob is turned in a clockwise direction, the wheel **12** is moved to the left, as viewed in Figs. 1 and 2, to engage the detents and lock the wheel on the bearing member **16** and thus on the shaft **11**.

The three projections **25***b* are provided so that the proper relationship can be obtained for moving the wheel so as to engage and disengage the detents on rotation of the knob. Thus in the embodiment shown, the second bearing member **25** has four possible positions relative to the bearing member **16**. It has the position shown in Fig. 3, the position where it is removed from engagement with the end of the bearing member and rotated 180° and then placed back in engagement with the bearing member **16**, and the reverse of these two positions when the bearing member is turned over. With this variation and with providing three projections, it is simple to assemble the second bearing member **25** on the machine so that rotation of the knob **22** to move the shank portion **26***a* of the bolt **26** from engagement with one projection **25***b* to engagement with the next projection **25***b* will cause the detents to engage or disengage, depending upon the direction of this movement.

When the operating parts of the clutch apparatus are in the positions shown in Figs. 1 and 2, the detents **18***a* and **19***a* are in engagement so that rotation of the drive wheel **12** by means of the motor **15** and spindle **13** will cause rotation of the drive shaft **11**. When it is desired to disengage the clutch apparatus, the knob **22** is rotated in a counterclockwise direction as viewed from the outer end of this knob. The extent of this rotation of the knob is determined by the shank portion **26***a* contacting the next bearing projection **25***b*. The extent of this movement is sufficient to withdraw the knob **22** from the bearing member **16** so that the wheel **12** can move away from the flange **16***a*. This outward movement of the wheel is caused by the spindle **13** always urging the wheel outwardly. The extent of movement is sufficient to disengage the detents **18***a* and **19***a*. The wheel may then be rotated freely on the bearing **16** without rotating the drive shaft **11**.

Because the motor **15** and spindle **13** urge the wheel **12** outwardly, the bearings **23** and **25** are provided so as to avoid excessive wear and heating of the wheel rotating against the stationary knob **22**. These bearings are made of a low friction material such as molded nylon.

Having described our invention as related to the embodiment shown in the accompanying drawings, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

We claim:

1. In a sewing machine, apparatus comprising: a drive shaft rotatable about its axis; an elongated bearing member on said shaft for rotation therewith having an annular flange on its inner end; a drive wheel rotatable on said bearing member and slidable axially thereon; a first clutch member attached to said flange; a second clutch member attached to said wheel, the clutch members including cooperating engageable locking portions of shallow depth for releasably attaching together said clutch members; a knob threaded to said shaft positioned on the side thereof opposite to said flange, the knob selectively moving said wheel toward and away from said flange on rotation of the knob to engage and disengage said clutch members; an annular first bearing concentric to said shaft adjacent to the outer side of said wheel and attached thereto; an annular second bearing concentric to said shaft between said first bearing and said knob and attached to said bearing member, said second bearing having spaced stop means thereon; and means on said knob engaging said stop means for limiting the extent of said rotation of said knob.

2. In a sewing machine, apparatus comprising: a drive shaft rotatable about its axis; an elongated bearing member on said shaft for rotation therewith having an an-

nular flange on its inner end; a drive wheel rotatable on said bearing member and slidable axially thereon; a first clutch member attached to said flange; a second clutch member attached to said wheel, the clutch members including cooperative engageable locking portions of shallow depth for releasably attaching together said clutch members; a knob threaded to said shaft positioned on the side thereof opposite to said flange, the knob selectively moving said wheel toward and away from said flange on rotation of the knob to engage and disengage said clutch members; an annular first bearing concentric to said shaft adjacent to the outer side of said wheel and attached thereto; an annular second bearing concentric to said shaft between said first bearing and said knob and attached to said bearing member, said second bearing having spaced stop means thereon; means for positioning said first and second bearings at any of a plurality of positions relative to each other; and means on said knob engaging said stop means for limiting the extent of said rotation of said knob.

3. In a sewing machine, apparatus comprising: a drive shaft rotatable about its axis; an elongated bearing member on said shaft for rotation therewith having an annular flange on its inner end; a drive wheel rotatable on said bearing member and slidable axially thereon; a first

clutch member attached to said flange; a second clutch member attached to said wheel, the clutch members including cooperating engageable locking portions of shallow depth for releasably attaching together said clutch members; a knob threaded to said shaft positioned on the side thereof opposite to said flange, the knob selectively moving said wheel toward and away from said flange on rotation of the knob to engage and disengage said clutch members; a first bearing attached to said drive wheel; a second bearing attached to said bearing member and normally outwardly of and engaging said first bearing; and means including cooperating projections on said second bearing and said knob to limit the extent of movement thereof away from said flange to that sufficient only to disengage said locking portions.

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