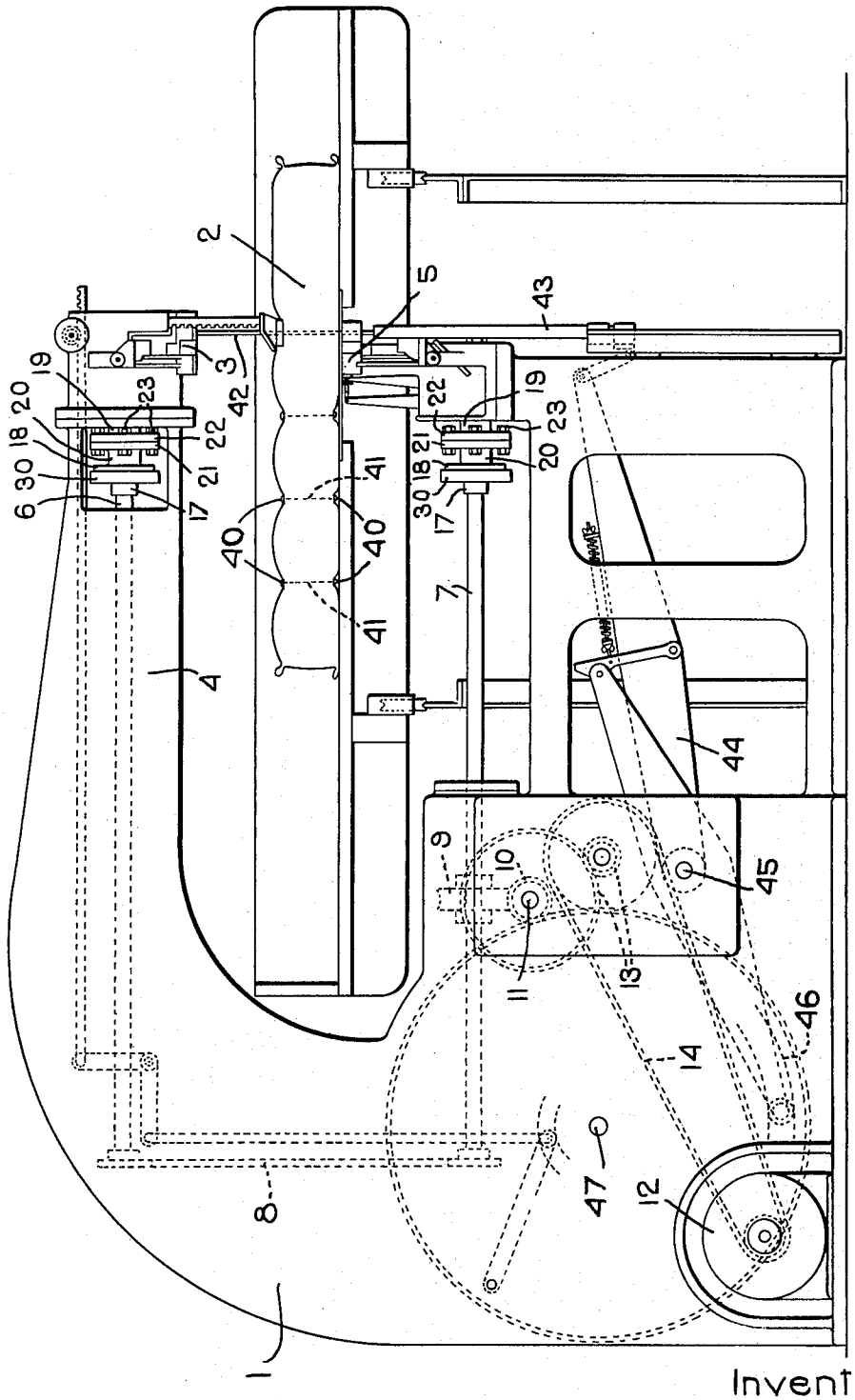
Nov. 9, 1937. W. B. MATHEWSON 2,098,785

TUFTING MACHINE

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Fig. 1.



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Fig.2.

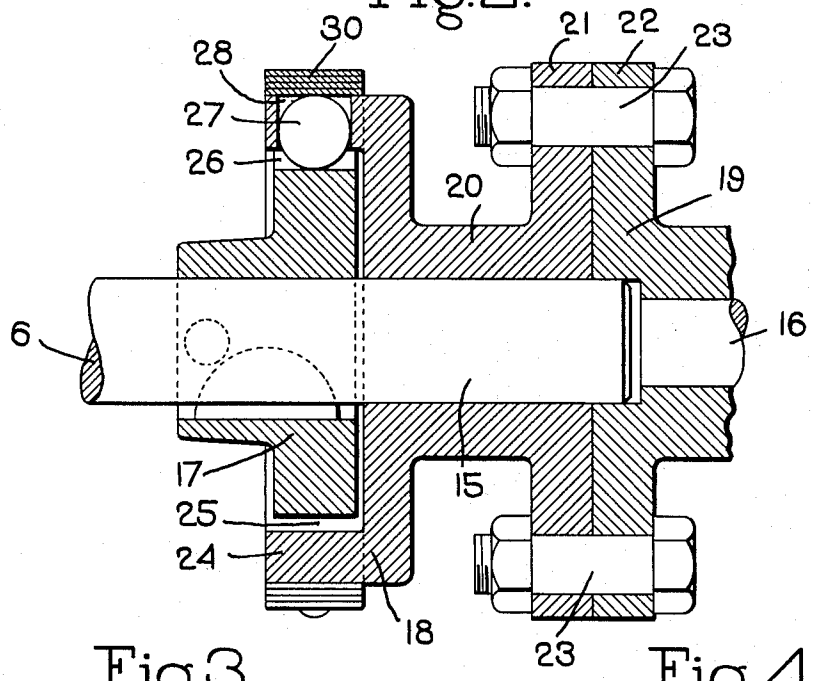


Fig.3.

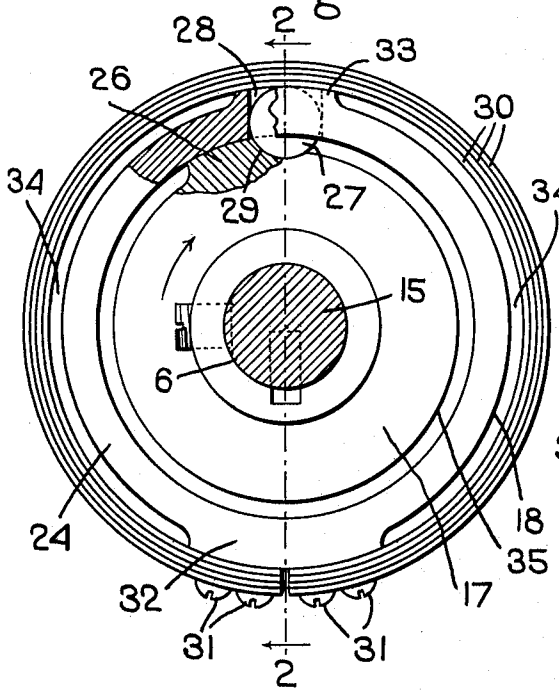
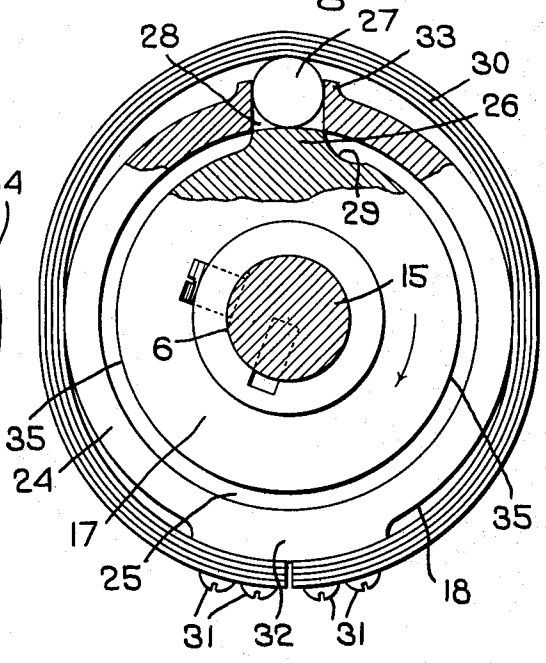


Fig 4



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UNITED STATES PATENT OFFICE

2,098,785

TUFTING MACHINE

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Application December 28, 1936, Serial No. 117,689

3 Claims. (Cl. 112—3)

This invention relates to tufting machines and particularly to that type of tufting machine adapted for tying tufting elements (which may be in the form of tufts, buttons or have any other form which makes them suitable for tufting mattresses, cushions or the like) on both sides of a mattress, cushion or the like.

These tufting machines are usually provided with two knotting devices, one operating on each side of the mattress and each adapted to tie the tufting element to the tufting cord which has been threaded through the mattress, and usually the machines are constructed so that the knotting devices operate successively, the knotting device on one side of the mattress operating first to tie a tufting element to the tufting cord and subsequently the knotter on the opposite side of the mattress becoming operative to tie a second tufting element on the other side of the mattress. The two knotting devices are usually operated from two drive shafts which are driven from a common prime mover, and in order that the machine may function properly it is imperative that the two knotting devices should be kept in proper timed relation.

In order to prevent the machine from becoming damaged in case either knotter mechanism meets an abnormal obstruction, the driving shafts for each knotting device may have a yielding connection therein in the form of a slip clutch which will give when the shaft is subjected to abnormal torque such as would be caused if the knotting mechanism meets with some abnormal obstruction.

In accordance with the present invention I have provided a novel yielding driving connection for the drive shaft of each clutch mechanism which will not only yield or give if the knotting mechanism meets any abnormal obstruction, thus preventing damage to the machine, but which will automatically restore the two drive shafts to their proper timed relation when the machine is started again after the obstruction has been removed.

In order to give an understanding of the invention I have illustrated in the drawings a selected embodiment thereof which will now be described after which the novel features will be pointed out in the appended claims.

My improvements are adapted for use in connection with tufting machines of various types which embody two separate knotting devices operating on opposite sides of a mattress, cushion or the like, and merely for the purpose of illustrating the invention I have shown it as it might be applied to the tufting machine of the type illustrated in my Patent No. 2,048,348, July 21, 1936.

In the drawings;

Fig. 1 illustrates a tufting machine such as shown in my above-mentioned Patent No. 2,048,348 having the present improvements applied thereto;

Fig. 2 is a sectional view through the yielding driving connection for the drive shafts of the knotters taken on the line 2—2, Fig. 3;

Fig. 3 is a view of Fig. 2 looking toward the right with parts broken out and showing the yielding driving connection in its operative relation.

Fig. 4 is a view similar to Fig. 3 but showing the action of the yielding driving connection when one of the knotting devices meets an abnormal obstruction.

Referring first to Fig. 1, 1 indicates generally a mattress-tufting machine adapted to tie the tufting elements 40 to a tufting cord 41 both at the top and the bottom of a mattress 2. This tufting machine, which is similar to that shown in my above-mentioned Patent No. 2,048,348, is provided with a needle 42 for inserting the tufting cord 41 through the mattress, an upper tufting knotter 3 carried by the overhanging arm 4 of the machine and adapted to tie the tufting element 40 to the tufting cord 41 on the top of the mattress, and a lower tufting knotter 5 operating beneath the mattress and adapted to tie another tufting element to the tufting cord on the bottom of the mattress. Each tufting knotter includes a controlling cam device which makes a single revolution for each knot-tying cycle. These tufting knotters may have any appropriate construction such, for instance, as that shown in the above-mentioned Patent No. 2,048,348, and hence I have not thought it necessary to illustrate them in detail, as their construction and operation will be evident by referring to said patent.

For the purpose of this invention it is sufficient to say that the movements of each knotter are controlled by a cam device which, in the construction illustrated in said patent, makes one revolution for each knotting cycle, and that the cam device for the upper knotter 3 is connected to and is rotated by an upper drive shaft 6, while the cam device for the lower knotter 5 is connected to and is driven by a lower drive shaft 7. These two drive shafts 6 and 7 are connected together by a suitable sprocket chain connection 8 and are driven from a common prime mover

so that they will be rotated in unison, each shaft making one complete rotation for each cycle of operations.

In the construction shown the shaft 7 has a worm gear 9 thereon meshing with a worm 10 on a shaft 11, and the latter is connected to a driving motor 12 through a suitable train of gearing 13 and belt drive 14, this manner of driving the drive shafts 6 and 7 being the same as that illustrated in the above-mentioned patent.

The tufting needle 42 is carried by a reciprocating slide 43 which is connected to and actuated by a lever 44 pivoted at 45 and controlled by a cam 46 mounted on the shaft 47 which is driven from the shaft 11 by suitable gearing.

The complete tufting cycle comprises passing a length of tufting cord through the mattress by the needle 42, tying a tuft or tufting element to the cord above the mattress by the operation of the upper tufting knotter 3, and then withdrawing the needle and tying a second tuft or tufting element to the tufting cord beneath the mattress through the operation of the tufting knotter 5. In order that the machine may function properly it is necessary that the two tufting knotters should be maintained in absolute timed relation so that during each complete and simultaneous rotation of the two drive shafts 6 and 7 each knotter will perform its function in proper timed relation with the other knotter.

As a safety measure it is also desirable to provide a yielding connection in the driving mechanism for each tufting knotter so that if the knotter meets any abnormal obstruction the yielding connection will give to prevent damage to the machine. In the case of the machine herein illustrated which is especially designed for tufting a mattress with tufting elements in the nature of tufting buttons it may happen that because of inaccurate placing of the tufting button the latter may be disposed in the path of the needle or some other moving part of the knotting mechanism, thereby forming an obstruction which would cause damage to the part unless the driving mechanism for the knotter could yield in some way.

The present invention provides a novel yielding connection which is adapted to be used with each driving shaft 6 and 7 and which will not only yield when the corresponding knotting device meets with an abnormal obstruction thereby preventing damage to the parts, but which will automatically bring the two knotting devices into their proper timed relation after the obstruction has been removed and maintain them in such relation.

The yielding driving connection embodying the invention is illustrated best in Figs. 2 to 4 and is in the nature of a slip clutch having a limited torque resistance but which is operative to transmit power from the drive shaft to the knotter only when said shaft and the cam device of the corresponding knotter have a predetermined relative angular position.

Each driving shaft is made in two sections, a driving section and a driven section, which sections are connected by the timing clutch construction embodying the invention. In Fig. 2 the two sections of the drive shaft 6 are shown at 15 and 16 respectively, 15 being the driving section and 16 the driven section which is connected to the knotter cams. The timing slip clutch herein illustrated comprises one clutch member 17 fast on the driving section 15 of the driving shaft and a cooperating clutch member 18 fast on the driven section 16 of said shaft. The driven section 16 of the shaft is shown as having a flange fitting 19 fast thereto to which is bolted a sleeve member 20 carrying the driven clutch member 18, said sleeve 20 constituting a bearing for the end of the shaft section 15. This sleeve section 20 is formed with a flange 21 which mates the flange 22 of the fitting 19, the two flanges being bolted together by suitable bolts 23.

The clutch member 18 is thereby rigidly secured to the shaft section 16.

The clutch member 18 is formed with the cylindrical flange portion 24 which provides within it a recess 25 in which the driving clutch member 17 operates. The clutch member 17 has an exterior diameter somewhat smaller than the interior diameter of the flange 24, and said clutch member is formed on its periphery with a clutching projection 26 adapted to cooperate with a ball 27 that is received in a radial opening 28 formed in the flange 24 of the clutch member 18. This ball is acted on by a suitable spring tending to urge it inwardly and when the parts are in normal driving position the ball rests in the seat 29 with which the clutch 17 is provided and engages one side of the clutch projection 26 as shown in Fig. 3.

The spring means yieldingly holding the ball in this operative position is herein shown as one or more leaf springs 30 which encircle the flange 24 of the clutch member 18 and the ends of which are secured to the clutch member in some suitable way, as herein shown by means of screws 31. The flange 24 is formed on its exterior with two raised portions 32 and 33, the raised portion 33 being located where the opening 28 is formed and the raised portion 32 being situated at the opposite side where the ends of the leaf spring 30 are secured to the clutch member. Because of this construction the leaf spring normally has contact with the clutch member 18 at the raised portions 32 and 33 only, said spring being spaced from the periphery of the flange 24 between these raised portions as shown at 34.

Assuming that the driving clutch member 17 and the shaft section 15 of the driving shaft are rotating in the direction of the arrow Fig. 3, the engagement of the clutching projection 26 with the ball 27 will serve to drive the driven clutch member 18 forward so that the rotative movement of the driving shaft section 15 will be transmitted to the driven shaft section 16 and thus to the knotter cams.

If, however, the driven shaft section 16 meets with abnormal torque resistance the clutch projection 26 will force the ball 27 backwardly against the action of the spring 30, as shown in Fig. 4, until said projection moves past the ball, thus disrupting the driving connection between the shaft sections 15 and 16. As soon as the clutching projection 26 has passed the ball 27, the spring 30 will force the ball inwardly against the periphery 35 of the driving clutch member 17 so that when said clutch member makes a complete revolution the clutching projection 26 is again brought into operative driving engagement with the ball 27. This clutch, therefore, provides a driving connection between the two shaft sections 15 and 16 when they have a predetermined angular relation only, and in case the shaft section 16 meets with undue torque resistance the clutch will give way or slip so that the shaft section 16 may remain stalled while the driving shaft section 15 makes a complete revo-

lution, at the end of which the two shaft sections are in their normal operative relative angular positions.

I will preferably place a timing slip clutch of this type in each of the drive shafts 6 and 7, as shown in Fig. 1, so that if either tufting knotter meets with any abnormal obstruction which might cause damage to the parts the corresponding clutch member will slip to allow the other knotter to complete the tufting cycle while the obstructed knotter remains stalled.

When the obstruction has been removed, however, the clutch device will automatically bring the two knotters back into their correct timed relation so that the tufting operation can proceed without requiring any manual adjustment to bring about the correct timing of the knotters relative to each other.

I claim:

1. A tufting machine having two knotters, a driving shaft for each knotter which makes one revolution for each knotting cycle, each driving shaft comprising a driving section, a driven section and a slip clutch connecting said sections, said slip clutch having a limited torque resistance and being operative to establish a driving connection between the driving and driven shaft sections when they have a predetermined relative angular position only, whereby when either knotter meets with abnormal resistance the corresponding clutch will slip and allow the driving section of the corresponding driving shaft to continue its rotation and upon the next rotation of the driving section the two shaft sections will be coupled in their correct predetermined angular position.

2. A tufting machine having two knotters, a driving shaft for each knotter which rotates through a predetermined angle for each knotting cycle, each driving shaft comprising a driving section, a driven section and a timing slip clutch connecting said sections, means for rotating the drving sections of the two driving shafts in unison, each clutch having a limited torque resistance and being operative to establish a driving connection between the driving and driven shaft sections when they have a predetermined relative angular position only, whereby when either knotter meets with abnormal resistance the corresponding clutch will slip and allow the driving section of the corresponding driving shaft to continue its rotation until it reaches the predetermined relative angular position relative to the cooperating driving section, in which position a driving connection between the driving shaft sections is again established through the clutch.

3. A tufting machine having a knotter operating on one side of the mattress, a cooperating element operating on the other side of the mattress, a driving shaft for the knotter, a second driving shaft for the cooperating element, means for rotating said shafts in timed relation to cause the knotter and the cooperating element to operate in timed relation, the driving shaft for the knotter comprising a driving section, a driven section, and a slip clutch connecting said sections, said slip clutch having a limited torque resistance and being operative to establish a driving connection between the driving and driven shaft sections when they have a predetermined relative angular position only, whereby when the knotter meets with abnormal resistance the clutch will slip and allow the driving section of the knotter drive shaft to continue its rotation together with the other drive shaft and upon the next rotation of the driving section of the knotter drive shaft the two sections of said shaft will be coupled in their correct predetermined angular position thereby again automatically establishing the correct timed relation in the operation of the knotter and the cooperating element.

WILFRED B. MATHEWSON.