July 21, 1959 W. ENGEL ET AL 2,895,441

SEWING MACHINE

Filed Aug. 6, 1956 4 Sheets-Sheet 1

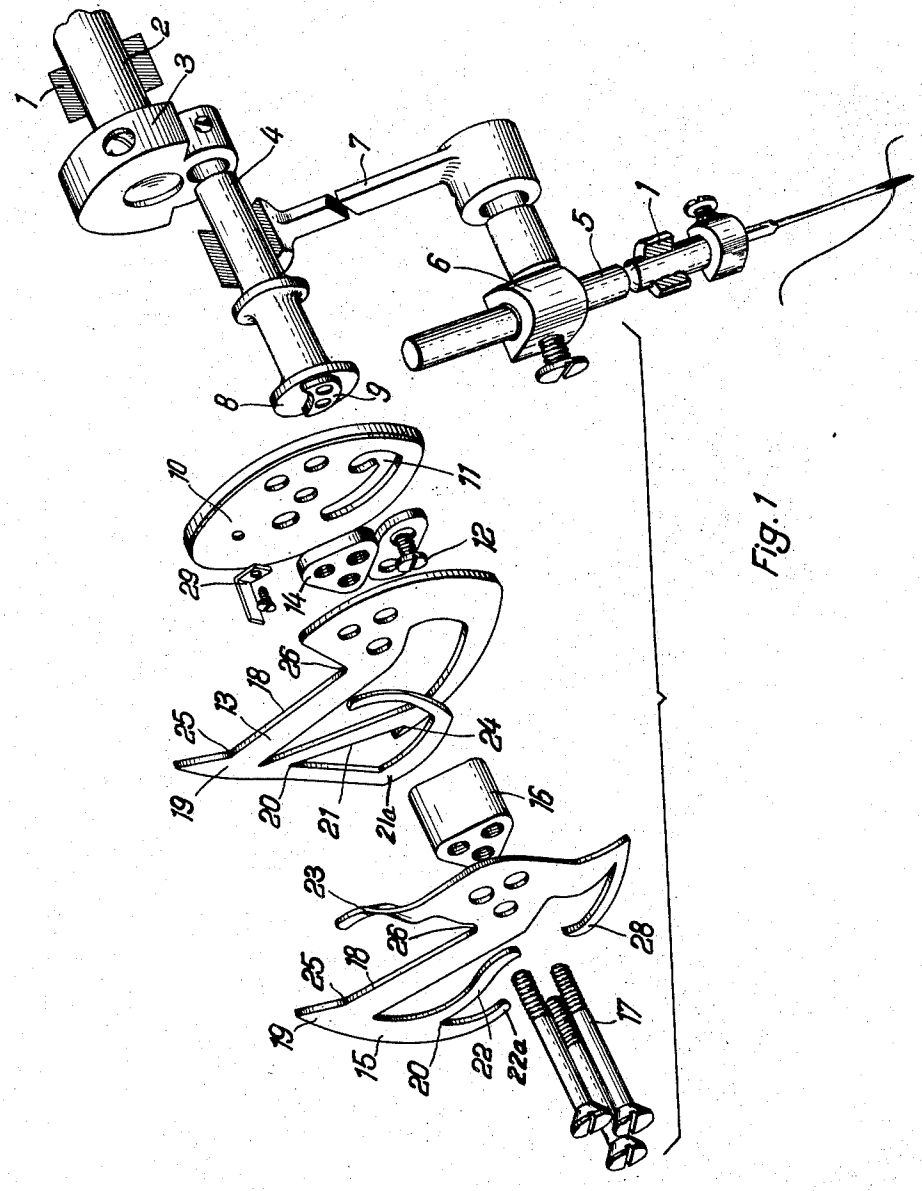


Fig. 1

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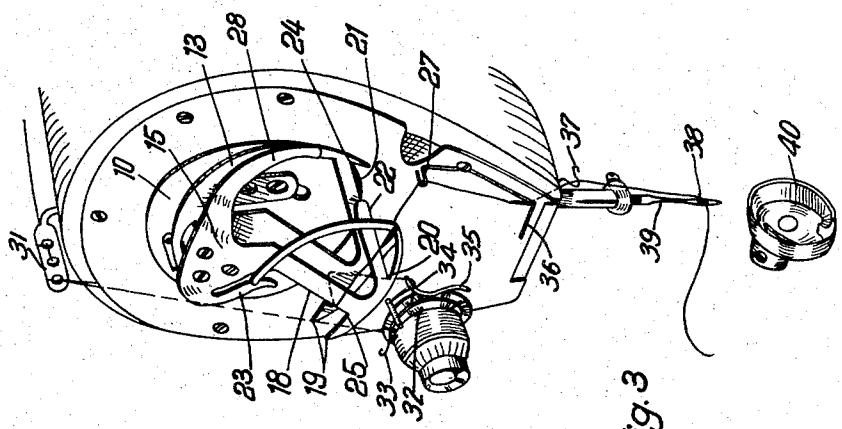


Fig. 3

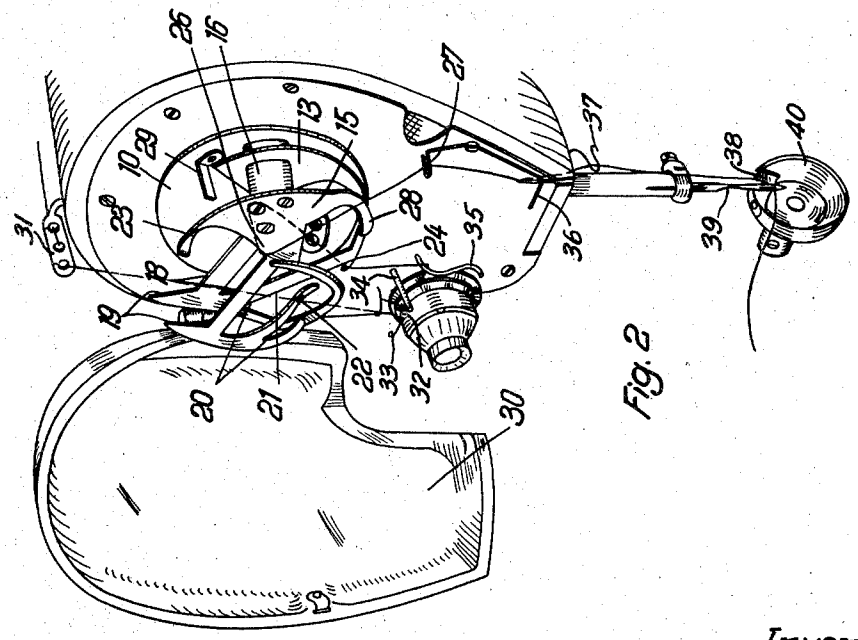


Fig. 2

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July 21, 1959 W. ENGEL ET AL 2,895,441

SEWING MACHINE

Filed Aug. 6, 1956 4 Sheets-Sheet 3

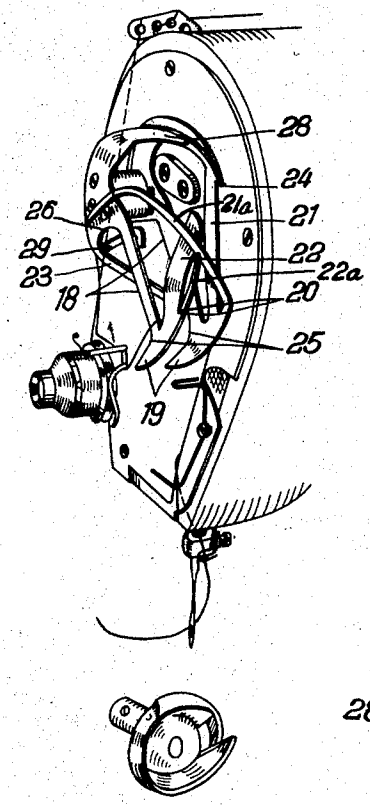


Fig. 4

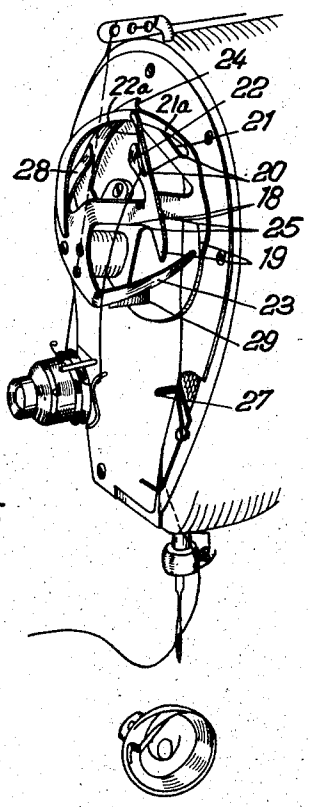


Fig. 5

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July 21, 1959 W. ENGEL ET AL 2,895,441

SEWING MACHINE

Filed Aug. 6, 1956 4 Sheets-Sheet 4

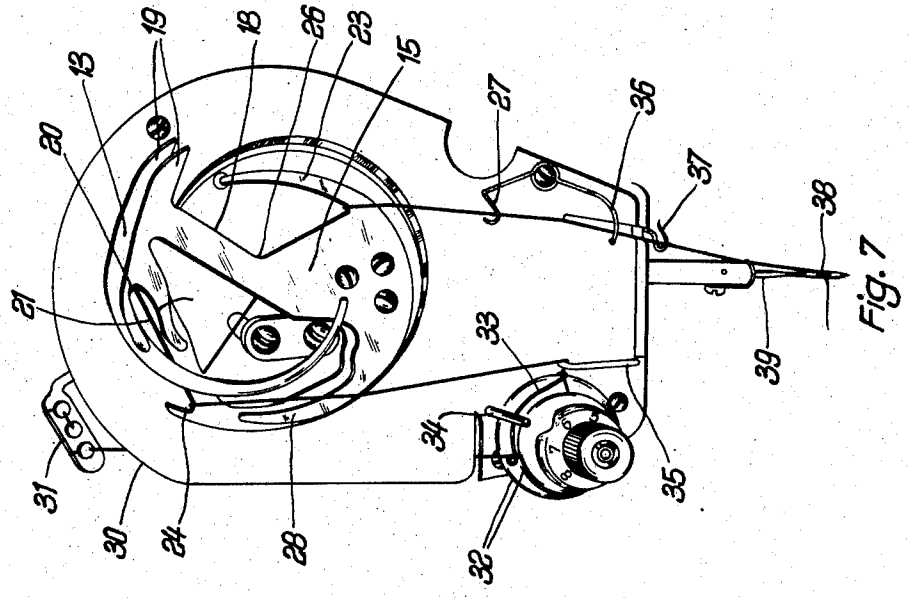


Fig. 7

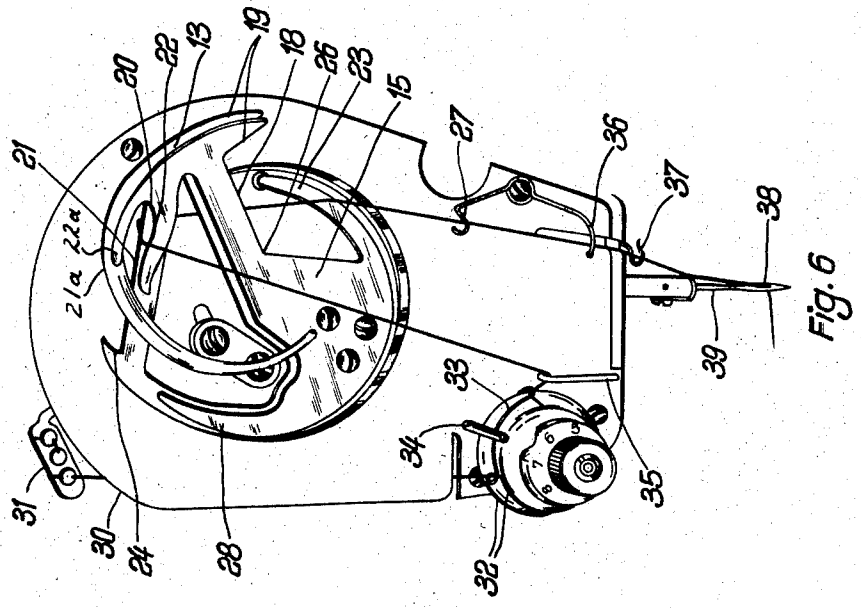


Fig. 6

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2,895,441

SEWING MACHINE

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Application August 6, 1956, Serial No. 602,333

Claims priority, application Germany August 10, 1955

3 Claims. (Cl. 112—248)

This invention concerns improvements relating to continuously rotating thread feed control devices, for sewing machines, of the kind which make a full revolution during the formation of one stitch.

Various such devices have been proposed heretofore, but had such a large diameter of circular motion of the rotating parts that they could not be accommodated on domestic sewing machines or were out of proportion for such machines.

An object of the present invention is to provide a rotary thread feed control device which is suitable for domestic as well as industrial machines.

To this end, according to the invention, a thread feed control device disposed on the head of a sewing machine and directly driven by the arm shaft thereof comprises two thread-guiding discs spaced at a distance apart axially with respect to the shaft and having respective thread-receiving control grooves, respective thread-yielding control edges which extend at the same distance apart over a certain length, respective thread-deflecting edges which extend angularly from the gap between the said control edges and a thread-receiving groove in the direction towards which the said thread-deflecting edges extend. As the thread extends, in the axial direction, transversely across the two discs, it will be seen that the diameter of circular motion of the rotating parts depends on the distance between the discs. It is, however, important that the length of thread extending transversely across the discs should be reduced to zero during the thread-slackening phase of machine operation in order to guide the thread into the catching corner.

A further object of the invention is to provide a rotary thread-control device which is suitable for other kinds of hooks as well as rotary hooks which rotate continuously once per stitch formation. This can be achieved by determining the distance between the two thread-control discs by means of exchangeable spacing pieces of different thicknesses. The thickness employed will depend on the amount of thread required by the rotary hook or like system used. In order to be able to give out and take up different amounts of thread when the distance between the discs is changed, the thread-receiving groove must be disposed on the inner disc.

At high speeds of rotation, the thread lifts away from the thread-yielding edges during the phase in which the loop is enlarged by the hook. To prevent the thread from performing centrifugally produced movements which could lead to thread breakage, pointed projections are disposed at the outer ends of the thread-yielding edges and approximately at right-angles thereto, the length of the projections being such that they liberate the thread when it has been received by the aforesaid control grooves.

To prevent the length of thread which extends towards the needle eye from winding round the spacing piece after the knot formation, that is to say after leaving the control grooves, a thread guiding limb is arranged to extend from the outer disc, that is the disc further from

the head, to the region of the inner disc in such a manner that the free end of the said limb receives the length of thread extending towards the needle eye when the thread leaves the control grooves.

To prevent the thread from becoming wound round the two discs in the event of thread breakage, the arrangement is made such that the thread does not, during normal sewing, move in a region between the two discs which begins at the outer end of the aforesaid thread-guiding limb and ends at the outer end of a second thread guiding limb provided on the outer disc and a thread cutter is disposed in this region. In the event of thread breakage, the path of the thread becomes changed so that the thread does enter the said region and is severed by the cutter and thus prevented from becoming wound round the discs.

For the sake of safety and appearance, a cover hinged to the head of the machine encloses the thread-control arrangement together with the thread over substantially the entire face of the head.

One embodiment of the invention by way of example is illustrated in the accompanying drawings, in which:

Figure 1 is an exploded perspective view of the thread-control arrangement,

Figures 2 to 5 are perspective view showing the said arrangement and the rotary hook and the needle in successive positions during the formation of a stitch, and

Figures 6 and 7 are front views showing the device in different positions of operation.

The arm shaft **2** mounted in the machine arm **1** carries the crank **3** at the head end of the arm in the usual manner. The crankpin **4** is fixed in the crank **3** at a radial distance from the shaft **2**. The needle bar **5** guided in the head carries a block **6** which is connected to the crankpin **4** by a link **7**. The end of the crankpin **4** is enlarged by a flange **8** which carries a key **9** of an arcuate shape whose center point coincides with the axis of the shaft **2**. An intermediate disc **10** which bears against this end of the crankpin **4** has an arcuate slot **11** corresponding to the key **9** and is secured to the crankpin by two screws **12**. As the slot **11** in the disc **10** is longer than the key **9** on the crankpin **4**, the said disc **10** can be adjusted angularly, within limits, about the axis of the shaft **2**. In order to obtain sufficient thread clearance between an inner rotary thread-control disc **13** and the disc **10**, a spacing disc **14** is disposed between them. Similarly, a spacing disc or piece **16** is disposed between the said inner disc **13** and an outer thread-control disc **15**. All these other discs are fixed to the disc **10** by screws **17**.

The two discs **13**, **15** each have a thread-yielding or feeding edge **18** controlling the feeding of the thread. The edges **18** coincide as seen in the axial direction and are parallel as seen in the radial direction. They extend radially outward from the axis of rotation of the device The outer ends of the said edges **18** are adjoined by identical pointed projections or noses **19** extending approximately at right angles to the said edges.

As shown in Fig. 2 thread is supplied from the yarn roll (not shown) by way of the head of the sewing machine through guide **31** behind cover **30** and downwardly; then the thread is wedged between the tensioning disks **32** and laid around tensioning spring **33** below pin **34** and around the angular control member **35** upwardly to the thread feeding device. The thread is now placed behind the control disk **13**, brought forward around disk **15** where it locates in the corner of throat **26**. From this point, the path of the thread leads through the ear **27** downwardly and behind ears **36** and **37** to the eye **38** of needle **39**.

As the thread feeding device rotates, the thread slides from the corner **26** upon guiding edges **18** as illustrated in Fig. 3 against the pointed projections or noses **19**. Here it remains until, as indicated in Fig. 4, it is received in the corners **20** of the two disks **13** and **15**. At this point the noses **19** on the disks release the thread and at the same time the catch **40** enters into the loop formed below the material being sewed.

During approximately the next quarter revolution of the device, the two corners **20** receive the loop thrown off by the rotary hook and pull on the thread for the purpose of forming the knot (Fig. 5). During the subsequent slackening of the thread (Fig. 6), it leaves the corners **20** and slides along a thread-deflecting or control edge **21** of the inner disc **13**, along a thread-deflecting edge **22** of the outer disc **15** and along a thread guiding limb **23** which extends from the outer disc **15** to the region of the inner disc **13** and thus guides the length of the thread, extending towards the needle eye, from the underside of the disc **13** to the upper side of the disc **15**. After slackening of the thread has taken place (Fig. 7), a thread-catching claw **24** at the end of the edge **21** receives the thread. The two edges **21** and **22**, which coincide as seen axially, extend at an acute angle to the edges **18** and, from the gap between the latter, they extend angularly in the direction of the claw **24**. The thread-guiding limb **23** and the thread-deflecting edges **21** and **22** co-operate in such manner that thread slackening is effected gently and not before the disappearance of the teeth of the toothed head beneath the stitch plate has been completed.

As more clearly illustrated in Figs. 5 and 6, a pair of thread receiving arms **21***a* and **22***a* are angularly spaced from the hooks or noses **19** and extend generally circumferentially and the guiding edges **21**, **22** commence inwardly of said arms **21***a*, **22***a* substantially in the manner of the chord of a circle and gradually converge toward each other. Each guiding edge **21**, **22** forms a corner **20** with the respective associated receiving arm **21***a*, **22***a*. A spur or claw **24** defining a throat is disposed at the end of the guiding edge **21**.

Since the coincident control corners **20** of the two discs, over which the thread runs, are axially spaced from each other, while there is only one thread-catching claw **24**, there is both a smaller distance from the corners **20** to the outer ends **25** of the two edges **18** and a smaller distance from the corners **20** to the axis of rotation of the two discs **13**, **15** than in the case of rotary devices which control the thread by means of a single disc. The smaller amounts of unbalance of the rotating masses thereby entailed makes the present arrangement suitable for both high-speed sewing machines and domestic machines by virtue of its small diameter of circular motion. Moreover, as the thread extends axially between the two corners **20**, the arrangement permits early knot formation.

On further rotation of the device, the length of thread from it to the needle eye is laid in the groove **26** (Fig. 2) formed between the thread-guiding limb **23** on the outer disc **15** and the two coincident edges **18**, while the claw **24** liberates the length of thread between the control device and the tensioning device. During this phase of the rotation, the thread is practically neither fed out nor taken up, since at this time the needle has formed the loop and the point of the hook enters the loop.

When, on further rotation of the device, the edges **18**, extending radially outwards, have assumed a downwardly inclined direction (Fig. 3), the thread slides from the groove **26** onto the edges **18**. In order to achieve good control by the edges **18**, a thread guide **27**, for the length of thread extending to the eye of the needle, is disposed near the diameter of circular motion of the device and beside the latter, so that the thread slides on the downwardly inclined edges **18** without uncontrollable movements being centrifugally produced which would lead to thread breakage.

Simply by changing the spacing disc **16** for one of a different thickness, the distance between the two discs **13** and **15** and hence the amount of thread required for the hook can be changed. It is thus possible by changing the said disc **16**, but without changing the control edges of the discs **13** and **15**, to provide for special cases of thread manipulation such as may occur, for example, when sewing thick materials. Moreover, it is thus also possible to use the same discs **13** and **15** for different hook systems.

Between the two discs **13** and **15**, a thread cutter **29** is disposed in the region of the unbroken outer edges between the outer end of the limb **23** and the outer end of a second thread-guiding limb **28** provided on the disc **15**, the cutter rotating with these limbs. This region is not touched by the thread during normal sewing, but in the event of thread breakage the thread between the two discs **13** and **15** comes to lie in this region also and is severed by the cutter **29**.

The arrangement described is suitable for both straight-stitch and zig-zag machines and for other kinds of hooks as well as hooks which rotate continuously once per stitch formation. In the arrangement illustrated rotation is in the counterclockwise direction, but, with appropriate disposition of the thread-tensioning device and of the means guiding the thread from the said device through the said arrangement to the needle eye, rotation in the clockwise direction can be employed.

As a protection against accident, the thread-control device and the thread are enclosed, over substantially the entire face of the head of the machine housing, by a cover **30** which is hinged to the head.

We claim:

1. In a sewing machine having an arm shaft, a rotary thread feed control device comprising a pair of spaced thread control disks mounted in axial alignment at the head of the machine in direct driving engagement with said arm shaft and having a plurality of conformations adapted to guide and support varying lengths of thread including a pair of members presenting thread guiding edge portions extending in substantially parallel alignment radially outwardly of said disks, a pair of nose portions extending one each substantially at right angles to and endwise of said guiding edge portions, a pair of thread catching arms having portions extending generally circumferentially of said device in the normal direction of rotation, one in each disk, a pair of members presenting thread deflecting edge portions extending from and inwardly of said arms and defining thread catching throats at the juncture with said arms, and a thread catching claw defined endwise of one said thread deflecting edge portions on one said disk and extending outwardly of one said edge portion and in generally opposite direction to said arms, and a spacing means between the disks for fixing the distance between said disks, said spacing means including a dismountable spacing member disposed between and generally centrally of said disks.

2. In a sewing machine having an arm shaft, a rotary thread feed control device comprising a pair of spaced thread control disks mounted in axial alignment at the head of the machine in direct driving engagement with said arm shaft and having a plurality of conformations adapted to guide and support varying lengths of thread including a pair of members presenting thread guiding edge portions extending in substantially parallel alignment radially outwardly of said disks, a pair of nose portions extending one each substantially at right angles to and endwise of said guiding edge portions, a pair of thread catching arms having portions extending generally circumferentially of said device in the normal direction of rotation, one in each disk, a pair of members presenting thread deflecting edge portions extending from and

inwardly of said arms and defining thread catching throats at the juncture with said arms, and a thread catching claw defined endwise of one said thread deflecting edge portions on one said disk, which is disposed proximate the end of said arm shaft, said claw extending outwardly of one said edge portion and in generally opposite direction to said arms, and a first thread guiding limb on said control disk remote from the end of said shaft extending outwardly from the center into the region of the other said control disk, adapted at its free end to receive the portion of thread extending downwardly toward the eye of the needle when said device is in the position where said thread leaves said thread catching corner portions.

3. Device in accordance with claim 2 including a second thread guiding limb on said disk remote from said arm shaft extending along the circumference of said disk and a rotatably mounted thread cutter extending intermediate said pair of control disks and between the ends of said thread guiding limbs.

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