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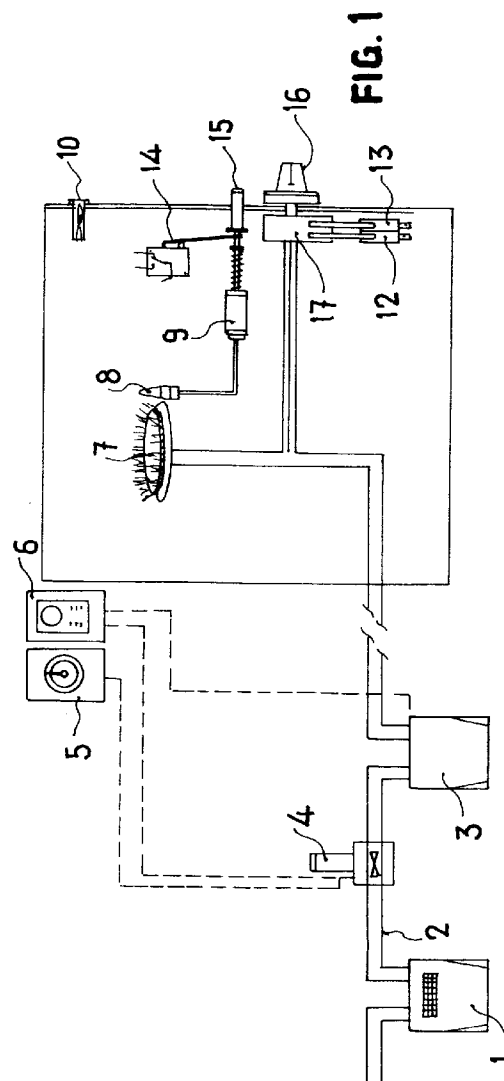
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(54) **Safety system to prevent accidental leakage in gas circuits and receivers.**

(57) The invention is based on creating a system which shuts off the supply of gas automatically, whenever the circuit has a leak or the receivers are mishandled, possible causes of leaks being allowing the gas to exit without lighting the burner; lighting the burner pushing the safety button and for uncontrollable reasons the flame being extinguished, either due to failed supply or by chance; and lighting the burner and not pushing the safety button.

The supply is automatically cut off and the possible leak cancelled by action of a number of mechanical, electrical, mechanical-electrical and/or electronic means, working in conjunction with each other.



The invention relates to a system with which the supply of gas is cut off in the event of and upon mishandling of its operation or there is an accidental leakage, whence it is useful in the gas sector, both household and industrial, and in all facilities adapted to the system.

Basically, the systems used heretofore are gas detectors giving an acoustic signal, both in the appliance itself or a different appliance linked thereto, but at a distance.

The invention yields a number of possibilities:

A). If a burner is connected by the relevant valve and the burner flame is not lighted within an adjustable time-period, estimated at 50 seconds, the supply of gas is automatically cut off through an electrically operated valve (see drawing number 3).

B). If the valve is connected and the burner lighted, but after approximately 20 seconds a safety button is not activated, it will also be switched off after some 50 seconds after valve connection and, as above, the supply of gas is cut off through the electrically operated valve (see drawing number 4).

C). If the burner is lit as in the above two paragraphs and works properly, a neon light fitted close to the receiver will begin flashing and if the flame should be put out by accident, after approximately 20 seconds, a timer adjusted at 50 seconds will begin to work, cutting off the supply of gas after such time (see drawing number 5).

D). When the receiver is at rest the electrically operated valve may be on or off; if it is off the supply will not be allowed through; if it is on, and there is a small leak, it will be automatically shut off.

At this point, if a check is specifically to be made to see whether there is a leak in the circuit from the gas flow detector to the receiver, i.e. a leak test, the burner valve must be shut when the neon light is off, at which point no consumption is expected, wherefore when the flow detector detects a leak, the supply will be cut off automatically and without any operation being required (see drawing number 6).

The main feature of the subject invention as compared with prior art is its comprehensive protection system that can save many human lives, and substantial material damage.

The advantage over former methods is that there is a change from passive safety, namely acoustic detectors which only give a signal, to active safety, for it cuts off the supply of gas automatically.

The invention will be described in full details with reference to the embodiment shown in the drawings, which is not limiting and may hence be varied so long as the actual characteristic aim thereof is not fundamentally altered.

In the drawings:

Figure 1 is a graphic diagrammatic description of

the system.

Figure 2 is a general electric diagram of the same system subject of Figure 1.

Figure 3 is a sectorial diagram applied to system possibility -A-.

Figure 4 is a sectorial diagram applied to system possibility -B-.

Figure 5 is a sectorial diagram applied to system possibility -C-.

Figure 6 is a sectorial diagram applied to system possibility -D-.

Figure 7 is a diagrammatic view of the device of the flow detector gears.

Figure 8 is a diagrammatic view of the automatic gas cut-off device.

In the drawings, the following number references have been made, to identify the various parts of the assembly:

- 1.- Gas meter.
- 2.- Gas piping.
- 3.- Flow detector.
- 4.- Electrically operated sealing-off valve.
- 5.- Timer.
- 6.- Relay.
- 7.- Burner.
- 8.- Thermocouple.
- 9.- Electromagnet.
- 10.- Neon light.
- 11.- Detector gears.
- 12.- Microswitch number 1.
- 13.- Microswitch number 2.
- 14.- Microswitch number 3.
- 15.- Safety button.
- 16.- Sealing-off valve.
- 17.- Eccentric.
- 18.- Operation indicator.
- 19.- Coil.

A thermocouple (8) is fitted in the burner of any gas appliance, close to the flame, so that it is heated even if adjusted to a minimum rating. The thermocouple (8) rod will be fitted with an electromagnet (9), its end fitted with a safety button (15) so that when the thermocouple is hot, the electromagnet (9) may be pressed or activated to remain interlocked while the heat is present. The push-button (15) in the electromagnet will be linked with an electric microswitch (14) which indicates when it is active and when it is idle, thereby to obtain the necessary electrical signals to know whether the button is on or off.

Each gas receiving appliance has at least a sealing-off valve (16) for each burner, each of which will also carry two microswitches (12) (13) to detect through an eccentric (17) arranged on the valve shaft whether it is connected or not, thereby obtaining the necessary electrical signals to know whether the sealing-off valves (16) are connected or disconnected.

The timer (5) selected works electronically,

though the system could be otherwise. It works on being energised and then begins timing, which is adjustable at 30 or 60 seconds, upon completion of which timing an inner switch will be activated which is used to power the electrically operated valve.

An electrically operated valve (4) will be fitted at the gas supply lead-in to cut off the supply. The valve is powered electrically through the timer or directly through a relay.

This feeding conduit will, after the electrically operated valve (4), be connected with a flow detector, which is essentially a gas meter without the metering portion, fitted with new metallic gears (11) which will turn when there is a gas flow, connecting and disconnecting, alternately contacting the notchings in the gears, thereby to provide signals to report whether or not there is a flow, no matter how small.

The distance between the flow detector (3) and the gas receiving appliance, does not change the system.

The above description is an electrical and mechanical system, with its own limitations, such as having to press the safety button whenever the burner is lighted and waiting a few seconds, just as in other appliances available in the market, for instance instantaneous heaters.

If the thermocouple is replaced with an NTC (temperature variable resistance) and an electronic timer is fitted, the waiting time for heating and cooling the thermocouple would then be suppressed.

Additionally, the said flow detector (3) is also electrical and mechanical and could be replaced with an electronic detector likewise measuring the leak flow.

The electric microswitches (12) (13) (14) could also be replaced with optical detectors or magnetic detectors.

The relay (6) could be replaced with a triac, thyristor or power transistor.

The electrically operated valve (4) could be replaced with a motorised valve.

The above changes would nevertheless enhance the intrinsic safety in dangerous or explosive areas, but would not change the main philosophy of the invention.

Subject to the above-mentioned various possibilities, included in parts A) to D), the system works as follows:

A). (See Figure 3) When the sealing-off valve in any burner is turned on and the flame is not lighted, what happens is that the first microswitch in the valve is connected to give way to the microswitch in the thermocouple electromagnet and if the latter is not activated (pushing the safety button) the microswitch will be activated and power the timer, which will begin to count the set time and after this time is up, if the safety button is still to be pushed, the timer will be activated to power

the electrically operated valve, which will cut off the supply of gas (see Figure number 3).

B). (See Figure 4) Continuing with the above, but lighting the burner, what happens is that the thermocouple is heated and after some 20 seconds if the electromagnet button (safety button) is not pushed, the microswitch will power the timer set at a time in excess of the thermocouple operating time (approximately 50 seconds), after which time the electrically operated valve will be connected and cut off the supply of gas (see Figure number 4).

C). (See Figure 5) however, if the electromagnet button is pushed, what happens is that the microswitches in the latter will be turned on and the timer order cancelled, whereupon the normal operating system will begin, a neon light to be connected to the flow detector will flash intermittently, thereby displaying the passage of gas through the detector, the greater the flow, the smaller the gap between flashes (See drawing number 5).

In the event that the flame is extinguished by chance in only one of the various possible burners in the receiver as a whole, what would happen is that the thermocouple would be cooled and after 20 seconds stop powering the electromagnet in the actual burner, driving the microswitch which will send an order to the timer and after the set time the electrically operated valve will be turned on, cutting off the supply.

D). (See Figure 6) When use of the gas receiving appliance is over, when the last sealing-off valve, with the neon light on, is shut off by the microswitch in the said valve, together with the microswitches in the other valves, connected in series, and if the flow detector gears are touching, a relay having two independent contacts will be connected, powering itself at its first contact to remain interlocked and at the same time powering electrically operated valve directly at the second contact, in order to cut off the supply of gas, remaining thus until a sealing-off valve in the burner is turned on, thereby to ensure that the power circuit to the gas receiver is switched off when no burner is used.

If on closing the last sealing-off valve we wait until the neon light is off, in other words that the flow detector gears are not connected, the relay will be at rest and the electrically operated valve will hence remain open, though if there is a leak between the detector and the receiving appliance, the detector gears will begin to move to the extent that there is a leak, and will finally be connected, interlocking the said relay and hence turning on the electrically operated valve.

In conclusion, it remains to be said that if the electrically operated valve stays open and is turned on when the installation is at rest, we can say that the circuit is leaking, but that the amount of gas let off will

have been limited thanks to the system (see drawing number 6).

In short, the invention is essentially characterised in that the supply of gas is cut off automatically, whenever there is a leak in the circuit or the receivers are mishandled, the gas receiving appliance being turned off:

- a). Whenever the actuation valve is connected and the burner is not lighted (Figure 3).
- b). Whenever the valve is turned on and the burner lighted and time elapses without the safety button being pushed (see Figure 4).
- c). Whenever the flame is extinguished by chance or mishandling (Figure 5).
- d). Whenever all the actuation valves in the receiving appliance are closed and the supply is automatically cut off, or else it can be left in place to check whether there is a leak in the circuit, likewise cutting off the supply of gas if such leak exists (see Figure 6).

In developing the system, as above-described, a number of limitations could ensue, which are easy to overcome in accordance with the following alternative embodiment (Patent 9202179 Priority 29-10-92).

These limitations will only be reflected on the safety system if the receiver is used and a hypothetical gas leakage comes about at the same time, which will continue to exist while the receiver is working, but which gas leakage will no longer exist when the last valve driving the receiver is shut off.

Consequently, the probability of danger is per se low, bearing in mind that if the receiver is for instance a household cooker, it would only be working three to four hours out of the twenty-four daily and even so the time of use would be split into three periods, given the manner in which the receiver or cooker will normally be used, and the user or users would consequently normally be present, thereby reducing the possibility of there being a danger situation even further.

The changes and improvements to the system comprise adapting its mechanical portion fitting two detector gears in the flow detector, plus slightly increasing the relays, as graphically shown in the drawings illustrating this description.

The said elements are advantageous, in the above-mentioned hypothetical leakage, in that the leakage would exist only the first time it coincided with the receiver working, and when the last sealing-off valve were shut off, the supply of gas would full automatically be cut off, and the pilot indicating operation turned on. Before using the supply again, it would first be necessary to repair the fault and then push the lock release button.

These improvements are shown in Figures 9, 10 and 11 of the drawings, as follows:

Figure 9 is a diagrammatic view of the operation; Figure 10 is an elevation view of the detector gears; and

Figure 11 shows the actual gears of the above figure, in this case as a plan view, thus showing the two sets of gears.

The references respectively relate to:

- 1.- Lock release button. Electrically operated valve.
- 2.- Microswitch number 2.
- 3.- Microswitch number 1.
- 4.- Microswitch number 3.
- 5.- Timer.
- 6.- Operation indicator. Sealing-off electrically operated valve.
- 7.- Triple contact relay.
- 8.- Coil.
- 9.- Double contact relay.
- 10.- Coil.
- 11.- Double contact relay.
- 12.- Coil.
- 13.- Drive shaft.
- 14.- Synchronised gears.
- 15.- Flow detector inner switch terminals.
- 16.- Flow detectors gear set.
- 17.- Gears in open position.
- 18.- Gears in shut position.
- 19.- Flow detector.
- 20.- Flow detectors gear set.

The changes and improvements to the system comprise the synchronised incorporation of the following materials:

- a). Lock release button (1).
- b). Triple contact relay (7).
- c). Double contact relay (9).
- d). Flow detectors gear set (16).

Starting with the two power lead-in terminals -A- and -B- with the microswitch (2) out-port, the feedback contact is powered by means of the triple contact relay (7) switch which will connect the mains lead-in terminal -B-. The same microswitch (2) out-port will also be connected with the feedback contacts of the double contact relays (9) and (11), the detector gear terminals (15) of the flow detector and the double contact relay (7) switch, which would in turn, on rotation of the terminals (15) in the event of a leakage in the piping, connect the triple contact relay (7) switch and coil terminals and thereafter the circuit would be connected to the electrically operated valve (6) terminals and operation indicator pilot.

The power terminal -A- is connected to the double contact relay (10) (12) coils and to the relay (11) switch lead-in so that, in the event of this hypothetical leakage continuing, the detector gear terminals (15) in the flow detector would connect the coil and the triple contact switch lead-in, and their out-port would connect the remaining terminals in the electrically operated valve and operation indicator pilot (6) and the supply of gas would in turn be cut off.

A new improvement to the invention is specifically designed for the industrial application of the sector

(Patent 9202375 Priority 25-11-92) and comprises using a leak-proof gas piping double circuit installation with an automatic system to detect the same and cut off the supply of gas.

In this case, the necessary elements have been adopted so that in the event of the receiver being mis-used, the supply of gas would be full automatically cut off.

The improved system protects the receiver, just as provided for in the system described above, saving that the mechanical temperature control has been suppressed and replaced with an electronic control, with temperature pre-selection.

In the gas piping circuit leading from the first general shut-off electrically operated valve to the receiver, the installation has been provided with a leak-proof gas piping double circuit installation with an automatic system which would detect and cut off the supply of gas in the event of a hypothetical leakage, using its synchronism, and could thus, given its characteristics, continue to keep the supply of gas through the other circuit.

Connection and disconnection is alternated by a cyclic timer, two delayed connection timers, the extension of relays, lock release buttons, in addition to the electrically operated shut-off valves and electrically operated general shut-off valves in the alternative circuits, and flow detectors make it possible to fully synchronise the same.

One of the advantages the system that the invention offers is that if the supply of gas is cut off due to a mishandling of the receiver, or a leakage in the piping, the gas volume will be spread, and will be so insignificant as to pose no danger whatsoever.

In short, this system works almost without accumulation of gas, thus making it different from other conventional systems, which work and accumulate gas to detect the same.

In order to provide an accurate interpretation of the various sides of the current improvement, a description is made of the replacement of microswitch number 2, the sealing-off valve, and the temperature control elements of the previous system comprised by: safety button, electromagnet and microswitch number 3.

Figures 12, 13, 14 and 15 refer to this alternative embodiment.

Figure 12 shows the overall leak-proof diagram.

Figure 13 is a diagrammatic operating view.

Figure 14 is an elevation view of the detector gears.

Figure 4 shows the actual gears of the above figure, this time as a plan view, thus showing the two sets of gears.

The number references respectively relate to:

- 1.- Microswitch number 1.
- 2.- Electronic temperature control with temperature pre-selection.

3.- Timer.

4.- Cyclic timer.

5.- Coil.

6.- Delayed connection timer.

7.- Coil.

8.- Operation indicator. Shut-off electrically operated valve "A". For leak-proof test of circuit number 1.

9.- Operation indicator. Shut-off electrically operated valve "B". For leak-proof test of circuit number 1.

10.- Lock release button. Electrically operated valve.

11.- Leak warning indicator. General shut-off electrically operated valve "C" of circuit number 1.

12.- Triple contact relay.

13.- Coil.

14.- Double contact relay.

15.- Coil.

16.- Double contact relay.

17.- Coil.

18.- Flow detector.

19.- Delayed connection timer.

20.- Coil.

21.- Operation indicator. Shut-off electrically operated valve "D". For leak-proof test of circuit number 2.

22.- Operation indicator. Shut-off electrically operated valve "E". For leak-proof test of circuit number 2.

23.- Lock release button. Electrically operated valve.

24.- Leak warning indicator. General shut-off electrically operated valve "F" of circuit number 2.

25.- Triple contact relay.

26.- Coil.

27.- Double contact relay.

28.- Coil.

29.- Double contact relay.

30.- Coil.

31.- Flow detector.

32.- Drive shaft.

33.- Synchronised gears.

34.- Detector inner switch terminals.

35.- Flow detecting gear set.

36.- Gears in open position.

37.- Gears in closed position.

38.- Flow detecting gear set.

39.- Flow detecting gear set.

With reference to the figures the system improvements comprise the synchronised incorporation of the following materials:

- a). Electronic temperature control, with temperature pre-selection (2).
- b). Cyclic timer (4).
- c). Delayed connection timer (6).
- d). Operation indicator. Shut-off electrically operated valve "A" (8) for leak-proof test of circuit

number 1.

e). Operation indicator. Shut-off electrically operated valve "B" (9) for leak-proof test of circuit number 1.

f). Lock release button. Electrically operated valve (10).

g). Triple contact relay (12).

h). Double contact relay (16).

i). Delayed connection timer (19).

j). Operation indicator. Shut-off electrically operated valve "D" (21) for leak-proof test of circuit number 2.

k). Operation indicator. Shut-off electrically operated valve "E" (22) for leak-proof test of circuit number 2.

l). Electrically operated valve lock release button (23).

m). Leak warning indicator. General shut-off electrically operated valve "F" (24) for circuit number 2.

n). Triple contact relay (25).

o). Double contact relay (27).

p). Double contact relay (29).

q). Flow detector (31).

r). Drive shaft (32).

s). Synchronised gears (33).

t). Flow detector inner switch terminals (34).

u). Flow detecting gear set (35).

v). Open position gears (36).

w). Gears in closed position (37).

x). Flow detecting gear set (38).

y). Flow detecting gear set (39).

Starting with the power lead-in terminals -A- and -B-, terminal -B- is connected to the microswitch (1) lead-in. Its out-port connects the lead-in to the temperature control switch (2), between the microswitch out-port (1) and the temperature control switch lead-in (2), the circuit being connected, which will be connected to the coil (5) in the cyclic timer (4); this same circuit connects the coil (7) of the delayed connection timer (6), this same circuit connecting the operation indicator and electrically operated valve (8), this same circuit connecting the operation indicator and electrically operated valve (9); this same circuit connects the coil (20) of the delayed connection timer; this same circuit connects the operation indicator and electrically operated valve (21) and this same circuit finally connects the operation indicator and electrically operated valve (22).

The circuit is connected at power terminal "A", which connects the timer (3) coil; this same circuit connects the timer circuit (3) lead-in; this same circuit connects the coil (5) in the cyclic timer (4) and this same circuit finally connects the cyclic timer (4) switch lead-in.

The circuit connecting the coil (7) in the delayed connection timer (6) is alternately connected from the first out-port contact of the cyclic timer (4); this same

circuit connects the delayed connection timer (6) switch lead-in.

The triple contact relay (12) switch lead-in is connected at the out-port of the delayed connection timer (6) switch. The operation indicators and electrically operated valve (8) and (9) are connected at the out-port of the same switch, and the same are closed through the closed contact of the triple contact relay (12) switch, thereby triggering the leak-proof test.

The timer (3) coil terminal is connected at the out-port of the temperature control (2) switch, and this same circuit connects the timer (3) switch lead-in, connects the circuit which is in turn connected to the out-port of the first triple contact relay (12) switch, and this same circuit finally connects the out-port of the triple contact (25) switch. The out-port of the timer (3) switch connects the out-port of the second triple contact relay (12) switch and this same circuit finally connects the out-port of the second triple contact relay (25) switch.

The lock release button (10) lead-in is connected at power terminal circuit "A" and its out-port connects the coil (15) in the double contact relay (14), this same circuit connects the coil (17) in the double contact relay (16) and this same circuit finally connects the double contact relay (14) switch, this same circuit connecting the second double contact relay switch in the relay (14), this same circuit connecting the first switch in the double contact relay (16) and this same circuit finally connecting the lead-ins of the terminals (34) in the first and second flow detector (18) switch. The coil (17) in the double contact relay (16) is connected at the out-port of the first flow detector switch (18) and this same circuit connects the double contact relay (16) switch lead-in and the out-port of the remaining switch in the double contact relay (16) connects the coil (13) in the triple contact relay (12) and this same circuit connects an out-port of the second triple contact relay (12) switch.

The coil (15) in the double contact relay (14) is connected at the out-port of the second flow detector gear (18) and this same circuit connects the double contact relay (14) switch and the out-port of the remaining switch in the double contact relay (14) connects the out-port of the first triple contact relay (12) and finally this same circuit connects the last remaining terminal of the coil (13) in the triple contact relay, which previously in its synchrony at the terminals of the first and second flow switches (18), in the hypothetical event of a leakage, will have finally connected the triple contact relay (12), and the lead-in of the first and second triple contact relay (12) switch powers the remaining terminals of the leakage warning indicator, and the general shut-off electrically operated valve "C", and the circuit number 1 gas supply will in turn be cut off.

The second out-port contact of the cyclic timer (4) switch alternatively connects the circuit which con-

nects the coil (20) in the delayed connection timer, this same circuit connecting the delayed connection timer (19) switch lead-in; the out-port of the delayed connection timer (19) switch connects the triple contact relay (25) switch lead-in. The out-port of the same switch connects the operation indicators and electrically operated valves (21) and (22), which electrically operated valves are shut through the closed contact of the triple contact relay (25) switch, thereby triggering the leak-proof test. Power terminal circuit "A" connects the lock release button (23) lead-in and its out-port connects the coil (28) in the double contact relay (27), this same circuit connecting the coil (30) in the double contact relay (29) and this same circuit finally connecting the double contact relay (29) switch.

The terminal "B" power circuit connects the first double contact relay (27) switch, this same circuit connecting the second double contact relay switch of the relay (27), this same circuit connecting the first double contact relay (29) switch and this same circuit finally connecting the lead-ins of the first and second flow detector (31) switch terminals. The out-port in the first flow detector (31) switch connects the coil (30) in the double contact relay (29) and the out-port in the remaining switch of the double contact relay (29) connects the coil (26) in the triple contact relay (25) and this same circuit connecting an out-port of the second triple contact relay (25) switch. The out-port of the second flow detector gear (31) connects the coil (28) in the double contact relay (27) and this same circuit connects the double contact relay (27) switch, and the out-port in the remaining switch in the double contact relay (27) connects the out-port in the first triple contact relay (25) switch, and finally this same circuit connects the last remaining terminal of the coil (26) in the triple contact relay, which previously in its synchronism at the terminals (34) of the first and second flow switch (32), in the event of a hypothetical leakage, will have easily connected the triple contact relay (25) and the lead-in of the first and second triple contact relay (25) switches, powers the remaining terminals in the leakage warning indicator and the electrically operated general shut-off valve "F", and the circuit number 2 gas supply will in turn be stopped.

It must be pointed out that both when the receiver is working and when it is at rest, the circuit affected will be cut out in the event of a leakage, with the electrically operated valve in the respective circuit being shut off, and it will therefore be possible to continue keeping the supply through the remaining circuit.

The installation could also work merging a programmable robot and suppressing the above-mentioned automations.

Claims

1.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, characterised in that the mechanical portion of a gas meter is used, eliminating metering and using the drive shaft and its movement, two metallic gears are fitted to rub against each other alternately on turning, in order that fitting an electric wire in each of the shafts thereof a signal will be achieved whose frequency will depend directly on the rotation of the shafts and the latter on the flow of gas (see drawing number 7) (Patent 9200526 Priority 10-3-92).

2.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claim 1, characterised in comprising a system which automatically cuts off the supply of gas when the circuit has a leak or the receivers are mishandled, by detecting movement of the sealing-off valve in a burner, and at the same time detecting the temperature thereof, if any, to decide through a timer whether or not to seal off with an electrically operated valve or motorised valve the supply of gas to the receiver appliance (Patent 9200526 Priority 10-3-92).

3.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 and 2, characterised in that the system forming synchronism incorporates a lock release button, a triple contact relay, a double contact relay and a set of two flow detector gears (Patent 9202179 Priority 29-10-92).

4.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 3, characterised in that the feedback contact is fed through the triple contact relay switch, which will connect the mains lead-in terminal "B" leaving from the out-port of the microswitch (Patent 9202179 Priority 29-10-92).

5.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 4, characterised in that the same microswitch out-port is connected with the feedback contacts of the double contact relays, the terminals of the detector gears of the flow detector and the switch of the double contact relay, which will, in the event of the pipe leaking, by means of a turning movement, connect the coil terminals and triple contact relay switch and from there the circuit will connect the terminals of the electrically operated valve operating indicator pilot (Patent 9202179 Priority 29-10-92).

6.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 5, characterised in that power terminal "A" is connected with the coils of the double contact relays and the lead-in of the relay switch so that if the hypothetical leakage continues, the coil and the triple contact switch lead-in will be connected

through the terminals (15) of the detector gears in the flow detector, the remaining terminals of the electrically operated valve and operation indicator pilot being connected at the out-port, the supply of gas being cut off (Patent 9200526 Priority 10-3-92).

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7.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 6, characterised in that in the case of industrial installations, the installation will be provided with a double leak-proof gas piping circuit, fitted with an automatic system to detect and shut off the supply through the damaged circuit, with the possibility of keeping the same through the second circuit (Patent 9202375 Priority 25-11-92).

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8.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 7, characterised in that the mechanical temperature control provided for the receiver has been replaced with another control, this time being electronic with means for pre-selecting the temperature (Patent 9202375 Priority 25-11-92).

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9.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 8, characterised in that system connection and disconnection is alternated by means of a cyclic timer, two delayed connection timers, the extension of relays, lock release buttons and electrically operated valves to shut off the alternative circuits, full synchronism being ensured through the flow detectors (Patent 9202375 Priority 25-11-92).

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10.- SAFETY SYSTEM TO PREVENT ACCIDENTAL LEAKAGE IN GAS CIRCUITS AND RECEIVERS, as in claims 1 to 9, characterised in that in the event of a leak, both if the receiver carries on working, and if it stays idle, the supply will be shut off in the relevant circuit by shutting off its electrically operated valve, which supply can be kept through the remaining circuit (Patent 9202375 Priority 25-11-92).

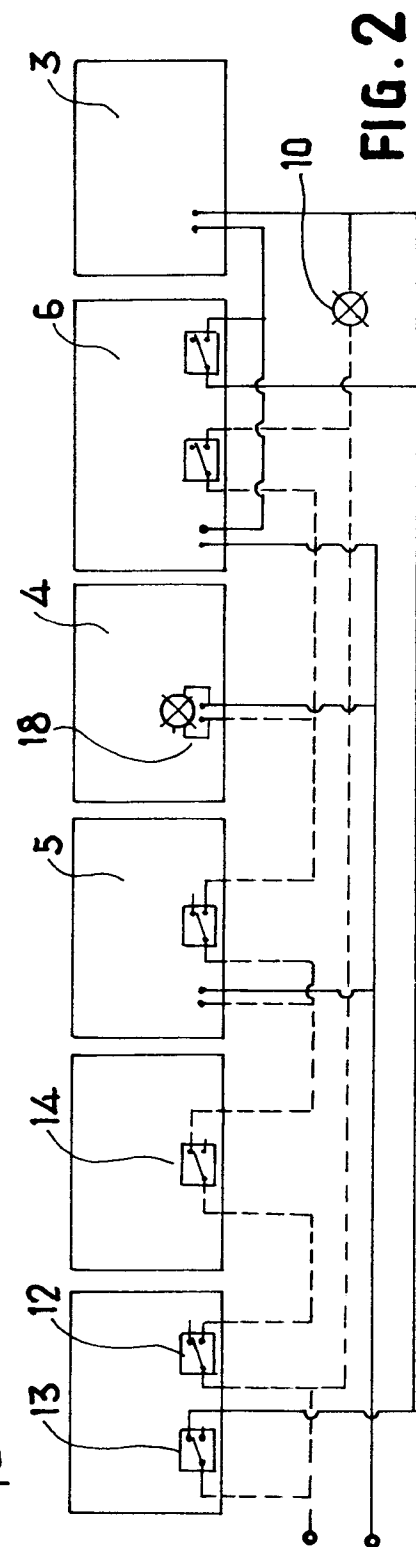
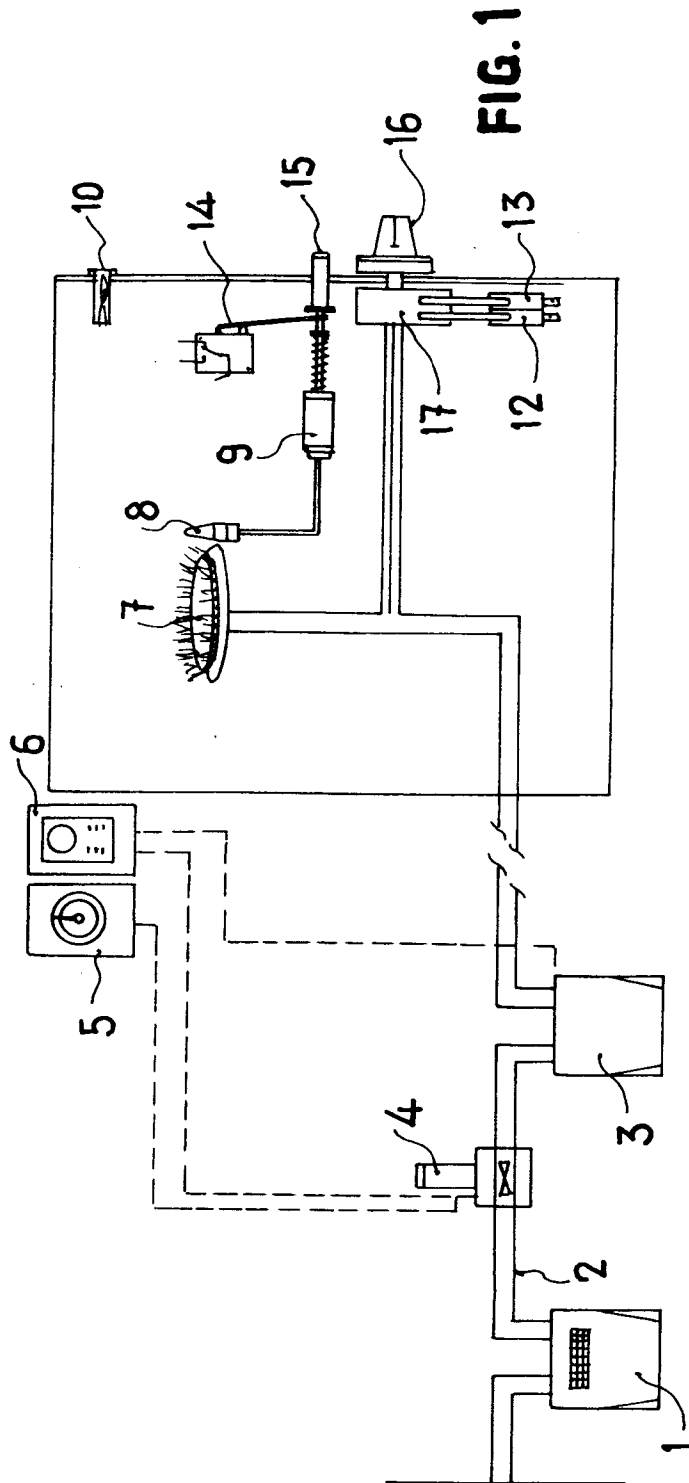
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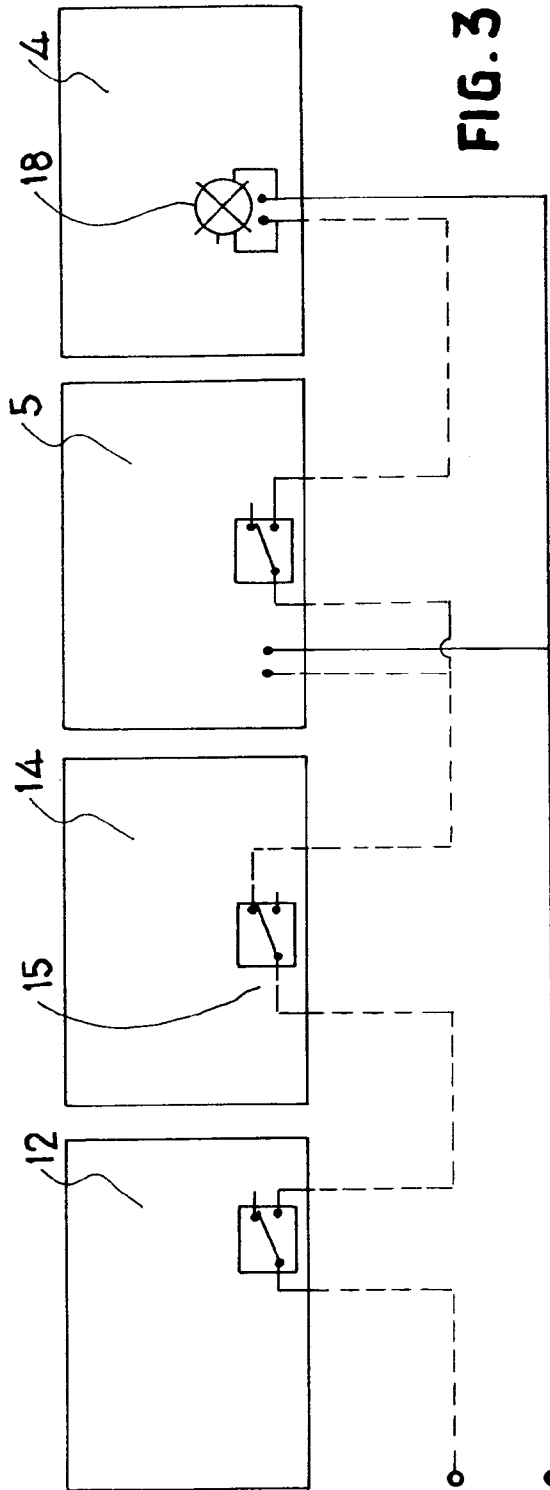


FIG. 3

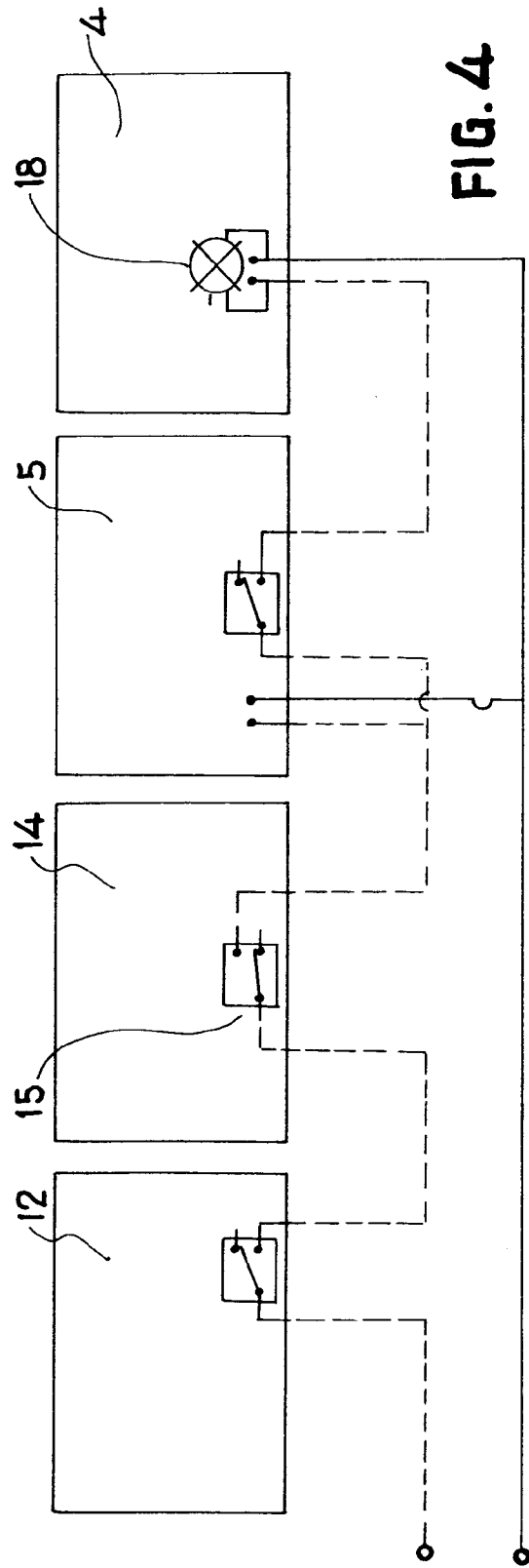


FIG. 4

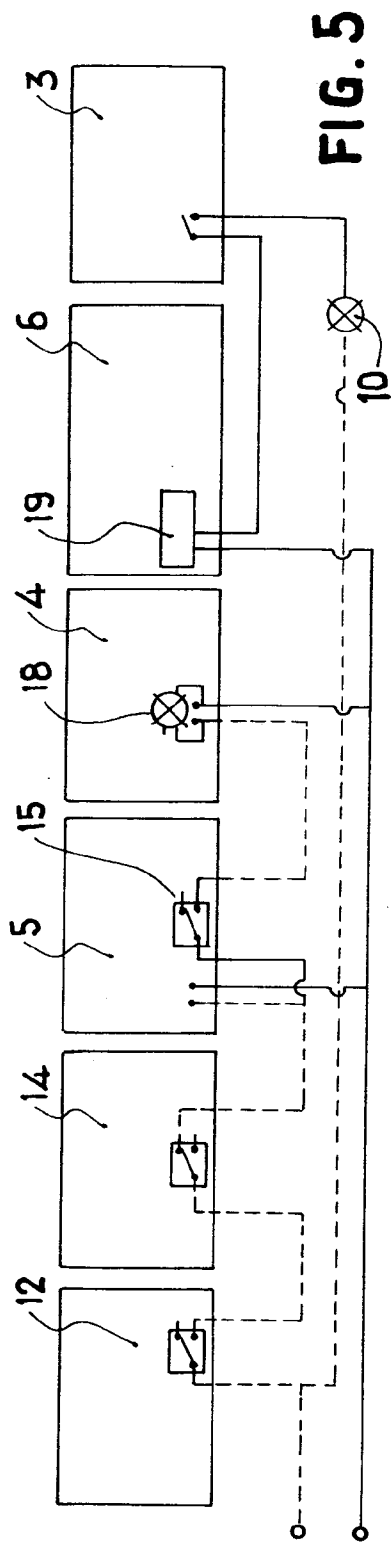


FIG. 5

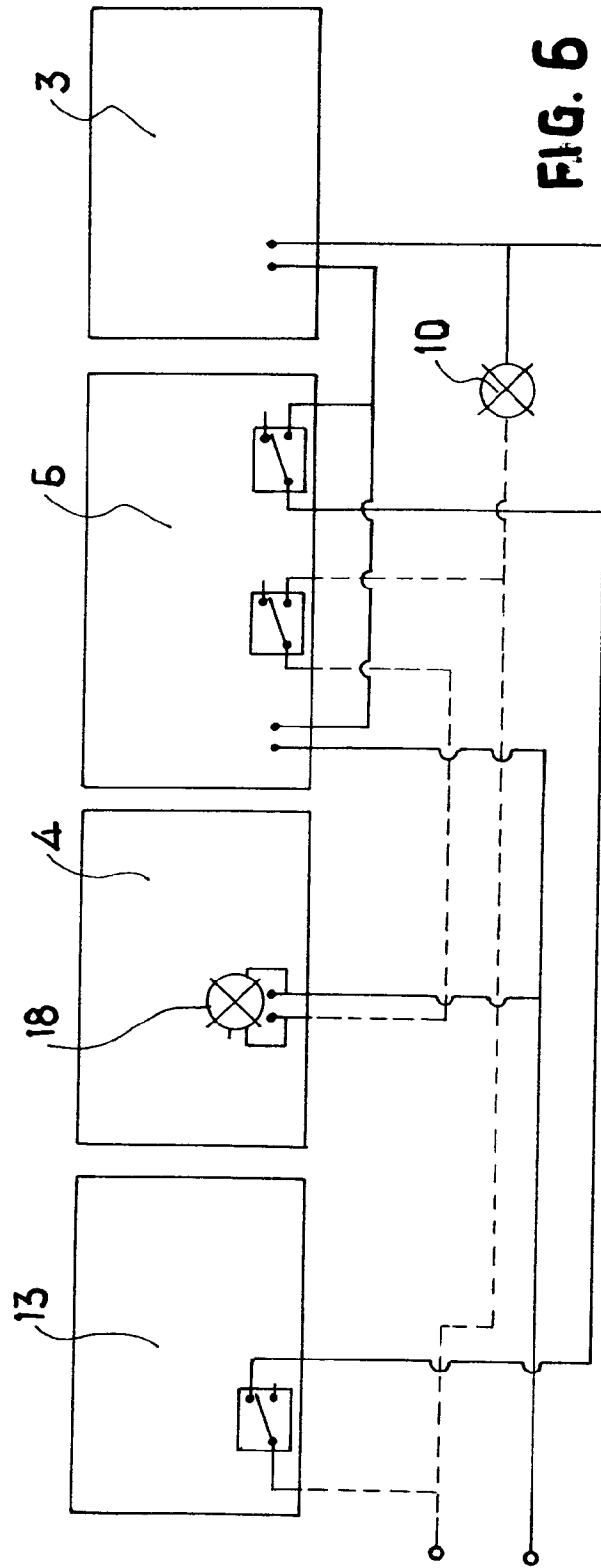
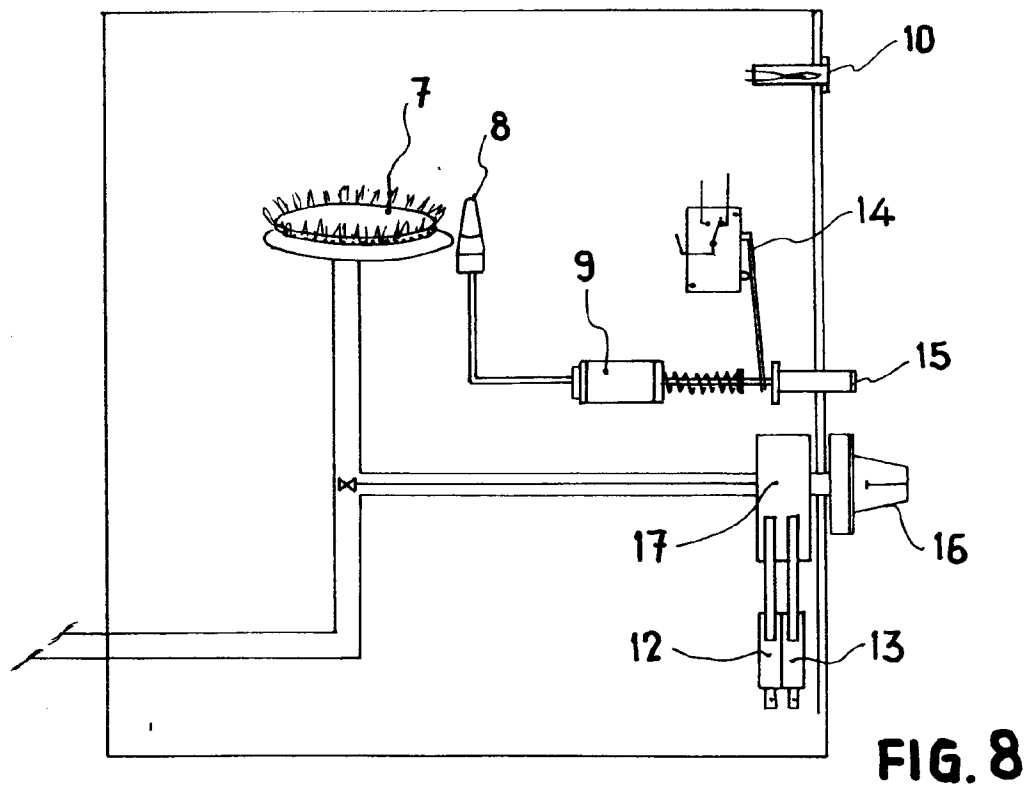
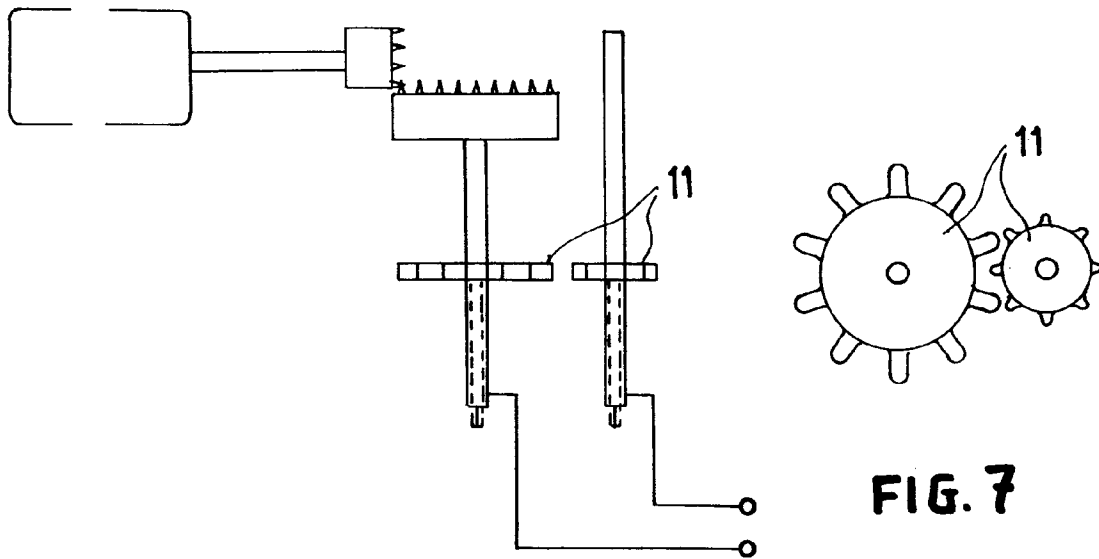


FIG. 6



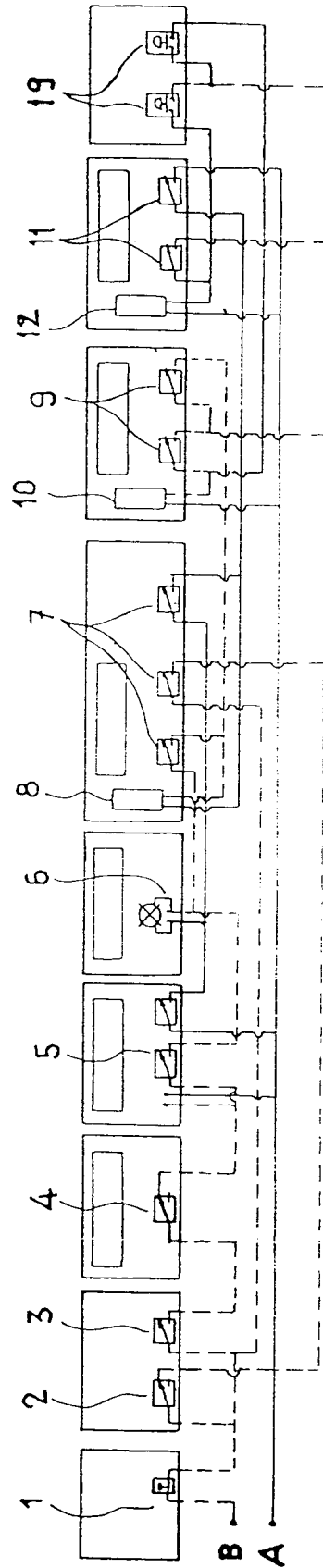


FIG. 9

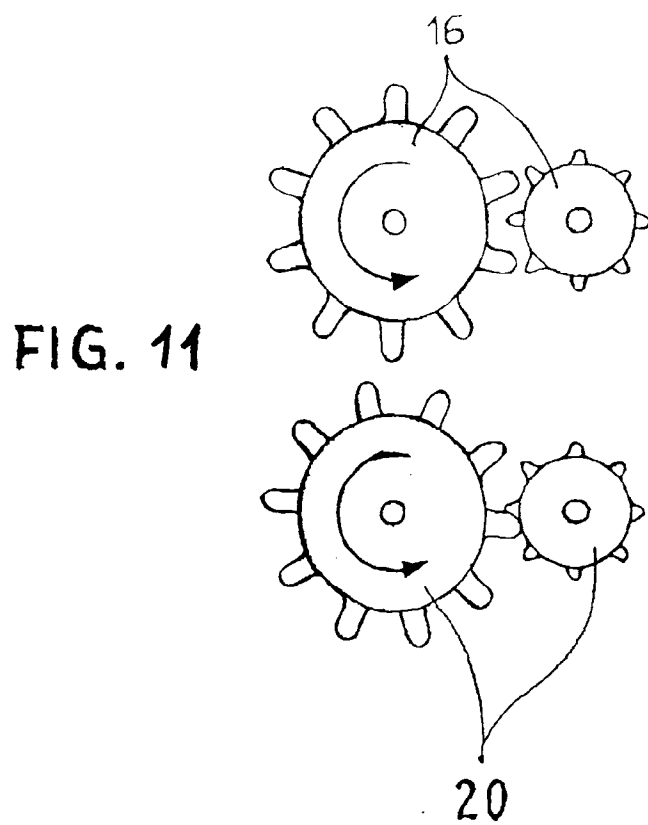
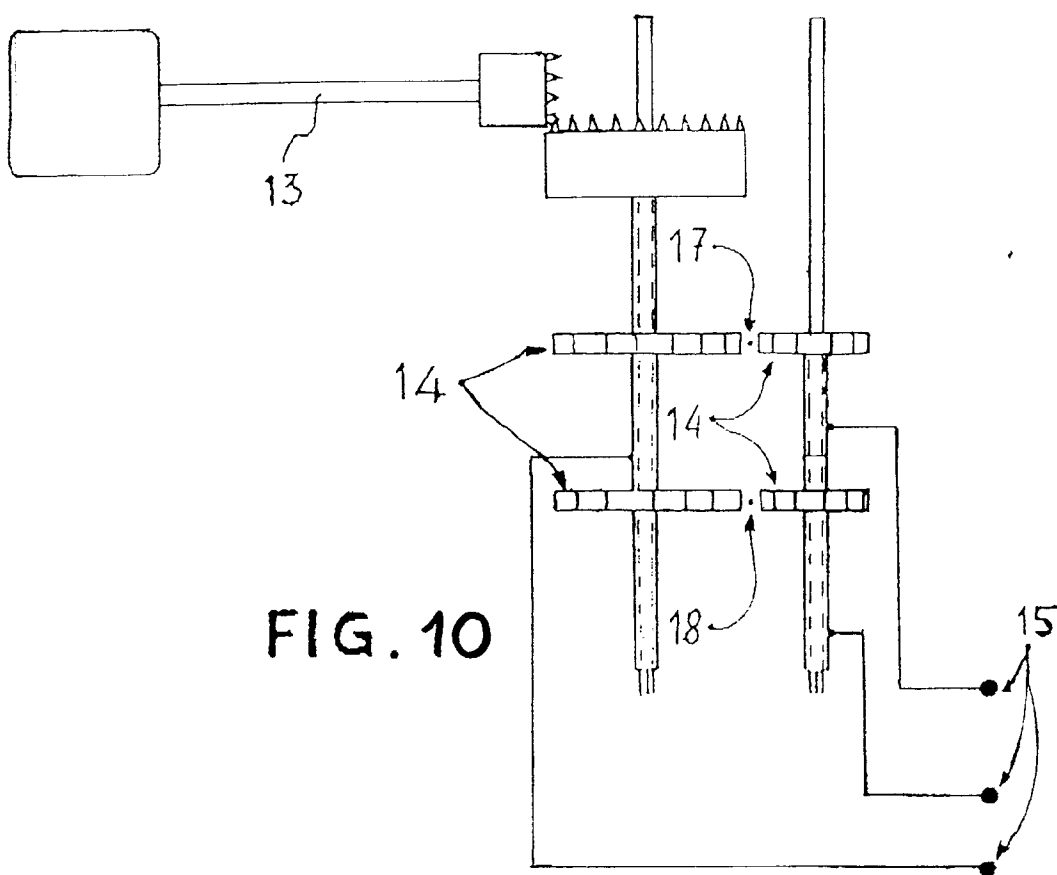
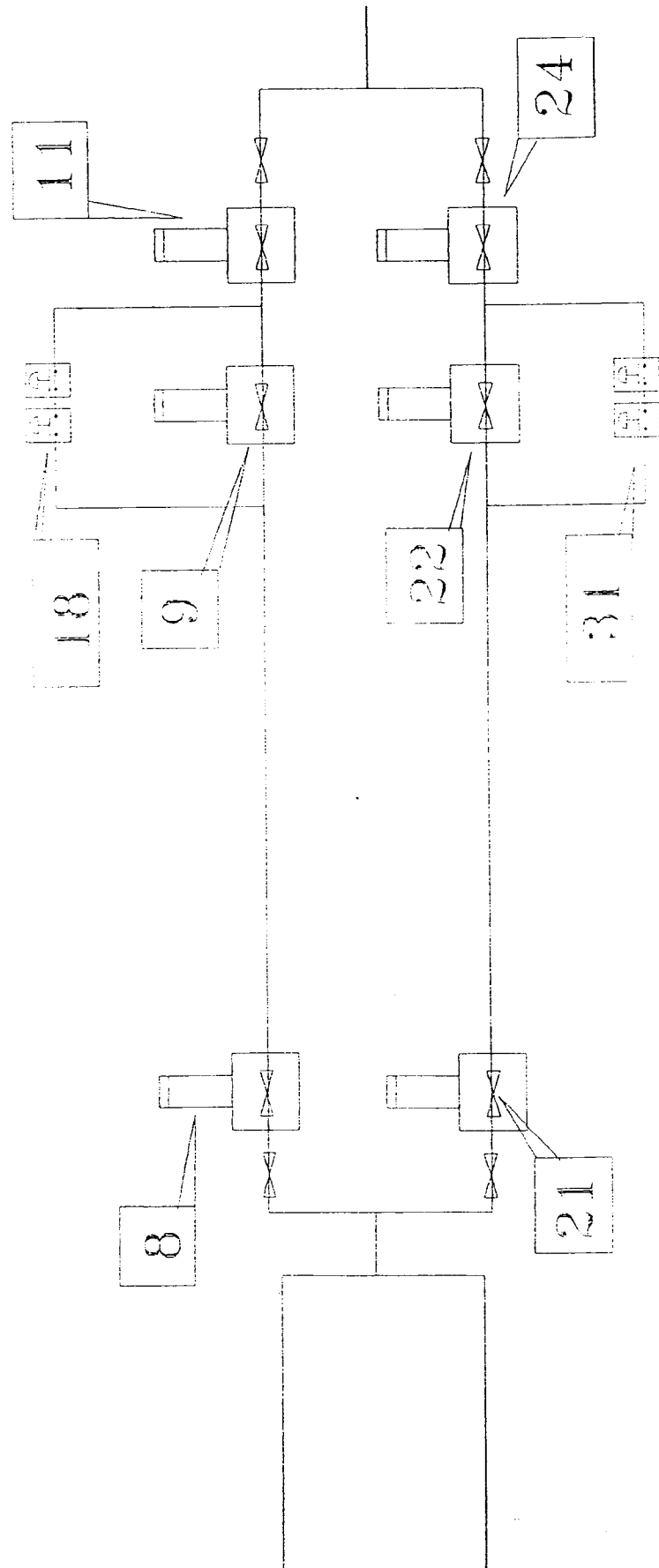


FIGURA 12



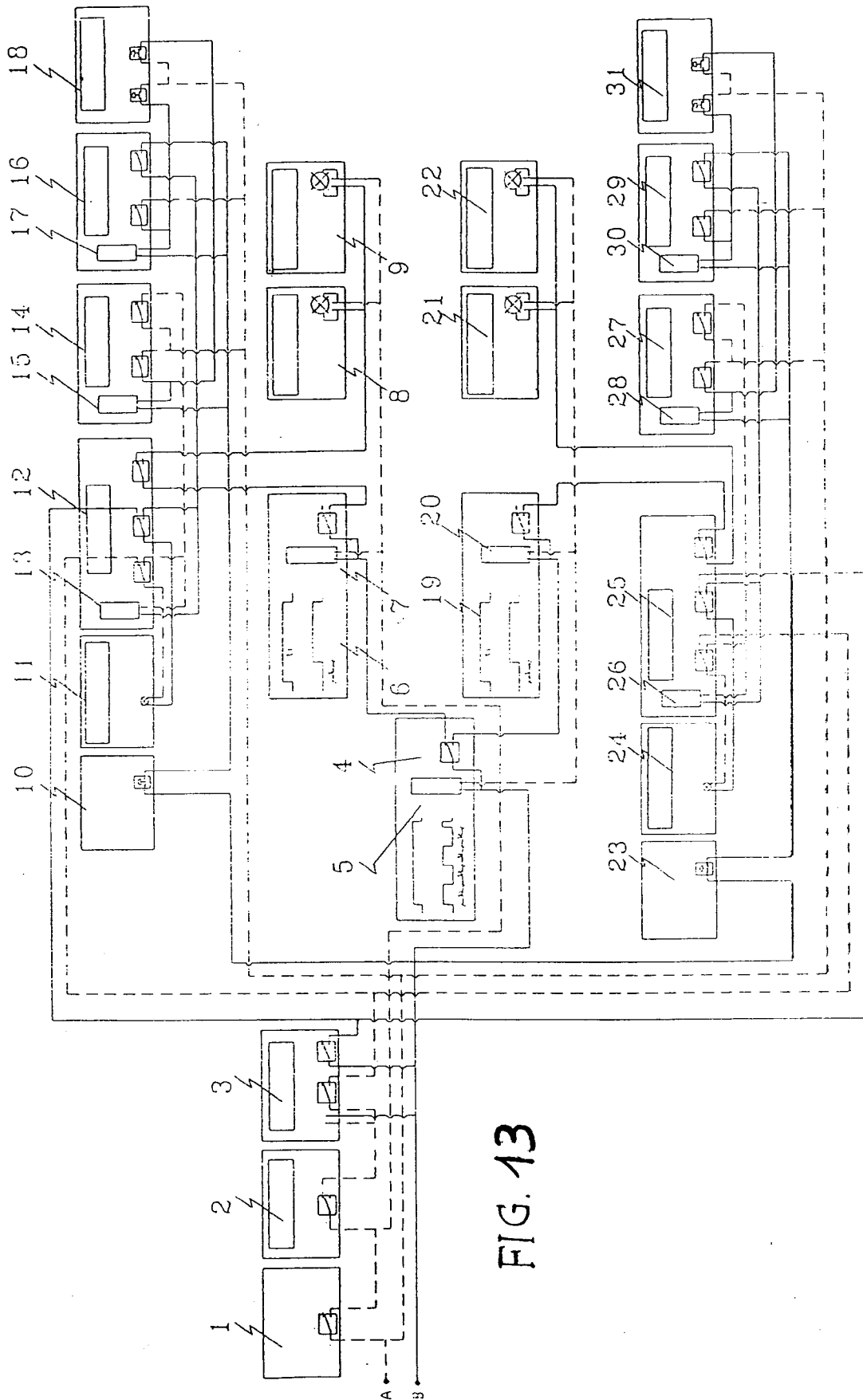
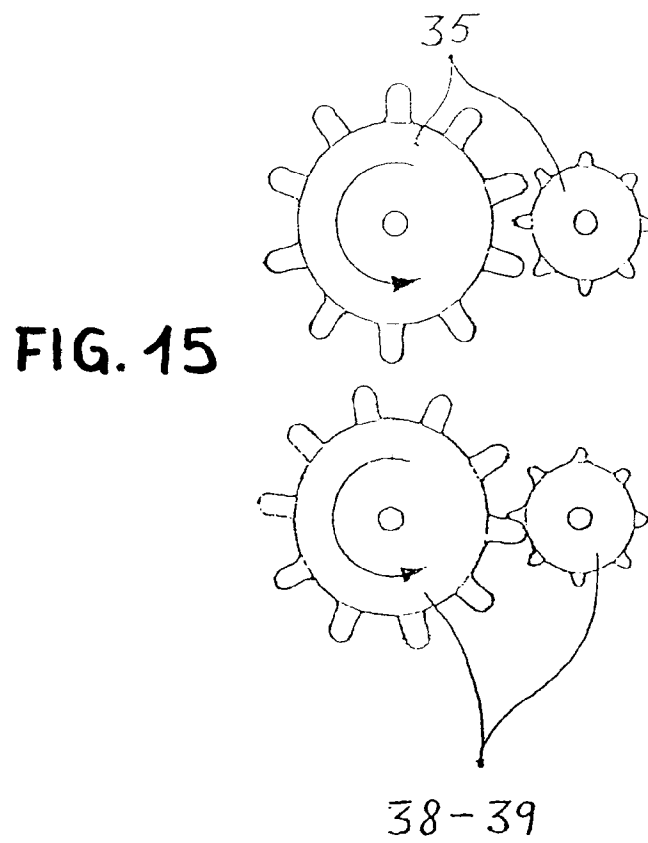
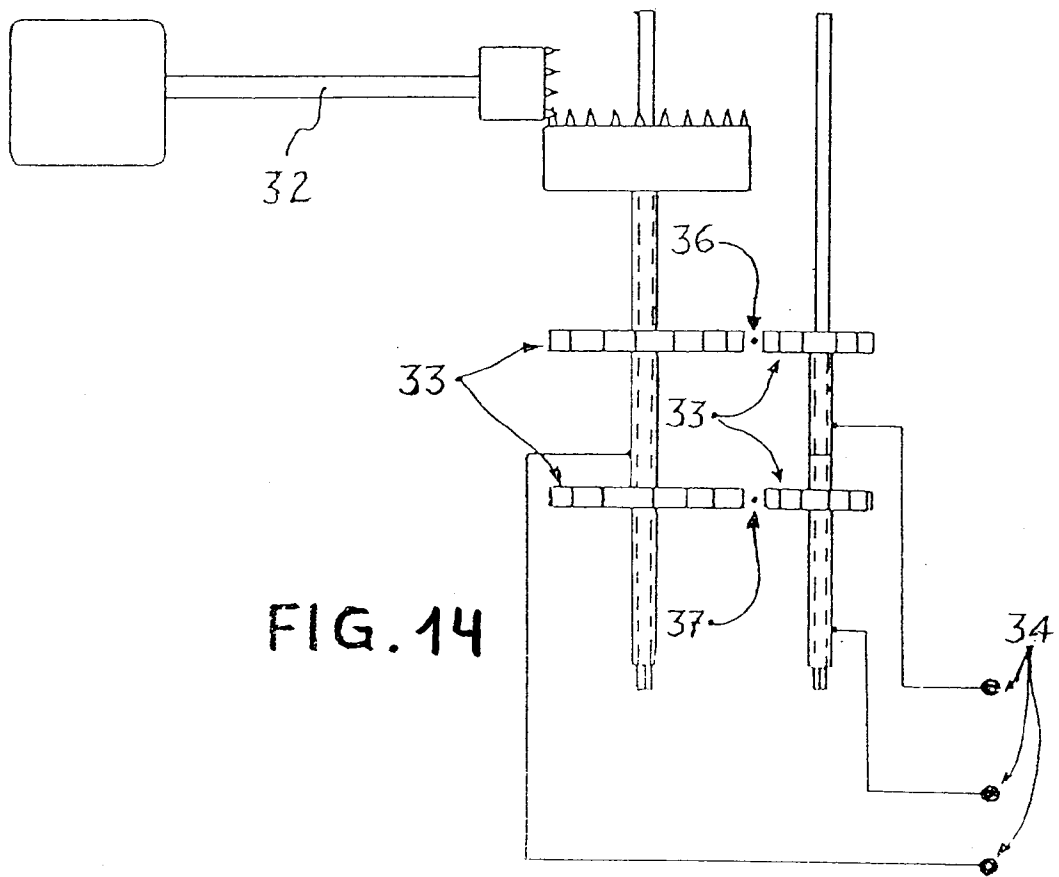


FIG. 13





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 50 0028

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 264 856 (MATSUSHITA ELECTRIC INDUSTRIAL) * abstract; figure 1 * ---	1	F23N5/18 F23N5/24
A	FR-A-2 587 087 (BENTZ) * the whole document * ---	1	
A	GB-A-186 989 (POWELL) * figures * ---	1	
A	PATENT ABSTRACTS OF JAPAN vol. 6, no. 267 (M-182)25 December 1982 & JP-A-57 157 932 (NIPPON DENKI) 29 September 1982 * abstract * * figure * ---	1	
A	FR-A-2 285 597 (AGENCE NATIONALE DE VALORISATION DE LA RECHERCHE) * figures 1,2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F23N G01F G01P
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10 JUNE 1993	Examiner KOOIJMAN F.G.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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