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Lemire

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[54] **SAFETY APPARATUS**

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[52] **U.S. Cl.**..... **307/92,** 192/129 R, 200/DIG. 2

[51] **Int. Cl.** **H01h 3/16**

[58] **Field of Search**..... 307/92, 149, 119; 200/DIG. 2, 61.58; 192/129 R, 129 A; 100/53

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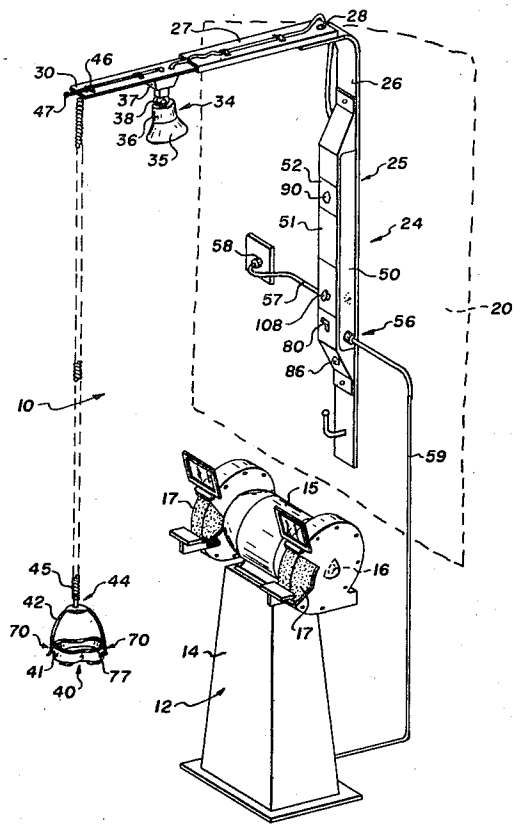
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[57] **ABSTRACT**

Safety apparatus intended to safeguard the operation of a machine and to discourage overloading of an electric motor powering the machine. The machine is one which requires the operator to wear an eye or face protector and incorporated in the protector is switch means connected by an electric circuit to the machine motor. Only when the protector is in normal position of use will the machine operate or the work be properly illuminated by a floodlight also forming part of the circuit. A heat sensitive switch in the circuit aids in preventing the operator from overloading the machine motor.

10 Claims, 4 Drawing Figures



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SHEET 1 OF 2

Fig. 1.

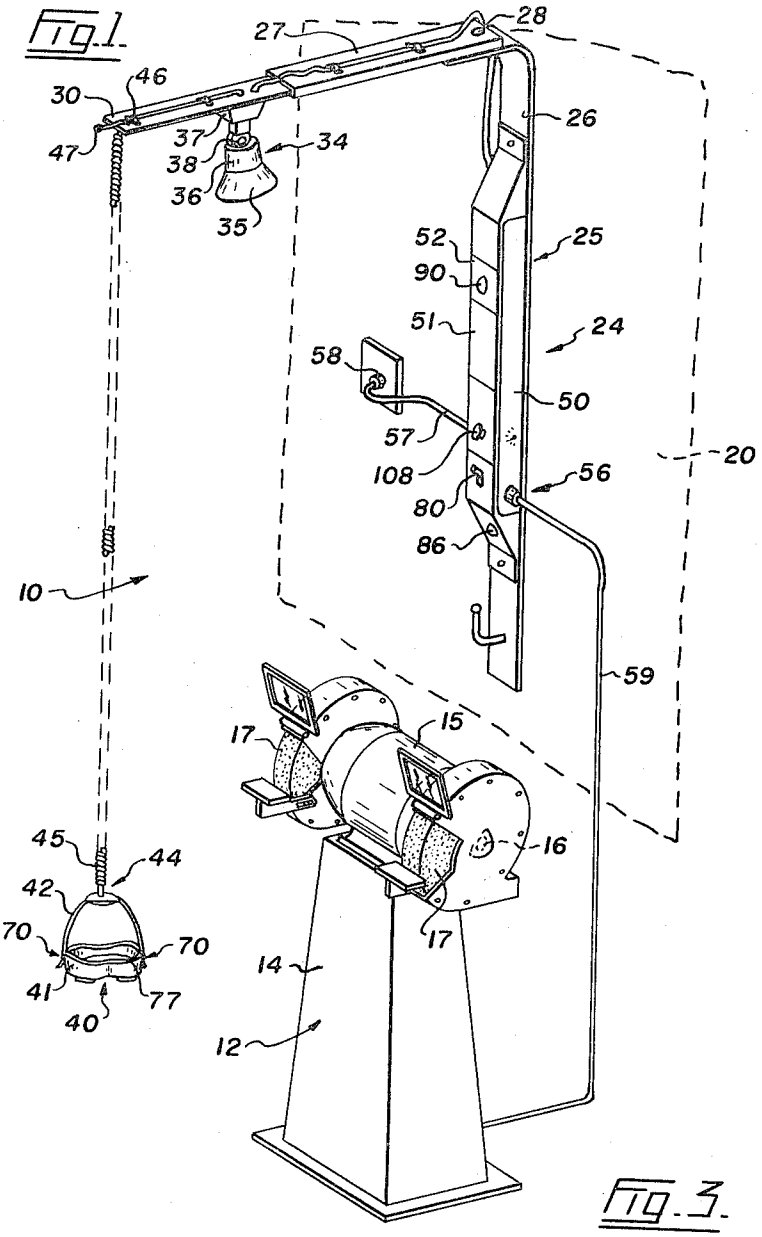


Fig. 2.

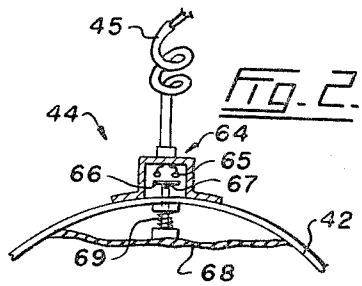


Fig. 3.

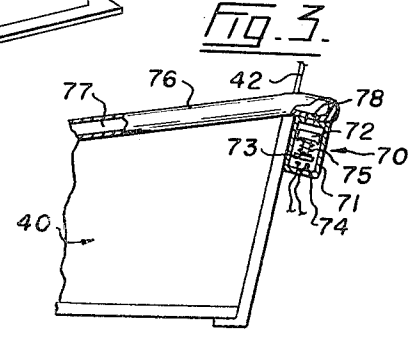
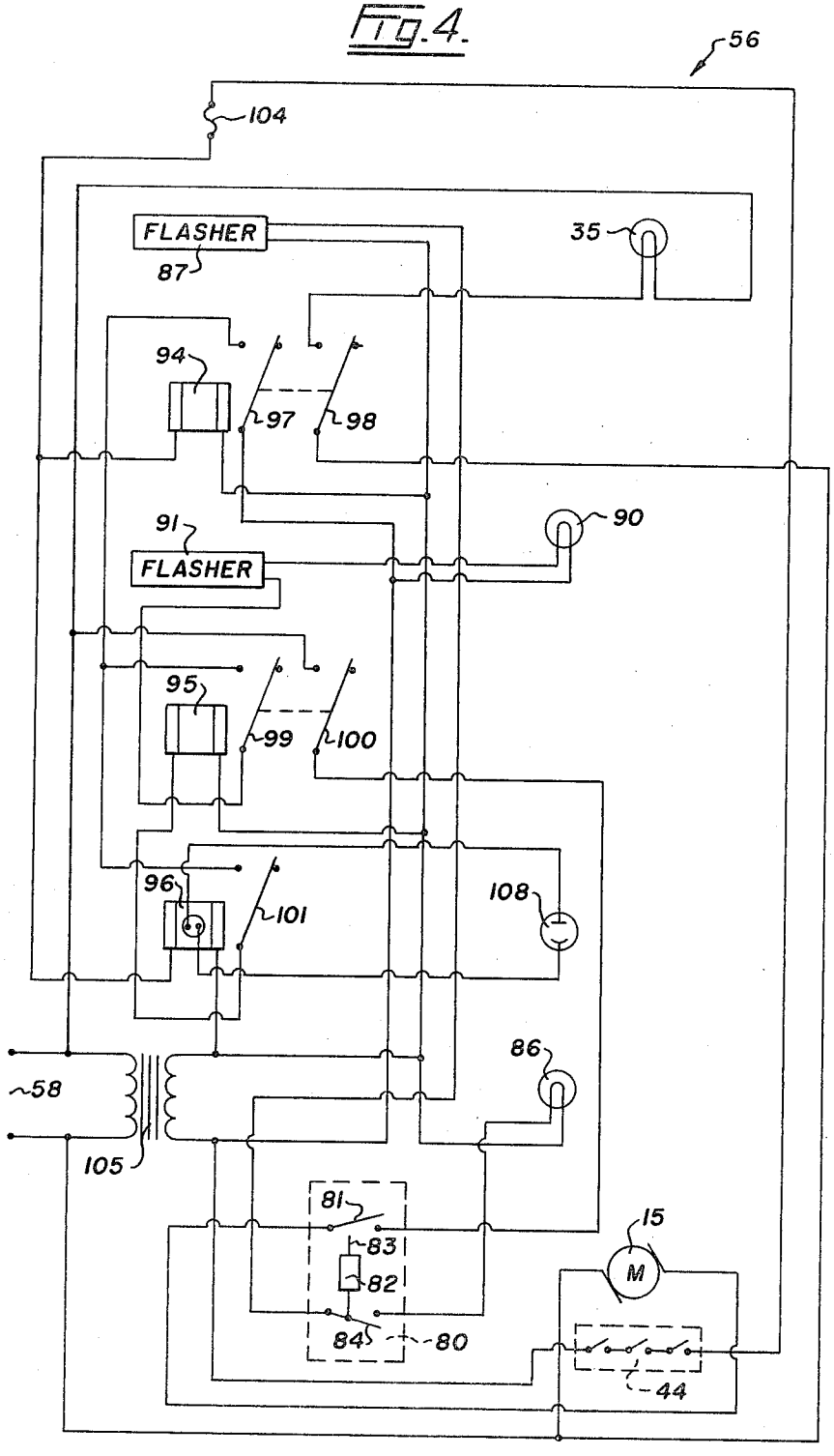


FIG. 4.


56
104
FLASHER
87
35
94
97
98
91
FLASHER
90
95
99
100
96
101
108
86
58
105
81
83
82
84
80
15
M
44

SAFETY APPARATUS

My invention relates to safety apparatus particularly intended for use on a grinding machine powered by an electric motor.

When a piece of metal is applied to the rotating wheel of a grinder, the resulting spray of hot metal particles makes it essential that the workers face, or at least his eyes, be protected and yet many serious accidents have resulted because grinder operators have neglected to don the protector which normally is supplied as part of the equipment of a grinder. Some men appear to think that if the grinding job is a small one requiring only a very short period of time at the wheel, then it can be done in relative safety which is not the case as the accident records show. Furthermore, grinding will sometimes be done without adequate lighting at the wheel and this to can be the cause of an operator being injured. A carelessly operated and inadequately lighted grinder can be damaged through overheating and it also presents some danger to the operator who may not be aware of developing trouble as he concentrates on the work.

I make a grinder a much safer machine to operate by providing safety apparatus which encourages an operator to wear goggles by placing them in a position where they cannot be ignored. It is almost mandatory to wear the goggles if the grinder is to operate at all and, in addition, the apparatus ensures that the required amount of properly directed lighting is available whenever the machine is in operation. These safety features are achieved by means which also safeguards the machine itself from damage through careless operation.

In drawings which illustrate a preferred embodiment of the invention,

FIG. 1 is a perspective view of safety apparatus in accordance with the present invention,

FIGS. 2 and 3 are detailed views of switch means or safety goggles forming an essential part of the safety apparatus, and

FIG. 4 is a wiring diagram showing an electric circuit of the safety apparatus.

Referring to the drawings, and particularly to FIG. 1, the numeral 10 indicates safety apparatus specifically intended for use in conjunction with a grinding machine 12. The conventional grinding machine generally indicated at 12 has a pedestal base 14 which supports an electric motor 15 and the opposite ends of driven shaft 16 of this motor carry a pair of grinding wheels 17.

Normally, the grinder 12 stands near a wall 20 in a workshop or elsewhere and the safety apparatus 10 includes mounting means generally indicated at 24 which conveniently can be secured to this workshop wall directly behind the grinder. As shown in FIG. 1, the mounting means 24 comprises a bracket 25 made up of a vertical leg 26 which is bolted to the wall 20, and a horizontal leg 27. The forwardly projecting leg 27 is telescopic or extensible and is secured to the upper end of the leg 26 by a vertically disposed pivot pin 28. Thus, the leg 27 can swing in a horizontal plane about the pin 28 whereby outer end 30 of said leg can be positioned as required overhanging the grinder 12 and projecting a suitable distance forwardly thereof.

The extensible leg 27 of the wall bracket supports illuminating means generally indicated at 34 and preferably comprising a floodlight 35. This floodlight 35 is

mounted in a socket 36 depending from a box 37 which is secured to the underside of the leg 27 near the end 30 thereof, the socket being provided with a pivot joint 38 which enables the light to be directed downwardly and rearwardly at an angle which will provide the maximum amount of illumination in the area of the grinding wheels 17.

A workmen grinding an article on one of the wheels 17 should protect his face or at least his eyes from flying sparks and the like and, for this purpose, the safety apparatus 10 includes a suitable protector which, in this particular example of the invention, is a pair of goggles generally indicated at 40. It will be noted that a face or eye protector in the form of a transparent face mask (not shown) is often used in lieu of goggles during a grinding or other such operation and that the about to be described electric elements which I have built into my goggles could just as readily be incorporated into such a face mask.

The safety goggles 40 comprise a plastic-supporting frame 41 which is held over the eyes by means of an elastic head band 42. I provide the head band of the safety goggles 40 with switch means generally indicated at 44 and this means is connected by an electric cord 45 to the end 30 of the bracket arm 27. The cord 45 is spirally wound and reinforced by a coil-spring (not shown) in the well known manner whereby normally the goggles 40 are supported by the cord and spring hanging in front of the machine 12 thus permitting a machine operator wearing the goggles to move about as required within a restricted area adjoining the grinder. Preferably, the cord 45 extends through a plastic ring 46 carried by the arm 27 and a suitable clamp 47 is provided on the end 30 whereby to grip and hold the cord with the goggles 40 supported at a selected height above the workshop floor.

The bracket leg 26 is fitted with various electrical elements forming part of the present invention which will be described in detail later. A removable housing 50 is secured to the leg 26 to enclose these elements and this forwardly facing housing has a front face 51 provided with a number of vertically spaced cut-outs 52 which expose a few of said elements. Front face 51 of the housing also carries suitable printed matter (not shown) which draws the machine operators attention to the presence and function of the exposed electric elements.

The safety spparatus 10 requires a circuit generally indicated at 56 which serves to connect the various elements carried by the bracket 25 with the motor 15 and the lamp 35 as well as the switch means 44. Included in this circuit is a cord 57 which extends to a source of electric power represented by an outlet 58 mounted on the workshop wall 20. Another cord 59 is plugged into the housing 50 to connect the motor 15 to the power source through various electric elements.

Referring now to FIGS. 2 and 3, the switch means 44 is shown to comprise a normally open switch 64 which conveniently can be mounted on the center of the head band 42 so as to be located at the back of the operator's head when the goggles are in position of use. Switch 64 has fixed contacts 65 adapted to be bridged by a movable contact 66 carried by an operating plunger 67. A pad 68 is secured to the band 42 and the plunger 67 is attached to this pad. A spring 69 encloses the plunger 67 to bias the contact 66 away from the contacts 65. When the band 42 encircles a workman's head to sup-

port the goggles 40 over his eyes, the plunger 67 is depressed and the contacts 65 and 66 are closed. Thus, the switch 64 is a pressure activated type which normally is open but which is adapted to be closed by pressure applied when the machine operator dons the goggles 40 in the normal manner.

The switch means 44 also includes another pair of pressure activated switches 70, one of which is shown in detail in FIG. 3. One switch 70 is secured to each side of the goggles 40 at the point of attachment of the band 42 and the switch comprises a casing 71 in which a plunger 72 is mounted. The plunger 72 carries a movable contact 73 adapted to engage fixed contacts 74. A spring 75 normally urges the contact 73 away from the contact 74. Face edge 76 of the goggles 41 is fitted with a resilient tube 77 which extends around the entire circumference of the goggles. The casing 71 and tube 77 have a common inlet-outlet port 78 opposite the head of the plunger 72.

Switch 64 and the two switches 70 are connected into the circuit 56 in series so that all switches must be closed to energize the motor 15. Thus, when the goggles 40 are placed over the eyes, the contour of the face in the region of the eyes compresses the tube 77 to an extent which expels sufficient air from the tube to operate the switches 70. The expelled air is discharged through the inlet-outlet ports 78 into the casings 71 and this depresses the plungers 72 to close the several contacts and complete the circuit 56. This particular switch arrangement makes it almost impossible for a deliberatly careless grinder operator to run the grinder motor 15 while holding the goggles 40 in one hand, for example, since it is not likely he could close all three of the series-connected switches at the same time. Normally, this closing of the several switches can be done only when the goggles 40 are clamped over the eyes by the head band 42 since only then is the tube 77 compressed to the required extent. It should be noted that the construction of switches 64 and 70 need not be exactly as shown in FIGS. 2 and 3 since they may be any one of a number of mechanically, electrically or otherwise operated switches as long as each have an equivalent switch arrangement which will be closed only when the goggles are in proper position of use.

Referring now to FIG. 4, the circuit 56 of the present safety apparatus is provided with a control switch 80 which has a manually operated contact 81 adapted to be closed to connect the motor 15 with the power source 58. I modify the switch 80 by providing it with heat-sensitive switch means in the form of a thermostatic device 82 having an endwise movable plunger 83. A contact 84 is operatively connected to the lower end of the plunger 83 and this contact is included in a line leading to a red warning light 86 which is mounted on the bracket leg 26 beneath the housing 50 so as to appear in the lowermost cut-out 52. The light 86 is turned on and off by means of a flasher 87.

The circuit 56 has another red warning light 90 mounted on the leg 26 so as to appear at the uppermost cutout 52, this light being adapted to be blinked by a flasher 91. Also included in the circuit 56 are relays 94, 95 and 96. Relay 94 has ganged or interconnected contacts 97 and 98, relay 95 has ganged contacts 99 and 100, and relay 96 has a single contact 101. A fuse 104 and transformer 105 are provided in the circuit 56. Finally, the circuit 56 has a photoelectric cell 108 which appears in a cut-out 52 between the lights 90 and 86. The light intensity at which the cell 108 will react can be controlled by a suitable rheostat-type switch, not shown.

A workman proposing to use the grinder 12 may be careless enough to ignore the goggles 40 suspended in front of his face and may close the contact 81 of the control switch 80 hoping to start the motor 15. However, the motor 15 will not start until the switch means 44 is closed by donning the goggles 40 and also, the lamp 35 will not light until the goggles are in position of use. Once the goggles are strapped to the operator's head to cover his eyes, the grinder 12 will operate in a normal manner.

If the lamp 35 was to burn out at some time during the grinding operation, a careless operator might choose to finish the job before replacing the lamp but this cannot be done with the present safety apparatus. The photoelectric cell 108 will detect the absence of proper illumination and the relays 94, 95 and 96 will be energized to break the circuit to the motor 15 and shut it off. Furthermore, the red warning light 90 blinks on and off to give visual warning to the operator that the lamp 35 must be replaced before the grinder will operate. Replacement of the lamp 35, of course, deactivates the several elements in the circuit 56 whereupon the motor 15 will run as before. Thus, it will be seen that the cell 108 and associate elements in the circuit 56 provide light-sensitive switch means adapted to disconnect the electric motor from the power source when the illuminating means is not operating properly.

Should the operator overload the motor 15, the thermoelectric device 82 will heat up due to the excess power demands of the motor and the plunger 83 will move upwardly first of all to close the contact 84. This results in the red warning light 86 being turned on and off to warn the operator that he is overheating the grinder 12 and that he should either ease up on the pressure is applying to the wheel 17 or halt grinding altogether until the machine cools down. In this manner, the safety apparatus 10 is provided with a second signalling device in the electric circuit 56 which is adapted to signal the existance of an overload on the electric motor.

If the operator ignores the flashing light 86 and continues grinding, the device 82 will get warmer still and eventually the plunger 83 will extend far enough to open the contact 81 of the control switch 80. This deenergizes the motor 15 while the light 86 continues to flash as an indication of why the machine has shut down. Once the motor has cooled down, the contact 84 will be reopened to turn off the light 86 whereupon the operator must again close the contact 81 of the control switch to restart grinding. Of course, the goggles 40 must be in position of use before the machine will operate at all. The arrangement of the device 82 cooperating with the several other elements of the circuit 56 provide the safety apparatus with another heat-sensitive switch means adapted to disconnect the electric motor from the power source when said electric motor is subjected to an overload.

From the foregoing, it will be apparent I have provided safety apparatus which makes the grinder as foolproof to operate as can reasonably be expected of such a machine. Operator's of the grinder are encouraged to follow normal safety precautions and thereby almost eliminate the likelihood of being injured by flying metal particles. The mounting means 24 supports the goggles

40 directly in front of the machine where they can hardly be ignored and the lamp 35 can be adjusted both by swinging the arm 17 horizontally, and be angular adjustment of the socket 38, so that light is directed over the shoulder of the operator and at the grinding wheel which is being used at that particular time. The grinder itself is protected from abuse and as a result there is less likelihood of a workpiece being ejected violently from the machine as sometimes occurs during the operation of a grinder not equipped with the present safety apparatus.

I claim:

1. Safety apparatus for machine powered by an electric motor comprising an electric circuit connecting the electric motor to a source of electric power, a protector adapted to be worn over the face of an operator of the machine, safety switch means mounted on the protector and connected by the electric circuit to the electric motor, said safety switch means having a pressure actuated contact which is closed to connect the electric motor to the power source normally only when the protector is in proper position of use upon the head of the machine operator.

2. Safety apparatus for a machine powered by an electric motor comprising an electric circuit connecting the electric motor to a source of electric power, a protector adapted to be worn over the face of an operator of the machine, safety switch means associated with the protector and included in the electric circuit, said safety switch means having a pressure actuated contact adapted to close and connect the electric motor to the power source when the protector is in proper position of use upon the head of the machine operator, and means for illuminating the work being performed on the machine by the operator, said illuminating means being included in the electric circuit, and light-sensitive switch means in the electric circuit adapted to disconnect the electric motor from the power source when the illuminating means is not operating properly.

3. Safety apparatus as claimed in claim 2, and including mounting means for the goggles and the illuminating means, said mounting means comprising a bracket having a vertical leg attachable to a wall near the machine and a horizontal leg overhanging said machine.

4. Safety apparatus as claimed in claim 3, in which said horizontal leg is longitudinally extensible and swingable about a vertical pivot located near the vertical leg.

5. Safety apparatus as claimed in claim 2 and including heat-sensitive switch means in the electric circuit adapted to disconnect the electric motor from the power source when said electric motor is subjected to an overload.

6. Safety apparatus as claimed in claim 2, and including a first signalling device in the electric circuit adapted to warn the machine operator of a defect in the illuminating means.

7. Safety apparatus as claimed in claim 6, and including a second signalling device in the electric circuit adapted to signal the existance of an overload.

8. Safety apparatus as claimed in claim 2, in which said safety switch means comprises two additional pressure actuated contacts spaced from the first mentioned pressure actuated contact as well as from one another with all of said contacts being connected in series.

9. Safety apparatus for a machine powered by an electric motor comprising an electric circuit connecting the electric motor to a source of electric power, a protector adapted to be worn over the face of an operator of the machine, safety switch means associated with the protector and included in the electric circuit, said safety switch means having a pressure actuated contact adapted to close and connect the electric motor to the power source when the protector is in proper position of use upon the head of the machine operator, means for illuminating the work being performed on the machine by the operator, said illuminating means being included in the electric circuit, and light-sensitive switch means in the electric circuit adapted to disconnect the electric motor from the power source when the illuminating means is not operating properly, heat-sensitive switch means in the electric circuit adapted to disconnect the electric motor from the power source when said electric motor is subjected to an overload, a first signalling device in the electric circuit adapted to warn the machine operator of a defect in the illuminating means, and a second signalling device in the electric circuit adapted to signal the existance of an overload.

10. Safety apparatus as claimed in claim 9, and including mounting means for the goggles and the illuminating means, said mounting means comprising a bracket having a vertical leg attachable to a wall near the machine and a horizontal leg overhanging said machine.

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