Jan. 7, 1941. C. D. BROWN 2,228,225

AUTOMATIC LOOM

Filed Nov. 13, 1939 2 Sheets-Sheet 1

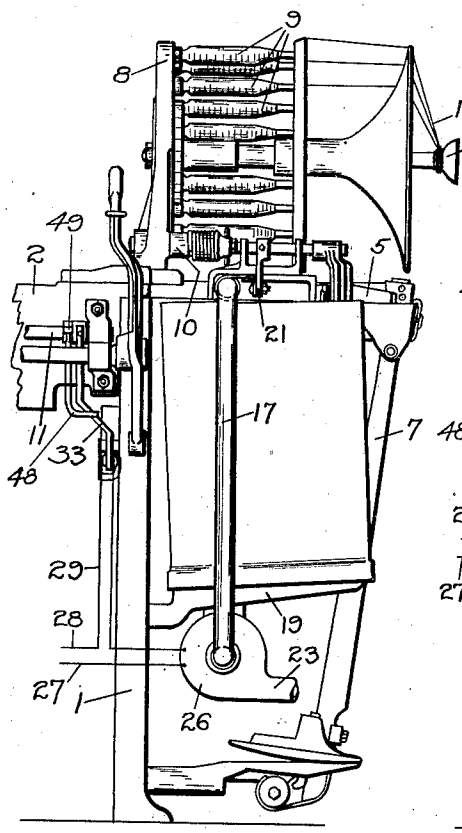


Fig. 1.

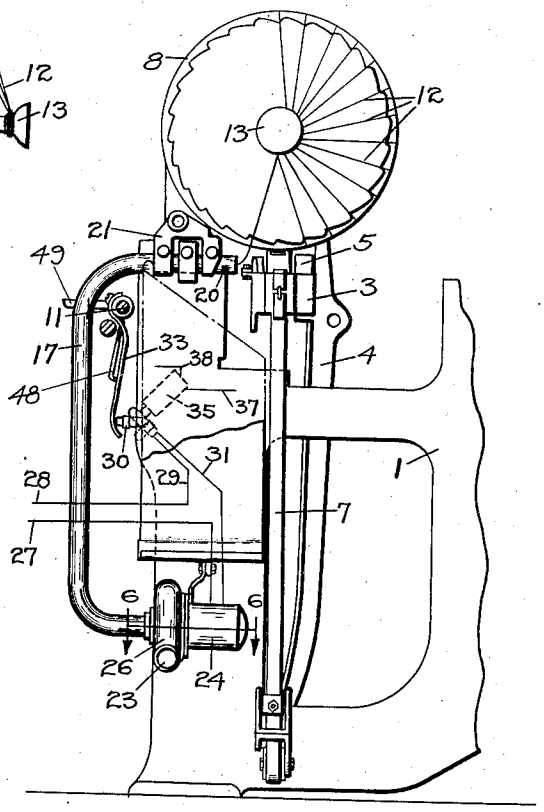


Fig. 2.

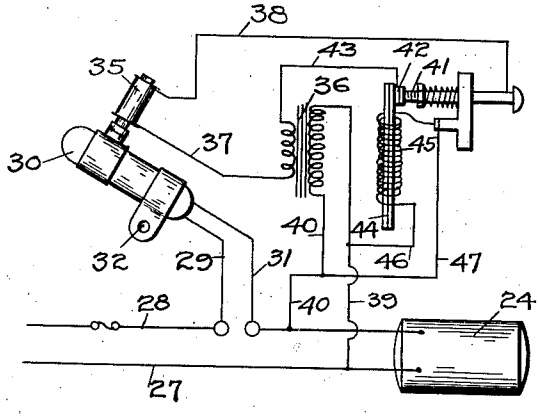


Fig. 3.

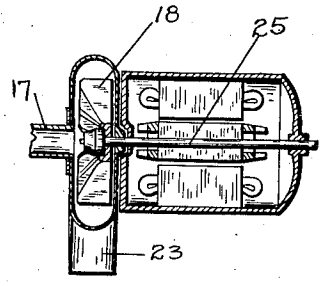


Fig. 6.

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AUTOMATIC LOOM

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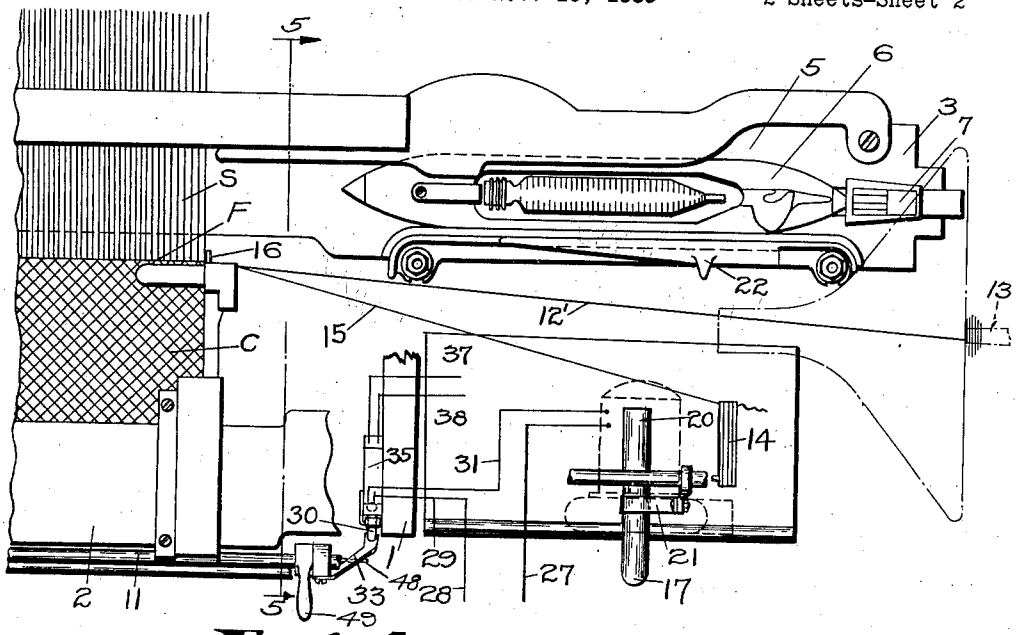


Fig. 4.

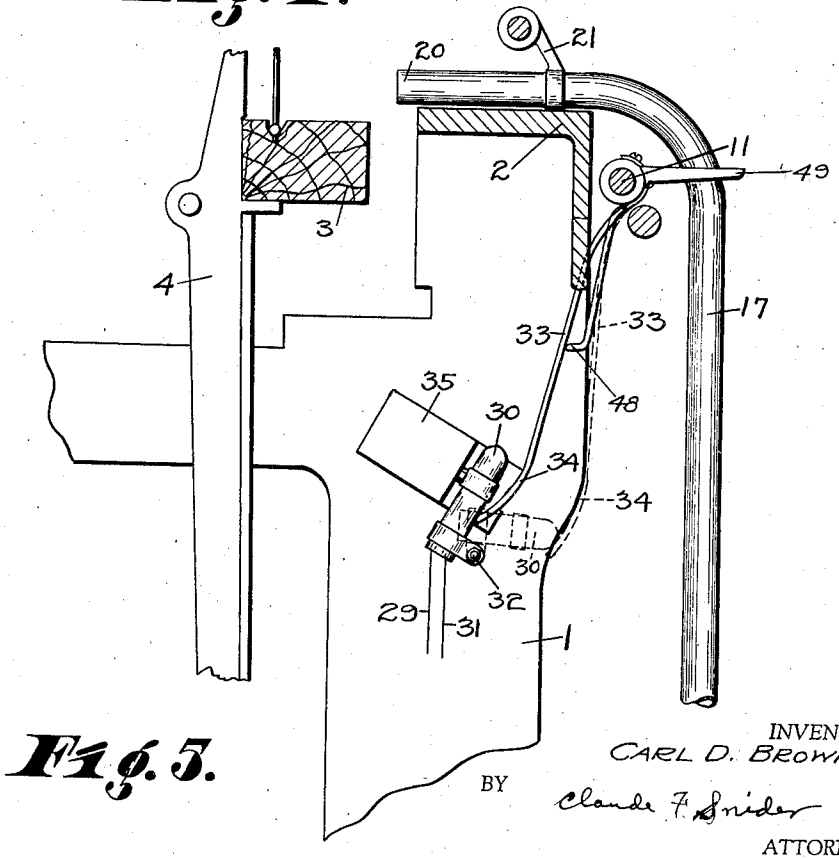


Fig. 5.

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2,228,225

AUTOMATIC LOOM

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Application November 13, 1939, Serial No. 304,095

12 Claims. (Cl. 139—256)

The present invention pertains to automatic filling replenishing looms and more particularly relates to the control and removal of pieces of filling ends formed by such looms.

Looms of the type mentioned commonly have a reciprocating lay with a shuttle box at the replenishing end thereof, and filling replenishing mechanism for automatically replenishing the filling supply whenever the latter becomes substantially exhausted. Operation of the replenishing mechanism incidentally results in the formation of outgoing and incoming filling ends projecting from the cloth selvage, which filling ends are later cut adjacent the cloth selvage and thereupon become loose pieces of filling thread. Unless the loose pieces of thread are gathered and removed from the loom, they are apt to be caught by the lay or shuttle and drawn into the cloth, thereby causing defects in the cloth.

It has been proposed heretofore to gather the pieces of filling ends and remove them from the loom by pneumatic means, comprising a pipe or conduit in which a partial vacuum is maintained. An open end of such conduit has been located in position adjacent either the outgoing or incoming filling end, but it has not been proposed to locate said end in position to gather both the outgoing and incoming filling ends. The prior vacuum-inducing means has comprised a cylinder pump with a reciprocating piston therein. In one instance, the piston was operated from the loom transferrer and had only one reciprocation for reach replenishing operation. In other instances, the piston was continuously reciprocated by a moving part of the loom.

The aforesaid prior pneumatic means have not been satisfactory and have not been used to any appreciable extent, partly because it is not sufficient to remove only the outgoing or incoming filling end and leave the other end on the loom, but also for other reasons. Among these other reasons are noted particularly the fact that a single stroke of a piston pump at the time of filling replenishment is insufficient to remove the filling ends, and the fact that continuous operation of such a pump results in very rapid wear which soon renders the apparatus inoperative.

A principal object of the present invention is to provide in a loom having automatic filling replenishing means incidentally forming outgoing and incoming filling ends as aforesaid, electrically operated pneumatic means for gathering such filling ends and removing them from the loom, and novel means for supplying the electric energy for operating such pneumatic means, which energy-supplying means shall be constructed and arranged to effect operation of the pneumatic means only at the time of and for an interval of several picks after each filling replenishing operation, whereby said pneumatic means shall be operated at the proper time and for a sufficient length of time to effectively remove the pieces of filling ends but shall not be subject to the disadvantages of prior constructions.

The foregoing and other objects of the invention are accomplished in the construction illustrated on the accompanying drawings, of which:

Fig. 1 is a front view of the right hand side of a loom having the preferred embodiment of my invention applied thereto;

Fig. 2 is an end view of the same;

Fig. 3 is a wiring diagram of certain electrical apparatus on said loom;

Fig. 4 is a plan view of certain mechanism shown on Fig. 1;

Fig. 5 is a fragmentary view in section taken approximately on line 5—5 of Fig. 4; and

Fig. 6 is a view in cross-section taken approximately on line 6—6 of Fig. 2.

The loom shown on the drawings is but fragmentarily illustrated, the parts and mechanisms not shown being of any suitable usual construction and not of the present invention. In addition, certain of the parts shown are not new, they being of the present invention only to the extent that they comprise parts that may be used as elements in the combination defined in the appended claims.

The aforesaid old parts include a loom frame of which the right hand loom side 1 and breast beam 2 are shown, and also include the lay, shuttle box, shuttle, picking mechanism and filling replenishing mechanism hereinafter described. The lay includes a lay beam 3 mounted on swords 4 which are pivoted in the loom frame whereby the lay is adapted to be reciprocated toward and from the front of the loom. The lay beam 3 carries a shuttle box 5 at the replenishing end of the lay, which in the present instance is at the right hand side of the loom.

A shuttle 6, carrying the filling supply, is picked from side to side of the loom, along the lay beam 3, by picking mechanism including a picker stick 7. As the shuttle is thus picked, it lays picks of filling thread in the shed S which filling thread is beaten into the fell F to thereby form cloth C. The filling supply in the shuttle usually lasts for

an interval of several hundred or even several thousand picks, and when the supply is substantially exhausted a fresh supply is provided by automatic filling replenishing mechanism.

The automatic filling replenishing mechanism shown includes a rotary hopper or magazine 8 having a supply of bobbins 9 therein, and also includes a transferrer 10 and means, of which a rod 11 is shown, for initiating operation of the transferrer. When the filling supply in the shuttle is determined (by means not shown) to be substantially exhausted, the rod 11 is turned in a direction counter-clockwise on Fig. 2 or clockwise on Fig. 5. This moves other usual devices, not shown, and when the shuttle 6 enters the shuttle box 5 the transferrer 10 inserts a fresh bobbin 9 therein and expels the exhausted bobbin from the shuttle. The filling ends 12 from the reserve bobbins 9 are attached to a fixed holder 13. This replenishing mechanism is well known in the art and accordingly is but fragmentarily illustrated.

Substantially simultaneously with the transfer of a bobbin 9 to the shuttle, parting and clamping blades 14 part the end of filling thread 15 which leads from the cloth selvage to the shuttle, and clamp the branch of such end which is connected with the cloth selvage. This filling end projecting from the cloth selvage is known in the art as the outgoing filling end. The parting and clamping blades 14 are mounted to move forwardly and rearwardly of the loom, and after clamping the end 15 are moved forwardly to the position indicated by Fig. 4. This parting and clamping mechanism may be substantially like that shown in patent to Stafford, No. 1,552,388, granted Sept. 1, 1925, to which patent reference may be had for a more complete disclosure.

Immediately after the replenishing operation is completed, the lay moves rearwardly and the shuttle 6 is picked along the lay beam 3 through the shed S, thereby laying a pick of filling thread (from the fresh supply) in the shed. Then, the lay beats this pick of filling into the fell F thereby leaving an end 12′ of filling extending from the cloth selvage to the holder 13. This filling end 12′ is known in the art as the incoming filling end. Both the incoming filling end 12′ and the outgoing filling end 15 are parted adjacent the cloth selvage by any suitable means such as the usual temple thread cutter 16. The thread cutter is operative to part the filling ends 12′ and 15 within a few picks after the replenishing operation is completed. The parting of these filling ends forms the loose pieces of filling thread, above mentioned, which are apt to be drawn into the cloth.

The present invention provides suitable pneumatic means for gathering the parted filling ends and removing them from the loom. In the particular embodiment shown, such pneumatic means includes a pipe or conduit 17 and a centrifugal pump or fan 18 for inducing a partial vacuum in the conduit. The pump 18 is supported from a bracket 19 well below and in front of the lay beam 3 and shuttle box 5. The lower end of the conduit 17 is connected with the central or intake part of the pump as shown and the conduit extends upwardly and rearwardly therefrom. The upper end 20 of the conduit 17 is supported by a bracket 21 so as to terminate directly in front of the shuttle box 5 intermediate the ends thereof, and beneath the hopper 8. When thus supported, the end 20 is closely adjacent the outgoing filling end 15. Upon reciprocation of the lay, a hook 22 on the front wall of the shuttle box 5 carries the incoming filling end 12′ forwardly into similar proximity to the end 20.

It will be noted that with the pump 18 in operation currents of air will flow into the end 20 of the conduit, through the pump, and out the exhaust or outlet pipe 23. The pipe 23 may lead to a collecting container, not shown, or to any suitable point remote from the loom. The outgoing and incoming filling ends will be gathered or drawn into the end 20 of the conduit as soon as they are parted at the cloth selvage. In this position, both filling ends are so held that they cannot become caught in the moving parts of the loom. The outgoing end 15 is released by the blades 14 before the next replenishing operation. An accumulation of incoming ends 12′ held by the holder 13 and the conduit 17 may be broken by a single movement of the operator's hand. All of the resulting loose pieces of filling thread will promptly feed through the conduit 17 and along the exhaust pipe 23, and are thus entirely removed from the loom.

The pneumatic means above described is electrically operated, preferably by an electric motor such as that indicated generally at 24. The armature shaft 25 of this motor is extended and the pump 18 is fixed directly thereon. The housing of the motor 24 is fixed to the housing 26 for the pump 18, so that the motor and pump comprises a single unit. The particular unit shown is the motor and pump unit of a small hand vacuum cleaner of the type commonly used for household purposes. Such unit is found to be much more efficient, and more satisfactory in all respects, than prior cylinder-pump devices.

It is found that any adequate pneumatic means, such as that above described, will satisfactorily remove the filling ends if operated only for very short intervals. The present invention provides an electric circuit, with control means therefor, arranged to supply electric energy to the motor 24 only at the time of each replenishing operation and for a predetermined interval, corresponding to several picks of the loom, after each such operation. Thus, the pneumatic means is in operation only a small proportion of the total time that the loom operates, but is always in operation at the proper times to promptly remove the filling ends as soon as they are parted by the temple thread cutter 16.

In the preferred embodiment, the aforesaid electric circuit includes wires or conductors 27 and 28 from a source of power, not shown, providing electric energy of the proper voltage for the motor 24. The wire 27 is connected directly to the motor 24 while a lead 29 connects the other wire 28 with a switch 30. A lead 31 connects the switch 30 with the other terminal of the motor 24. Thus, when the switch 30 is open the electric circuit is open and the motor 24 is not in operation, but when the switch is closed electric energy is supplied to the motor. The particular switch shown is a commercial form of mercury switch which is closed when tilted up as shown by Figs. 3 and 5 and is open when tilted down as shown by Fig. 2 and in dotted lines on Fig. 5. This switch is pivoted at 32 to a fixed bracket. When the switch is unsupported it swings, by gravity, on its pivot. The switch is thus biased to open position.

The switch 30 is closed each time that replen-

ishment of the filling supply is initiated, and to this end an arm 33 may be fixed to the rod 11. The arm 33 projects downwardly and its lower end is curved at 34 to support the switch 30 in open position during normal loom operation, as shown by dotted lines on Fig. 5. When the rod 11 is turned to initiate the replenishing operation, the curved end 34 tilts the switch upwardly to closed position, and the motor 24 is thereby caused to operate. The rod 11 is returned to its normal position immediately after each replenishing operation, whereas the motor should continue to operate for several picks thereafter. The invention accordingly provides means for holding the circuit closed for several picks and then opening it.

The last mentioned means may comprise a holding means, such as an electromagnet 35, and means, preferably electrically operated, for releasing the holding means after a predetermined interval. The magnet 35 is fixed in proper position to magnetically hold the switch 30 when the latter is in its upper or closed position. The magnet is energized by electric energy derived from the secondary of a transformer 36 through conductors 37 and 38. The primary of the transformer 36 is connected to conductor 27 and lead 31 by leads 39 and 40, respectively, so that the transformer is energized only during the intervals that the switch 30 is closed. The lead 38 extends from the electromagnet 35 to a contact member 41 which normally engages a contact member 42. A lead 43 connects the latter member with the secondary of the transformer.

The aforesaid electrically operated means for releasing the holding means, such as electromagnet 35, preferably includes a heat-responsive element such as a bi-metal strip 44 constructed and arranged to effect such release of the holding means after the element has been heated for an interval of several picks. The particular strip 44 consists of two different metals in intimate contact whereby it is adapted to change its shape when heated. The strip 44 is fixed at one end and carries contact member 42 at its other end. Thus, when the strip bends under application of heat, contact 42 will be moved away from contact 41, thereby opening the circuit which energizes the electromagnet 35.

The element 44 may be heated by a heating coil 45 which is electrically connected by leads 46 and 47 with the leads 39 and 40, respectively, the coil being thereby connected in parallel with the primary of the transformer 36. The coil 45 surrounds the strip 44 and applies heat directly thereto. The coil is so connected, however, that it is heated only while the switch 30 is closed. The coil 45 and element 44 are preferably of proper characteristics to effect the opening of contacts 41, 42, and thereby release of the holding magnet 35, after the switch 30 has been closed for about ten seconds. It is noted that the transformer 36, element 44, heating coil 45 and contacts 41, 42 may be housed in a box supported at any convenient point on the loom. These parts are accordingly not shown except in the diagram of Fig. 3.

The switch 30 may be manually tilted to closed position at any time, independent of operation of the replenishing mechanism. To facilitate the manual tilting of the switch, a manually operable bell crank 49 is loosely pivoted on the rod 11 and is provided with an arm 48 engaging the spring arm 33 for bending the latter without turning rod 11. Manual closing of switch 30 may be resorted to when filling ends 12' are broken while the motor 24 is off and it is desired that the loose pieces of thread feed away from the loom before the next replenishing operation.

Having fully disclosed the preferred embodiment of my invention, I claim:

1. In an automatic filling replenishing loom, the combination of the reciprocating lay, filling replenishing mechanism incidentally forming the usual outgoing filling ends projecting from the cloth selvage, means for parting said filling ends adjacent the cloth selvage, electrically operated pneumatic means for gathering the parted filling ends and feeding them away from the lay, an electric circuit supplying electric energy to said pneumatic means, means for closing said circuit at the time of each replenishing operation, and means for opening said circuit a plurality of picks after each said replenishing operation is completed.

2. In an automatic filling replenishing loom, the combination of the reciprocating lay, filling replenishing mechanism incidentally forming the usual outgoing and incoming filling ends projecting from the cloth selvage, means for parting said filling ends adjacent the cloth selvage, pneumatic means arranged to gather the parted filling ends and remove them from the loom, an electric motor for operating said pneumatic means, an electric circuit supplying electric energy to said motor, means operated by some part of said replenishing mechanism for closing said circuit, and means for opening said circuit a plurality of picks after each replenishing operation is completed.

3. A loom having automatic filling replenishing mechanism which incidentally forms the usual outgoing and incoming filling ends projecting from the cloth selvage, means for parting said filling ends adjacent the cloth selvage, electrically operated pneumatic means for gathering the parted filling ends and removing them from the loom, and means supplying electric energy to the last said means only during and for a single predetermined interval after each operation of said replenishing mechanism.

4. A loom having a reciprocating lay, automatic filling replenishing mechanism incidentally forming the usual outgoing and incoming filling ends projecting from the cloth selvage, means for parting said filling ends adjacent the cloth selvage, pneumatic means constructed and arranged to gather the parted filling ends and remove them from the loom, an electric motor for operating said pneumatic means, an electric circuit supplying electric energy to said motor, said circuit including a switch, means for closing said switch each time said replenishing mechanism operates, and electrically operated means arranged to effect the opening of said switch a plurality of picks after each said replenishing operation.

5. A loom having, in combination with automatic replenishing mechanism and pneumatic means for gathering filling ends and removing them from the loom, an electric motor for operating said pneumatic means, an electric circuit supplying electric energy to said motor, said circuit including a switch, means operated by some part of said replenishing mechanism for closing said switch, heat-responsive means operative when heated to effect the opening of said switch after a plurality of picks of the loom, and means for applying heat to said heat-responsive means only when said switch is closed.

6. A loom having, in combination with automatic replenishing mechanism and pneumatic

means for gathering filling ends and removing them from the loom, an electric motor for operating said pneumatic means, an electric circuit supplying electric energy to said motor, means for closing said circuit each time that said replenishing mechanism operates, a heat-responsive element constructed and arranged to effect the opening of said circuit a plurality of picks after heat is applied thereto, and an electric heating element connected with said circuit and arranged to apply heat to said heat-responsive element while said circuit is closed.

7. A loom having, in combination, automatic filling replenishing mechanism incidentally forming the usual outgoing and incoming filling ends projecting from the cloth selvage, means for parting said filling ends adjacent the cloth selvage, electrically operated pneumatic means for removing the parted filling ends to a point remote from the moving parts of the loom, an electric circuit supplying electric energy to operate said pneumatic means, said circuit including a switch biased to open position, means for moving said switch to closed position each time said replenishing mechanism operates, means for holding said switch in closed position, and means for releasing said holding means at a predetermined time after each operation of said replenishing mechanism.

8. An automatic filling replenishing loom of the type incidentally forming loose pieces of filling ends after each replenishing operation, said loom having pneumatic means constructed and arranged to gather said pieces of filling ends and remove them to a point remote from the moving parts of the loom, an electric motor for operating said pneumatic means, an electric circuit supplying electric energy to said motor, said circuit including a switch biased to open position, means closing said switch and thereby said circuit each time the filling supply is replenished, means for holding said switch closed, means including a heat-responsive element constructed and arranged to release said holding means after said element has been heated for an interval of several picks, and means for applying heat to said element only while said circuit is closed.

9. An automatic filling replenishing loom of the type incidentally forming loose pieces of filling ends after each replenishing operation, said loom having a reciprocating lay provided with a shuttle box at the replenishing end thereof, a conduit having one end located in front of said shuttle box, a pump for inducing a partial vacuum in said conduit to thereby draw said loose pieces into said conduit, an electric motor for operating said pump, an electric circuit supplying electric energy to said motor, said circuit including a switch biased to open position, means closing said switch and thereby said circuit each time the filling supply is replenished, electromagnetic means for holding said switch closed, a heat-responsive element arranged to release said holding means after such element has been heated for an interval of several picks, and a heating coil electrically connected with said circuit and arranged to apply heat to said element only while said circuit is closed.

10. An automatic filling replenishing loom having pneumatic filling end-removing means, an electric motor for operating said means, an electric circuit supplying electric energy to said motor, said circuit including a switch, means for closing said switch and thereby said circuit each time the filling supply is replenished, an element adapted to change its shape when heated for an interval of several picks of the loom, means controlled by said element for effecting the opening of said switch when said element becomes changed in shape as aforesaid, and a heating coil electrically connected with said circuit and arranged to heat said element only while said switch is closed.

11. An automatic filling replenishing loom having pneumatic filling end-removing means, an electric motor for operating said means, an electric circuit supplying electric energy to said motor, said circuit including a switch biased to open position, means for closing said switch and thereby said circuit each time the filling supply is replenished, means for holding said switch in closed position, a metallic element adapted to change its shape when heated for an interval of several picks of the loom, means controlled by said element for releasing said holding means when said element changes its shape as aforesaid, and means for applying heat to said element only while said switch is closed.

12. An automatic filling replenishing loom having pneumatic filling end-removing means, an electric motor for operating said means, an electric circuit supplying electric energy to said motor, said circuit including a switch biased to open position, means for closing said switch and thereby said circuit each time the filling supply is replenished, electromagnetic means for holding said switch closed, a bi-metal element adapted to change its shape when heated for an interval of several picks of the loom, means controlled by said element for de-energizing said electromagnetic means when said element changes its shape as aforesaid, and an electric heating coil electrically connected with said circuit and arranged to apply heat to said element when said circuit is closed.

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