April 20, 1937. M. L. MENNESSON 2,077,525

PNEUMATIC SAFETY DEVICE FOR THREAD WORKING MACHINES

Filed Dec. 9, 1935 2 Sheets-Sheet 1

Fig. 1

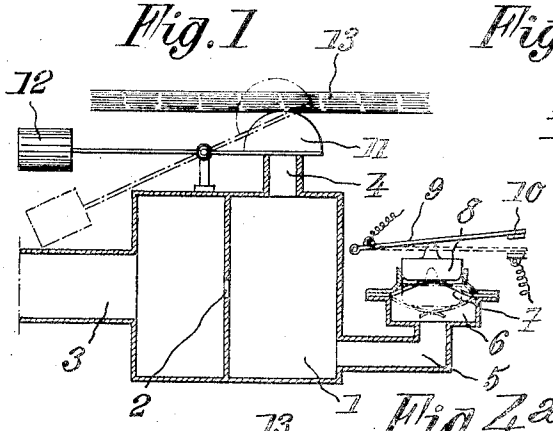


Fig. 2

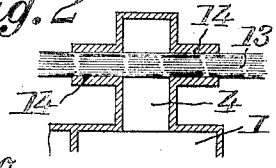


Fig. 3

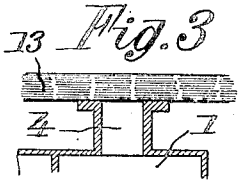


Fig. 4

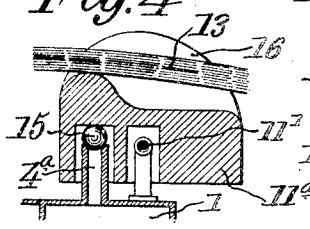


Fig. 4a

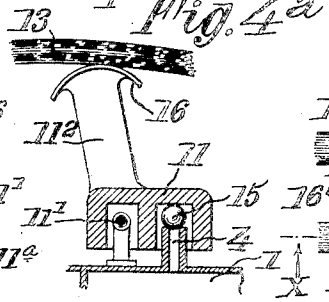


Fig. 4b

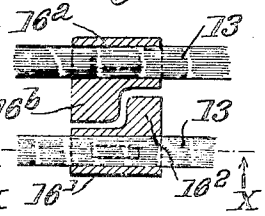


Fig. 5

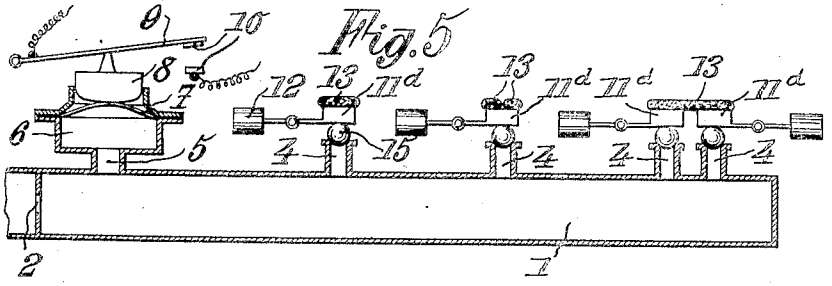
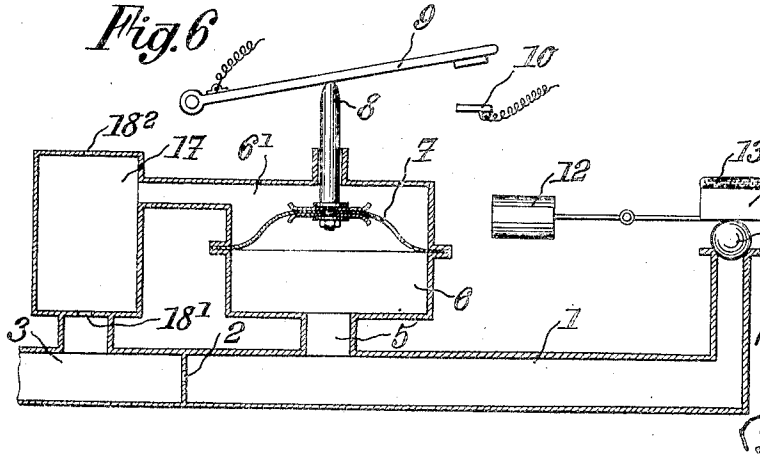


Fig. 6



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PNEUMATIC SAFETY DEVICE FOR THREAD WORKING MACHINES

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Fig. 7.

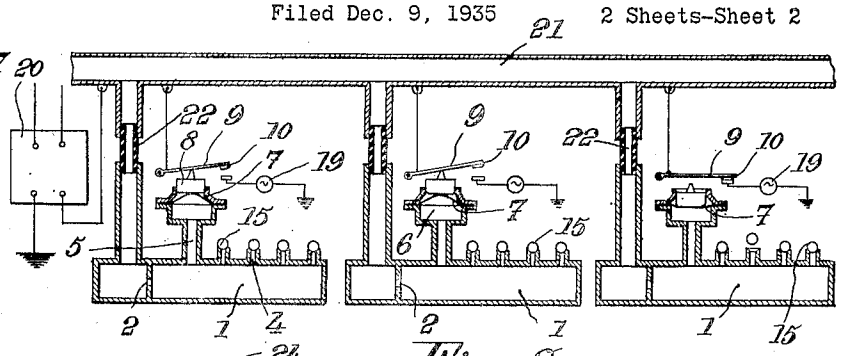


Fig. 8.

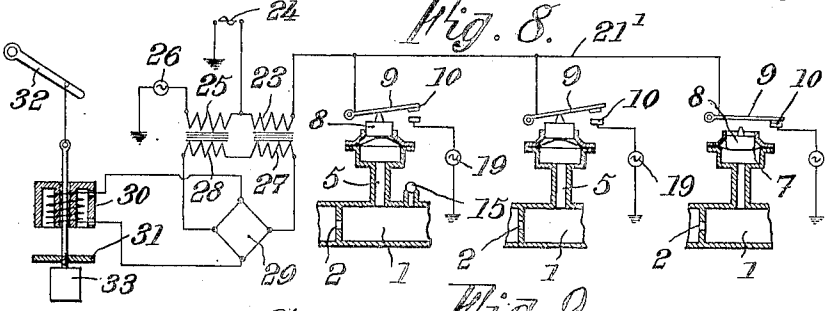


Fig. 9.

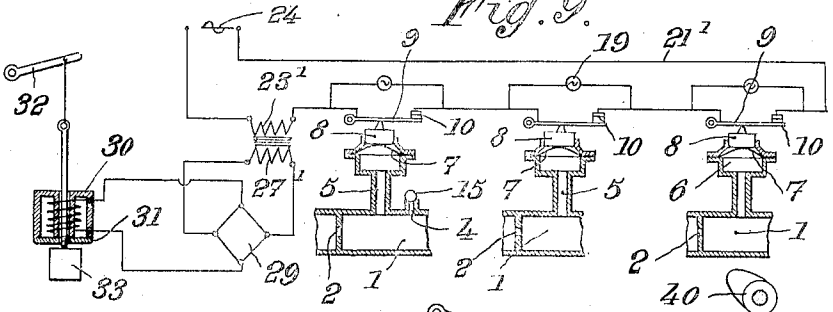
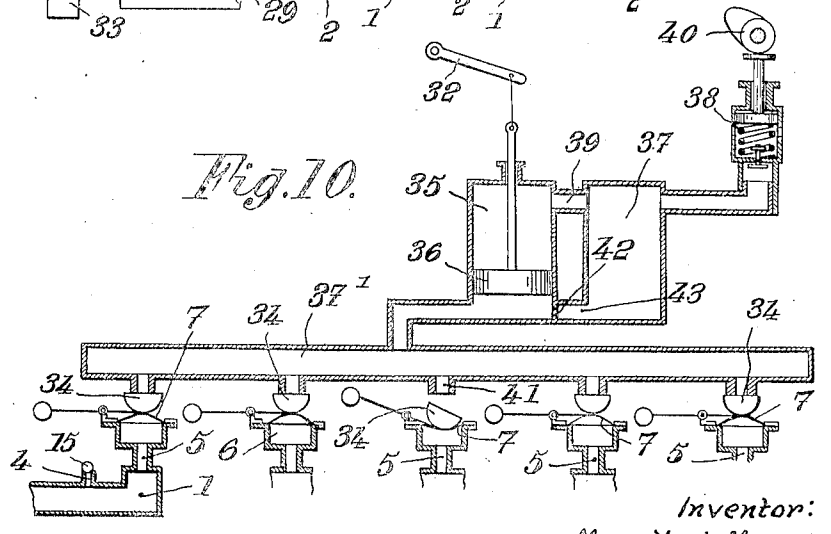


Fig. 10.



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UNITED STATES PATENT OFFICE

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PNEUMATIC SAFETY DEVICE FOR THREAD WORKING MACHINES

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Application December 9, 1935, Serial No. 53,683
In Belgium December 12, 1934

11 Claims. (Cl. 117—28)

The present invention relates to pneumatic safety devices for machines for the treatment of threads, or the like, of the kind in which the absence of a thread produces, due to an escape of fluid, a variation in the pressure of said fluid in a chamber. The invention is more especially, although not exclusively, concerned with machines of this kind adapted to work on threads, yarns, wicks, or the like, of textile materials.

The object of the present invention is to provide a device of the kind above referred to which, while occupying but little space, is capable of controlling, in a safe and efficient manner, the working of the machine with which it is associated.

The essential feature of the present invention consists in providing the chamber containing the fluid under pressure as above stated with at least one outlet adapted to cooperate with a corresponding valve adapted to be controlled by at least one thread, yarn, or the like, and in fitting said chamber with an element, either deformable or movable, which under the influence of a drop of the pressure in said chamber resulting from the opening of said valve, is capable either of stopping the machine or of operating a signal through an electric or pneumatic relay.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a diagrammatic sectional view of a device made according to a first embodiment of the invention;

Fig. 2 is a sectional view of a modification of a part of this device;

Figs. 3 and 4 are views similar to Fig. 2, relating to two other modifications, respectively;

Figs. 4*a* and 4*b* diagrammatically show, in vertical section on the line X—X of Fig. 4*b* and in plan view, respectively, a modification of the arrangement of Fig. 4;

Fig. 5 is a diagrammatic sectional view of a device according to the present invention;

Fig. 6 is a similar view of a device made according to a third embodiment of the invention;

Fig. 7 is a diagrammatic sectional view of the combination of several devices according to the invention so as to control a single electric relay;

Fig. 8 is a diagrammatic sectional view of a similar arrangement;

Fig. 9 is a view similar to Fig. 8, showing a modification;

Fig. 10 is a similar view showing a device according to the present invention, equipped with a pneumatic relay.

In the following description, the word "thread" will be employed to designate any elongated material, obtained by drawing, extrusion, or otherwise, such for instance as a thread, yarn, wick, portion of a wick, combination of wicks, made of a textile, metallic, or other material.

The device according to the present invention includes a chamber 1 communicating, through an orifice or passage of restricted section 2, with a conduit 3 connected with a reservoir containing a gaseous fluid under pressure, for instance compressed air, at uniform pressure, or at a pressure variable within certain limits.

This chamber is further provided with at least one outlet 4 through which it can communicate with the atmosphere.

Furthermore, chamber 1 communicates, through a conduit 5, with a casing 6, in which is fitted a membrane 7 (or a piston) upon the internal face of which the pressure existing in chamber 1 can act, while the atmospheric pressure acts on the external face of said membrane.

This membrane 7 is caused to act; for instance through a rigid push-piece 8, on a control organ 9, for instance an oscillating lever, which acts either directly or indirectly, for instance through an electric relay, not shown in Figs. 1 to 7, fed with current through a contact 10. This control organ 9 is thus capable of producing a modification of the working of the machine, or even the stopping thereof or of a portion thereof. It may also, according to the invention, operate an optical, acoustic, or other signal which permits of finding immediately the part of the machine where a fault in the working has occurred.

The arrangement of this control organ 9 is such that it is in the inactive position when the pressure in chamber 1 is normal. On the contrary, when this pressure drops, membrane (or piston) 7 moves downwardly and brings the cooperating elements of contact 10 together.

This drop of the pressure in chamber 1 is obtained in the following manner:

The outlet orifice 4 of chamber is closed, in the example of Fig. 1, by a stopping device 11, such as an oscillating valve provided with a counterweight 12, upon which passes generally a single thread 13, either before or after the passage of said thread through the machine in which said thread is utilized. As shown by Fig. 5, I may, in some cases, cause several threads, for instance two, or on the contrary only a portion of a thread, for instance one half of a wick, to pass upon element 11*a*.

Due to the tension, weight and friction of the thread, valve element 11 is held upon its seat with a strength sufficient for overcoming the pressure existing inside chamber 1. When the thread breaks, this action on the thread disap-

pears, valve 11 opens automatically, and the air present under pressure in chamber 1 can escape freely through orifice 4. The compressed air that is fed through orifice 2 is not sufficient for restoring the initial pressure existing in said chamber prior to the opening of outlet 4. Consequently, membrane 7, or the like, moves downwardly, for instance under the action of its own weight, or of the weight of push-piece 8, or of a return spring or the like, which closes contact 10. The respective positions occupied by the parts at this time are shown in dotted lines in Fig. 1.

When the thread has been repaired and valve element again applied against its seat, the initial pressure is restored in chamber 1, which moves membrane 7 or the like upwardly and brings back control organ 10—9 into inactive position.

Instead of using a membrane or piston, such as 7, I might make use of any other manometric device capable of controlling an electric relay or a pneumatic relay, or a signalling device. For instance I might make use of a mere U-shaped tube containing an electricity conducting liquid adapted to cooperate with one or several electric contacts connected to the mechanism to be controlled from a distance.

In the modifications shown by Figs. 2 and 3, the thread 13 itself directly stops the outlet of chamber 1, being engaged in a transverse passage 14 connected with said chamber (as shown by Fig. 2), or being merely applied upon said outlet 4 (as shown by Fig. 3). Of course, in this case, the outlet is made of such a shape and size that the thread shall effectively stop leakage between itself and conduit 14, or, at least, shall permit only losses which can be compensated by the inflow of fluid through orifice 2.

As a matter of fact, the arrangements according to Figs. 2 and 3 are capable of working when it is desired to stop the machine or operate a signal when, for some reason, the section of the thread undergoes a sudden reduction, sufficient for creating a leakage, past said thread, which the inflow through orifice 2 is not capable of compensating. I thus obtain a drop of the fluid pressure inside chamber 1 which may be sufficient for bringing control organ 9 into operative position, for which position it indicates that something abnormal is taking place.

The modification of Fig. 4 follows directly from the embodiment of Fig. 1, with the difference that valve element 11*a* and the counterweight are combined into a single piece, capable of pivoting about an axis 11^1 and which serves to close outlet orifice 4, for instance through a ball valve 15. Piece 11*a*, in which thread 13 is passing, forms a kind of U-shaped gutter 16, the branches of which are curved on the inlet side so as to prevent the accumulation of matter. The center of gravity of the whole is located above said axis 11^1. Piece 11*a* preferably forms two protecting caps for avoiding the action of external elements, one of these caps protecting orifice 4*a* and the other one protecting axis 11^1.

Figs. 4*a* and 4*b* show a modification of this last described arrangement. According to this modification, the closing of outlet orifice 4 is produced indirectly by thread 13, by causing the latter to act on the valve element, ball 15 for instance, through a pivoting or spring mounted detecting device 11, the part of which on which the thread acts by tension, friction, and/or gravity consisting of a surface 16 carried by an arm 11^2 at the end thereof.

As shown by Fig. 4*b*, the active surface 16 may carry a part 16^1 on which the thread to be controlled is normally applied, and at least one lateral extension 16^2, arranged in line with the lateral extension 16*b* of the main part 16*a* of the active portion of an adjacent detecting device. With this arrangement, the threads, which pass normally upon the main parts 16^1 and 16*a* respectively, can, eventually, replace each other, for instance due to a crossing, without ceasing, for this reason, to maintain the two corresponding detecting devices in the closing position.

Analogous detecting devices are shown in Figs. 5 and 6, and also, in a partial manner, in Figs. 7 to 10. It should be well understood that I may make use of any of the arrangements above described, and especially with reference to Figs. 1 to 4, and also in Figs 4*a* and 4*b*.

I may also make use of any device capable of moving apart, even to a very small distance, the detecting device and the closing device for an effort lower than the pressure exerted thereon, due to the presence of the thread to be checked.

The example shown in Fig. 5 concerns the case in which several outlet conduits 4 are connected to a single chamber 1 provided with a single control member 9.

In the embodiment of Fig. 6, one face of the membrane 7 or the like is subjected to the action of the pressure existing in the chamber 6 and the other face of said membrane is subjected to the action of the pressure existing in a chamber 6^1. This last mentioned pressure is controlled by a device including a chamber 17 provided with two orifices of restricted section 18^1 and 18^2 arranged in series, orifice 18^2 opening into the atmosphere. Chamber 17 is fed with fluid through conduit 2, that is to say from the same source of fluid under pressure as chamber 6. With this arrangement, the pressure existing in chamber 17 is always proportional to the feed pressure transmitted through conduit 2, whereby slight variations of this feed pressure are without consequence. As soon as the pressure drops in chamber 1, due to breaking of thread 13 (opening of outlet 4) the pressure existing in chamber 6^1, which is not modified by this drop, causes membrane 7 to move downwardly.

I may also provide several distinct chambers 1 for one or several threads (Fig. 7), and, in order to permit of rapidly finding the group to which belongs a broken thread, each group may be provided with a signal lamp 19, or any other optical or acoustic signal, independent of the relay 20, either electric or not, which is controlled by member 9.

The respective chambers 1 may be fed with fluid under pressure through a common conduit 21 and the latter may be used as a conductor connecting the various control members 9 to the common electric relay 20. For this purpose, this conduit is insulated from the mass of the machine, for instance by means of sleeves 22 made of an insulating material, such as ebonite. The circuit is then advantageously closed through the mass of the apparatus as it is clearly visible on the right hand side of Fig. 7, in which it has been supposed that one of the wires had just broken.

In Fig. 8 I have shown in what manner an apparatus of the kind of that shown by Fig. 7 can act on an electric relay and what structure this relay may be given.

The contacting devices 9—10 are connected in shunt with a conductor 21^1, itself connected in

series with the primary 23 of a transformer fed with current from a source 24 of alternating current. To the feed circuit of the primary 23, there is connected, in shunt, a second primary 25, belonging to a second transformer, preferably identical to the first mentioned one and advantageously including a test lamp or adjusting lamp 26. The respective secondaries 27, 28 of these transformers are connected in series and arranged in such manner that the inducted electromotive forces are in opposition. These secondaries feed current, preferably through a rectifier 29, to an electro-magnet 30 the armature 31 of which is connected to the clutch lever 32 of the machine, which is provided with a counterweight 33.

Under normal conditions of working, the primary 23 is not fed with current and only primary 25 is connected to the source of alternating current 24. Alternating current is fed to rectifier 29 and to electro-magnet 30, which keeps its armature 31 in the position for which the lever 32 keeps the clutch in operative engagement. If one of the threads happen to break, for instance a thread corresponding to the apparatus shown on the right hand side of Fig. 8, the current also flows through primary 23 and as its secondary 27 is mounted in opposition with the secondary of the other transformer, which is constantly energized, the tension at the terminals of rectifier 29 and of electro-magnet 30 is reduced, eventually to zero, whereby counterweight 33 moves lever 32 into the position in which the clutch is disengaged, shown by Fig. 8.

When the thread has been repaired, a workman brings back lever 32 into the position that corresponds to the engagement of the parts of the clutch and the electro-magnet maintains its armature 31 in the corresponding position.

In the embodiment of Fig. 9, the contacting devices 9—10 are inserted in series in the feed circuit 21 of the primary 23^1 of a transformer the secondary 27^1 of which is connected, through rectifier 29, with electro-magnet 30, which works as above described. When a thread breaks, contact 10 is cut off (contrary to what has been supposed up to now) which causes the electro-magnet 30 to be de-energized. Furthermore, a test lamp 19 may be connected in shunt to the terminals of each relay 20, provided that its electrical resistance is sufficiently high in order that, due to the cutting off of the circuit 21^1, the tension at the terminals of the electro-magnet is sufficiently reduced in order that its strength becomes lower than the effect of the weight of 33.

In the example shown by Fig. 10, the clutch 32 is controlled by a pneumatic relay 35 including a piston 36 both of the faces of which are subjected to the pressure of a gaseous fluid fed by a reservoir 37 to which said fluid is supplied from any suitable source, for instance a pump 38, which may be actuated by a cam 40 driven by a moving organ of the machine.

The pressure that acts upon the upper face of the piston always corresponds to that of reservoir 37 owing to the communication afforded by a passage 39 of large section. On the contrary, the pressure that acts on the lower face of the piston corresponds to that existing in a chamber 37^1 which can be placed in communication with chamber 37 through a calibrated orifice or small section 42 and a conduit 43. Under normal conditions of working, the pressures acting on the respective faces of piston 36 are equal and the control lever 32 of the machine occupies the position for which the clutch is let in. If, due to the breaking of a thread, the pressure in the corresponding chamber 1 decreases, membrane 7 or the like is moved downwardly and it produces the displacement of a valve member 34, mounted either pivotally or otherwise, which cooperates with an orifice 41 provided in the wall of chamber 37^1. It follows that the pressure in chamber 37^1 decreases and piston 36, urged by the higher pressure existing in chamber 37, moves downwardly, bringing lever 32 into the position corresponding to the disengagement of the clutch, as shown by Fig. 10.

Once the thread has been repaired, the pressure increases in chamber 1; the corresponding membrane 7 is moved upwardly and closes orifice 41. The pressure in chamber 37^1 again becomes equal to that existing in chamber 37 and the workman can bring lever 32 into its position corresponding to the clutch being let in.

It should be noted that chamber, or chambers, 1, and also chamber 37^1, might be fed from the same source of fluid under pressure, for instance pump 38.

Of course, it is possible to control, either through the same relay or through an auxiliary relay, any device for braking the machine, entering into action when the clutch is released, either in the manner above described, or in any other way.

In the preceding description I have only considered the case in which, in chamber 1, there exists an overpressure which drops when one or several of the outlet orifices 4 is opened. I might also, and with the same advantage, use any arrangement in which an outlet remains closed under normal conditions and automatically opens as soon as the thread breaks or its section suddenly decreases below a predetermined value.

The device above described, which is both simple and efficient, permits of automatically controlling the working of a machine by immediately bringing about an operation or operating a signal which permits of obviating the consequences of any defectuous operation.

In a general way, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of the present invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. A device for use in a machine for working threads and the like, which comprises, in combination, a casing including a chamber filled with a fluid at a pressure different from atmospheric pressure and having at least one outlet, valve means for controlling said outlet adapted to be operatively controlled by at least one thread element, so as to open when said thread is broken, and a member movable in response to variations in the fluid pressure in said chamber produced by the opening of said valve means.

2. A device for use in a machine for working threads and the like, which comprises, in combination, a casing including a chamber filled with a fluid at a pressure different from atmospheric pressure and having at least one outlet, a valve cooperating with said outlet arranged to be kept in closed position by the presence of at least one thread element worked normally in said machine,

yielding means for opening said valve adapted to operate when said thread element is missing, and a member movable in response to variations in the fluid pressure in said chamber produced by the opening of said valve.

3. A device for use in a machine for working threads and the like, which comprises, in combination, a casing including a chamber having at least one outlet opening into the atmosphere and an inlet of restricted section, means for feeding fluid under pressure to said chamber through said inlet, a valve for controlling said outlet arranged to be kept in closed position by the presence of at least one thread element normally worked upon by said machine, yielding means for opening said valve adapted to operate when said thread element is missing and a member movable in response to variations in the fluid pressure in said chamber produced by the opening of said valve.

4. A device according to claim 3 in which said valve is arranged to be directly acted upon by said thread element, the yielding means for opening said valve consisting of a counterweight.

5. A device according to claim 3 including a pivoting member for keeping said valve in the closed position adapted to cooperate with said thread element, said pivoting member being so balanced as to pivot into a position permitting the opening of said valve in the absence of said thread element.

6. A device according to claim 3 further including a second chamber having two orifices of restricted section connecting the inside of said second mentioned chamber respectively with the atmosphere and with said means for feeding fluid under pressure, and means for causing the fluid pressure in said second mentioned chamber to act on said movable member in opposition to the action of the fluid in the first mentioned chamber.

7. A device according to claim 3 further including means operative by said movable member for stopping at least one part of said machine.

8. A device according to claim 3 further including, signalling means, and means operative by said movable member for actuating said signalling means.

9. In connection with a machine for working threads and the like, a plurality of devices according to claim 3, and a common relay adapted to be operated by any of these movable members.

10. A device according to claim 3 further including an electric relay, a circuit for said relay, and a make and break device in said circuit, said movable member of claim 3 constituting the active element of said make and break device.

11. A device according to claim 3 further including a pneumatic relay, and means operative by said movable member for operating said relay.

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