

May 30, 1967

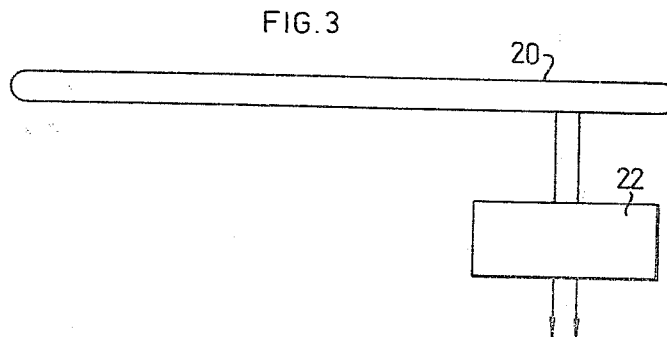
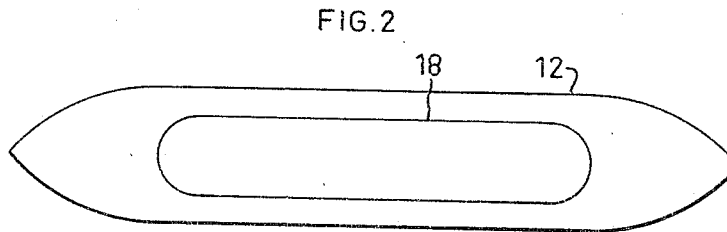
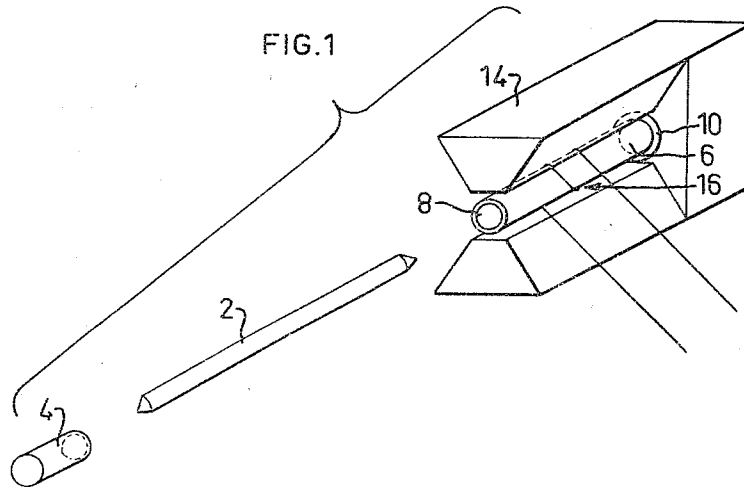
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LOOM WEFT STOP MOTION DEVICES

Filed Feb. 11, 1966

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FIG. 4

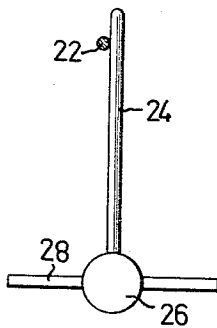


FIG. 6

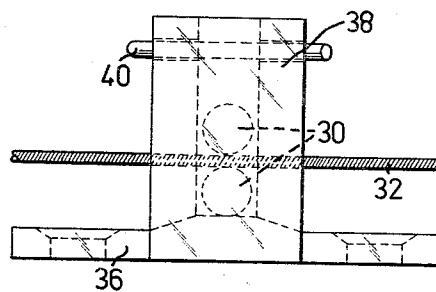


FIG. 5

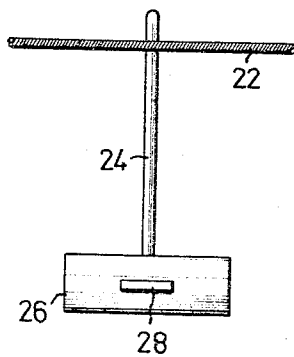
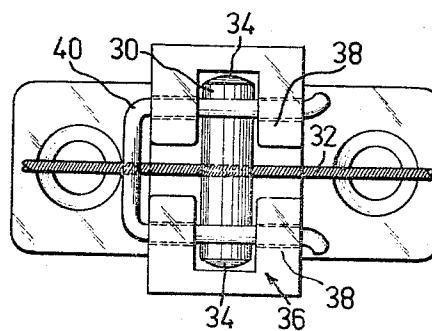


FIG. 7



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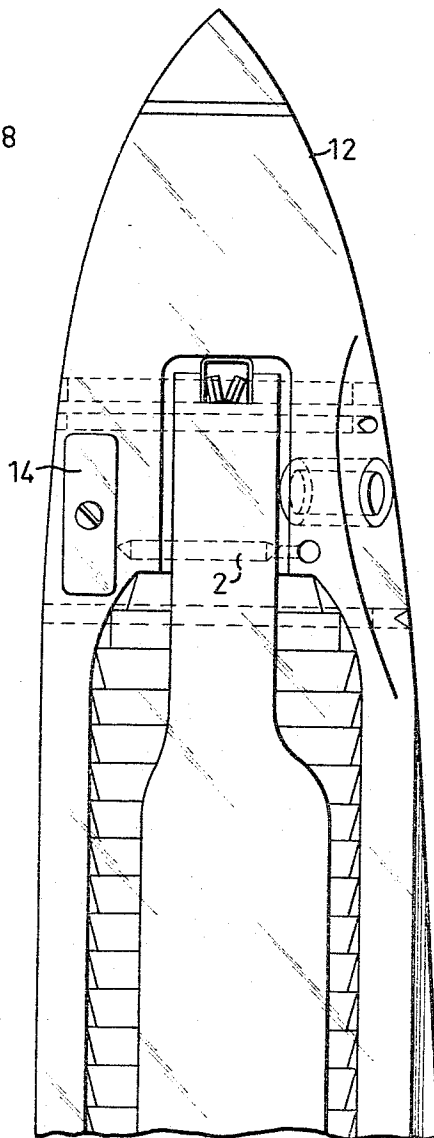
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FIG. 8



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FIG. 9

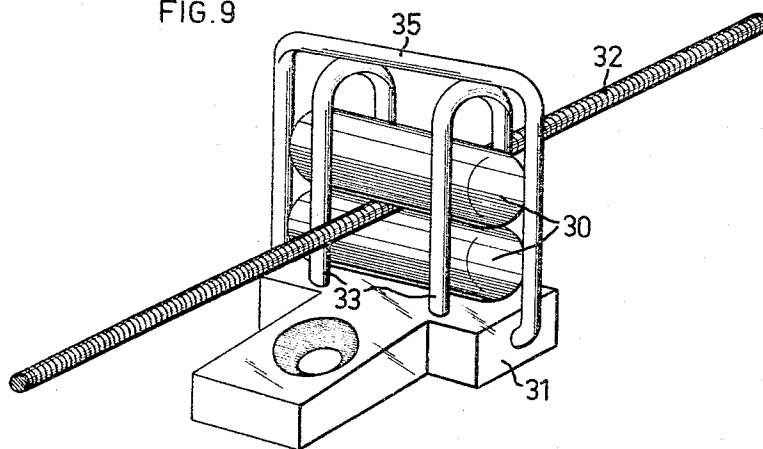
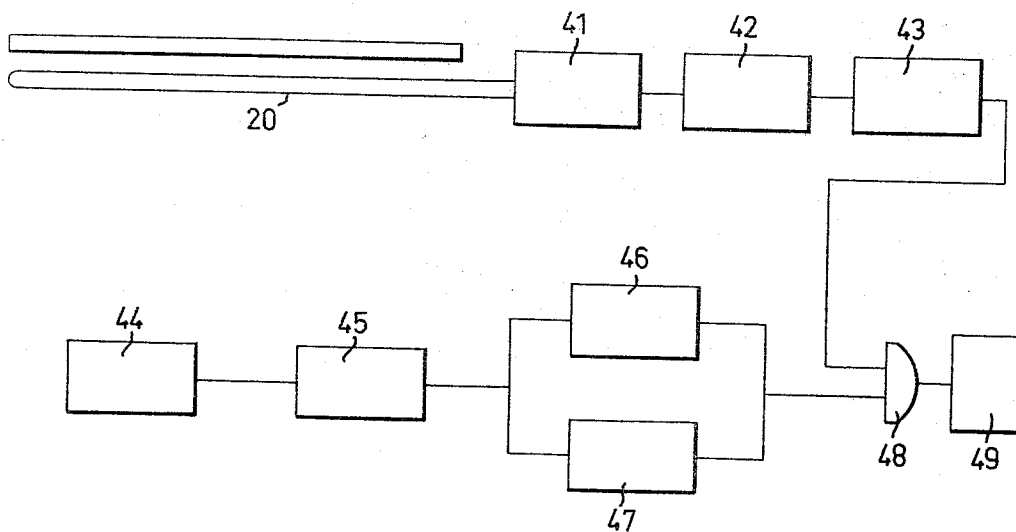


FIG. 10



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LOOM WEFT STOP MOTION DEVICES

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Filed Feb. 11, 1966, Ser. No. 526,745

4 Claims. (Cl. 139—371)

This is a continuation-in-part of my U.S. patent application Ser. No. 384,699 filed July 23, 1964, now abandoned.

This invention relates to a loom weft stop motion device which is responsive to the unwinding of a weft or shoot thread from a shuttle during the passage thereof along a shuttle race in a loom and which comprises transmitter means disposed in the shuttle and contacting the thread being unwound, said transmitter means being adapted, under the influence of the movements of the thread, to change a magnetic field, and sensing means located at the shuttle race and adapted to deliver an electric signal by the action of an effect generated by changing magnetic field.

In a previously known device for stopping the weft motion in a loom when a thread does not run out of the shuttle during the movement thereof along the race in the loom the thread is caused, before it leaves the shuttle, to rotate an element which is adapted to rotate on a fixed axis and in which a permanent magnet is oriented to generate a rotary magnet field perpendicularly to induction coils. In the coils, which have to be at least two in number, there is thus generated an electric signal as long as the thread runs out of the shuttle and the latter is located above the coils which are situated each at one end of the shuttle race. The signal from the coil past which the shuttle first travels, is to be cancelled by the signal generated if the thread runs out of the shuttle when the shuttle travels past the coil located at the other end. If the signals cancel each other the operation of the loom remains unchanged, but is otherwise interrupted. The two signals are fed to an electronic device in which one signal is inverted and thus will be given a direction opposite to the other signal. If the two signals are of equal timing and have the same amplitude they will cancel out each other. In order that the signals may be of the same timing at a definite point of time, which is complicated by the short duration of the signals, an extremely complicated and very precise construction of the electronic device must be provided and as a consequence said device becomes unreliable and very expensive. To provide a useful device also when the shuttle is thrown out on both sides of a fabric, at least two coils have to be arranged at both ends of the shuttle race.

Apart from the fact that the device outlined in the preceding paragraph is extremely unreliable and sensitive to ambient distortion it does not respond when the thread paid out from the shuttle is temporarily ruptured between the coils and thus between the edges of the fabric. Such temporary ruptures of the thread may lead to the necessity of discarding the finished fabric. It is of primary interest to the weaving industry to solve this problem and to simplify and improve the means employed in the previously known device.

The present invention not only overcomes the drawbacks and inconveniences of the device outlined in the foregoing, but also solves the problem of temporary ruptures of the thread paid out from the shuttle between the ends of the shuttle race. The basic idea of the present invention is that a change produced in a magnet field by the thread paid out from the shuttle is continuously sensed throughout the shuttle race by means of a single wire loop or coil which is disposed in the table, beneath it and/or laterally of it. Particularly with metal tables it may be preferable to dispose part of the loop beneath the table and part of the loop at one side of the table. The change in the magnetic field is brought about according to the invention in

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that the thread when paid out from the shuttle causes a means in a magnetic circuit (said means preferably being a permanent magnet) to oscillate or to both oscillate and rotate whereby the magnet field around the magnetic circuit is changed and an electric signal is induced in the coil or loop. The electric signal is supplied to an electronic device which stops the loom when the signal disappears irrespective of the position taken by the shuttle in the race when thread is paid out from the shuttle. The electronic device comprises timing means which prevent stopping the operation of the loom on one hand when a normal thread slack is taken up and on the other hand when the shuttle is in one of the shuttle boxes.

The above and further features of the invention and the advantages gained thereby will become apparent from the following description in which reference is made to some embodiments chosen by way of example and shown in the accompanying drawings in which:

FIG. 1 is a perspective view of an embodiment of a transmitter means;

FIG. 2 is a view of an element of the transmitter means in FIG. 1, which element is disposed in a shuttle;

FIG. 3 is a diagrammatic view of a sensing means;

FIGS. 4 and 5 are views of a second embodiment of a transmitter means;

FIGS. 6 and 7 are views of a third embodiment of a transmitter means;

FIG. 8 is a fragmentary view of a shuttle provided with an embodiment of the device according to the invention.

FIG. 9 is a perspective view of a signal transmitter according to a further embodiment of the invention;

FIG. 10 is a block diagram of an embodiment of the electronic device according to the invention.

FIG. 1 shows an embodiment of a transmitter means having a rod 2 provided with eccentric bearing points. The rod is mounted for rotation in a stationary bearing 4 and a movable bearing 8 arranged on an armature 6. The armature is disposed in a resilient fastening 10 in order to wobble or move between the poles of a magnet 14 when the rod 2 is caused to rotate by the thread unwound from the shuttle 12. The distance between the armature and the poles of the magnet will change when the armature is so moved between the poles of the magnet. An electrically conductive coil 16 is arranged on the armature 6 and this coil is connected with an electrically conductive wire loop or coil 18 (FIG. 2) arranged in the shuttle 12.

When the shuttle moves along its race in a loom the thread unwound from the shuttle will cause rotation of the rod 2 which through its eccentric mounting causes armature 6, a magnetic member, to move or wobble in the magnetic field between the poles of the magnet 14. This will induce in the coil 16 an electric signal which will flow through the wire loop or coil 18 in the shuttle 12, which loop or wire is connected with the coil 16.

The electric signal will cause changes in the magnetic field generated by the coil 18. Arranged in the slay-beam table beneath the shuttle race is a sensing means having an electrically conductive wire loop or coil 20 (FIG. 3) which extends along the entire length of the shuttle race and in which the changes in the magnetic field generated by the coil 18 produces by induction an electric signal which is supplied to an amplifier 22. The amplified signal is passed to means (not shown) for interrupting the operation of the loom, for example relays or other known interrupting devices connected in the operating circuit of the loom.

By reason of the sensing wire loop or coil 20 extending throughout the length of the shuttle race the loom will be caused to stop with a minimum of delay by means of the change of electric signal generated in the coil 20 as soon as at a rupture of the thread the latter ceases to

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actuate or rotate the rod 2 and thus to vibrate the armature 6 connected with said rod.

FIGS. 4 and 5 show a modified transmitter means having a rod 24 engaging the thread 22 unwound from the shuttle 12, and at one end the rod 24 is provided with a magnet 26. This magnet is suitably mounted in the shuttle 12 by means of a resilient fastening element 28 to be set in vibration by the thread unwound from the shuttle. With the use of this transmitter means there are no coils or loops required in the shuttle 12 but the changes produced by the thread 22 via the rod 24 in the magnetic field around the magnet 26 are sufficient to induce in the electrically conductive wire loop or coil 20 in the table beneath the shuttle race the signal required for actuating the means for interrupting the operation of the loom.

FIGS. 6 and 7 show a third embodiment of the transmitter means. This preferably has two rollers 30 of magnetic material freely movable one in relation to the other, one of said rollers being a permanent magnet whereby it will attract the other roller. The thread 32 to be unwound from the shuttle 12 is passed between the rollers and because of the magnetic force between the rollers 30 the thread will thus be clamped between said rollers which are caused to rotate by the thread. In order that the rollers 30 may move freely in relation to each other and rotate they are mounted in grooves 34 which are provided in the limbs 38 of a one-piece U-shaped holder 36 preferably of nylon. The rollers are retained in the grooves 34 by means of a yoke 40 extending through the limbs and grooves of the holder at the upper portion thereof.

The signal required for the actuation of the means serving to interrupt the operation of the loom is induced in the electrically conductive wire loop or coil 20 beneath the shuttle race by changes in the magnetic field around the rollers. Further electrically conductive coils in the shuttle are not required in this embodiment of the transmitter means.

The transmitter means as last described will not only provide a continuous control of the unwinding of the thread from the shuttle 12 but also an extremely desirable, very advantageous braking of the thread. Naturally this transmitter means may be provided with more than two rollers or with one stationary member and one or more rollers. Furthermore, more than one of the elements engaging the thread in this transmitter means may be permanent magnets.

FIG. 8 shows a part of the shuttle 12 in which a portion of a practical embodiment of the transmitter means illustrated in FIG. 1 is arranged. The rod 2 is situated in the path of the thread unwound from the shuttle and will consequently be actuated in such a way by the thread that it will rotate and cause the armature 6 (not shown in FIG. 8) to wobble between the poles of the magnet 14. Any of the other embodiments of the transmitter means can be arranged in a similar manner in the shuttle.

According to a considerable improvement of the embodiment of the transmitter shown in FIGS. 6 and 7 the rollers 30, at least one of which is a permanent magnet and the other is of some suitable magnetic material, are mounted in a support which is shown in FIG. 9 and has a base plate 31. Fixed to the base plate 31, which preferably has an extension with holes therein for securing the base plate by screwing to a shuttle, are two yokes 33 e.g. of wire which extend over the rollers 30 each at one end thereof, and a further yoke 35 which extends from one short end of the base plate 31 to the other end thereof across the yokes 33 to which the yoke 35 is secured by soldering or in any other suitable manner. The yokes 33 and 35 are arranged so that the rollers 30 have a relatively small lateral and longitudinal clearance but a relatively large vertical clearance from the base plate 31. All parts of the support except the rollers must be of non-magnetic material.

Like in the embodiment earlier described, when the

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shuttle moves in its race the thread runs between the rollers which brake the thread and which are caused by the thread to both rotate and move up and down in the support at very high speed. This will change the magnetic field around the magnetic circuit formed by the rollers, whereby an electric signal is induced in the wire loop or coil 20 beneath the shuttle race. As long as the thread is intact and the shuttle is within the limits of the coil 20 an electric signal of relatively high frequency is supplied to the electric device. The signal depends upon the speed at which the rollers rotate and vibrate or oscillate.

FIG. 10 shows a preferred embodiment of the electronic device according to the present invention, in block form and partly schematically. The signal generated in the loop or the coil 20 is supplied to an amplifier 41. The amplifier delivers the amplified signal to a rectifier 42 of the temperature compensated type. The rectifier is connected across a D.C. amplifier 43 to a gate 48 which when it is open allows a signal from the amplifier to pass to a relay 49. When the relay receives a signal the operation of the loom is interrupted since the relay 49 is connected in the operating circuit (not shown) of the loom. As long as a signal is obtained from the loop 20 no signal is delivered from the amplifier 43 and the relay 49 is not actuated even if the gate 48 is open. Only if the signal from the loop or coil 20 ceases a signal is obtained from the amplifier 43 and the relay 49 is actuated if the gate 48 is open.

The opening and closing movements of the gate 48 are controlled by timing means such as two monostable multivibrators 46 and 47. These are connected in parallel and cooperate to keep the gate 48 open during a given period which is determined by two factors, viz (1) the period during which the shuttle moves in its race and thread is to be unwound therefrom, and (2) the period during which the shuttle moves in the first portion of its race without thread being unwound from the shuttle since a certain thread slack is first to be taken up before the thread begins to unwind from the shuttle. The circuit comprising the parallel-connected multivibrators is connected over a pulse shaper 45 to a switch 44 which is opened or closed by a cam (not shown) on the crankshaft of the loom. The cam is so arranged that the switch is closed when the shuttle leaves the shuttle box whereby the pulse shaper 45 delivers a pulse to the two multivibrators. One of the multivibrators (multivibrator 47) tends to keep the gate 48 open during the first-mentioned period (1) and is thus set to this period, while the other multivibrator 46 tends to keep the gate 48 closed during the first portion of the shuttle movement during which as a rule no thread is unwound from the shuttle but only the thread slack is taken up. Relatively large tolerances of the time periods may be permitted and if desired the period defined by the multivibrator 46 can be automatically interrupted by means of the signal generated in the loop or coil 20 so that the gate 48 is opened as soon as thread is unwound from the shuttle and the operation of the loom can be interrupted via the relay 49 if a thread rupture occurs and the signal ceases. Of course, the whole of the electronic device is connected in a known manner to a conventional source of current (not shown).

In addition to the continuous supervision, the present invention brings the further great advantage that in the two last-mentioned embodiments of the transmitter there is exerted on the thread a braking force and that the thread does not run in contact with any solid surface but the path through the transmitter is entirely floating whereby the frictional movement exerted and consequently the wear of the thread are reduced to a minimum. Further, the change of the magnetic field becomes greater by the provision of the floating path for the thread. The last-mentioned embodiment of the transmitter reduces to a minimum the collection of thread and dirt particles in the transmitter and besides this embodiment permits cleaning of the transmitter in a very convenient manner.

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It should also be pointed out that the present invention is applicable to looms without shuttles since the system is not dependent on the movements of the shuttle but a signal is generated in the loop also when the shuttle is immovable and the thread is withdrawn therefrom.

A great advantage also is that the permanent magnet (one roller) of the transmitter need not be oriented. This feature is extremely cost-saving in the manufacture of the transmitter. Probably, this phenomenon is due to the material employed, since the manufacture of the permanent magnetic roller has irregularities of structure, for which reason the magnetic pole distribution will also be irregular.

What I claim and desire to secure by Letters Patent is:

1. A stop motion device which is responsive to the unwinding of a thread from a shuttle during the passage thereof along a shuttle race in a loom and which comprises transmitter means disposed in the shuttle and contracting the thread being unwound, said transmitter means being adapted, under the influence of the movement of the thread, to change a magnetic field, and sensing means located along the entire shuttle race and adapted to deliver an induced electrical signal under the action of the changing magnetic field, said transmitter means comprising two rotatably mounted elements of magnetic material arranged on either side of the thread to be unwound from the shuttle, at least one of said elements being a permanent magnet and at least one of said elements being movable in relation to the other such that the elements are attracted by the magnetic force therebetween to provide for said changing of the magnetic field and braking of the thread during unwinding from the shuttle, said sensing

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means including an electrically conductive coil extending along the entire length of the shuttle race and adapted to deliver said electrical signal by induction as a result of the changes of the magnetic field, said electrical signal being supplied to an electronic device for stopping the operation of the loom upon stoppage of the passage of the thread and resulting disappearance of the electrical signal.

2. A device as claimed in claim 1, wherein the two elements are freely movable relative to one another and at least one of the elements is a roller which is caused to rotate and wobble when the thread is pulled between the elements.

3. A device as claimed in claim 2, wherein the two elements are rollers, the device further comprising a cage-formed holder supporting said rollers, including a base plate on which the rollers are stacked, a yoke retaining said rollers at each end thereof and a further yoke crossing the other two yokes from end to end at said base plate.

4. A device as claimed in claim 3, wherein the holder is made of non-magnetic material.

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H. S. JAUDON, *Assistant Examiner.*