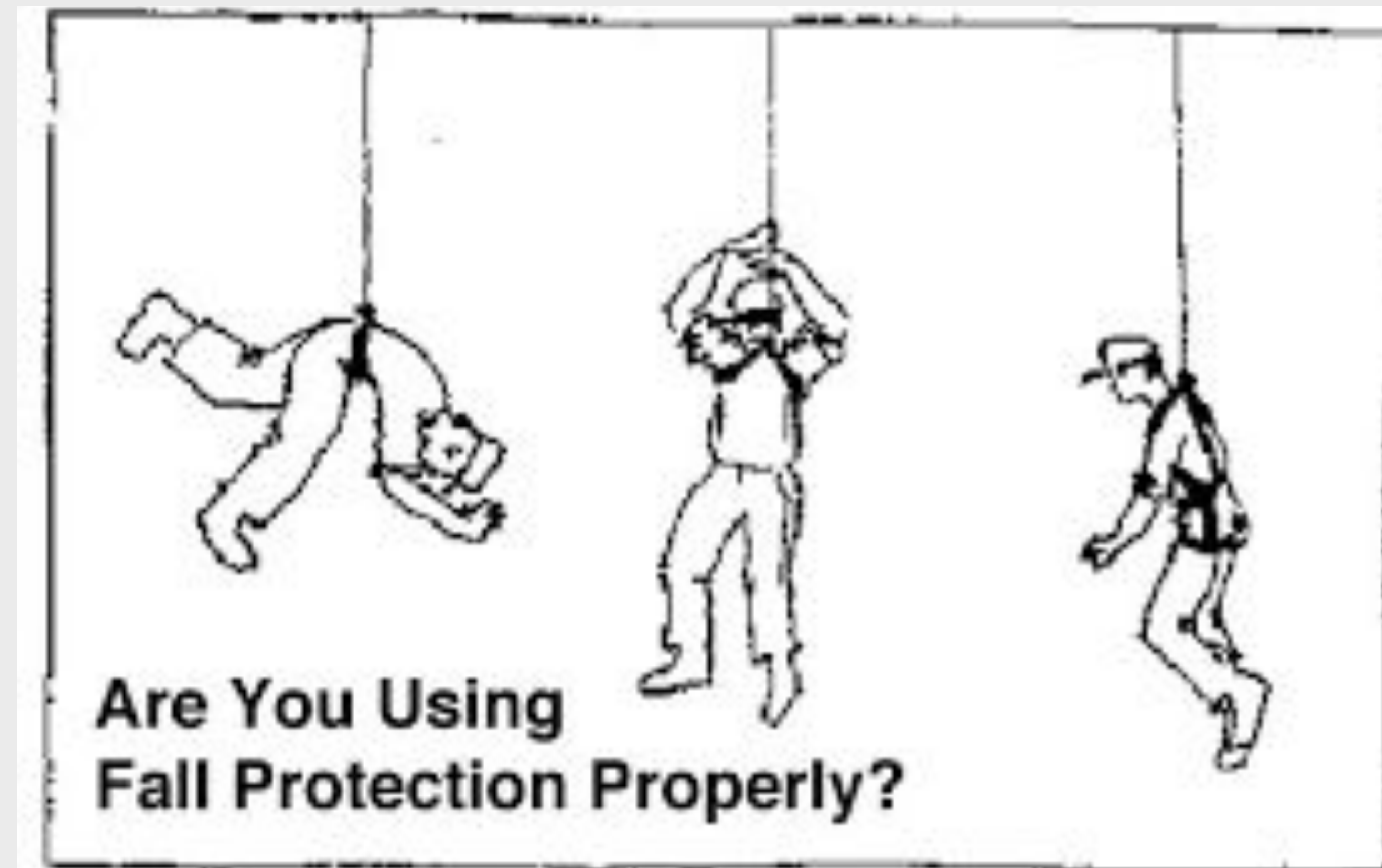


Safety Harness Monitor

OSHA fines and violations are no more!

The best and most efficient way of monitoring compliance and proper usage of a harness.



<https://th.bing.com/th/id/R.be9a3bc18428ec404ce40f5872c301807rik=A9AKdSQOqG%2bFw&riu=http%3a%2f%2fcdn.simplifiedsafety.com%2fimages%2f1610%2fproperly-using-fall-protection.jpg&ehk=JdlNO4AnOJndfEITKTzmXw8TKyrDjVSQG80LEeQ%2b%2bo%3d&risj=8pid=mgRaw&=0>

Background

History

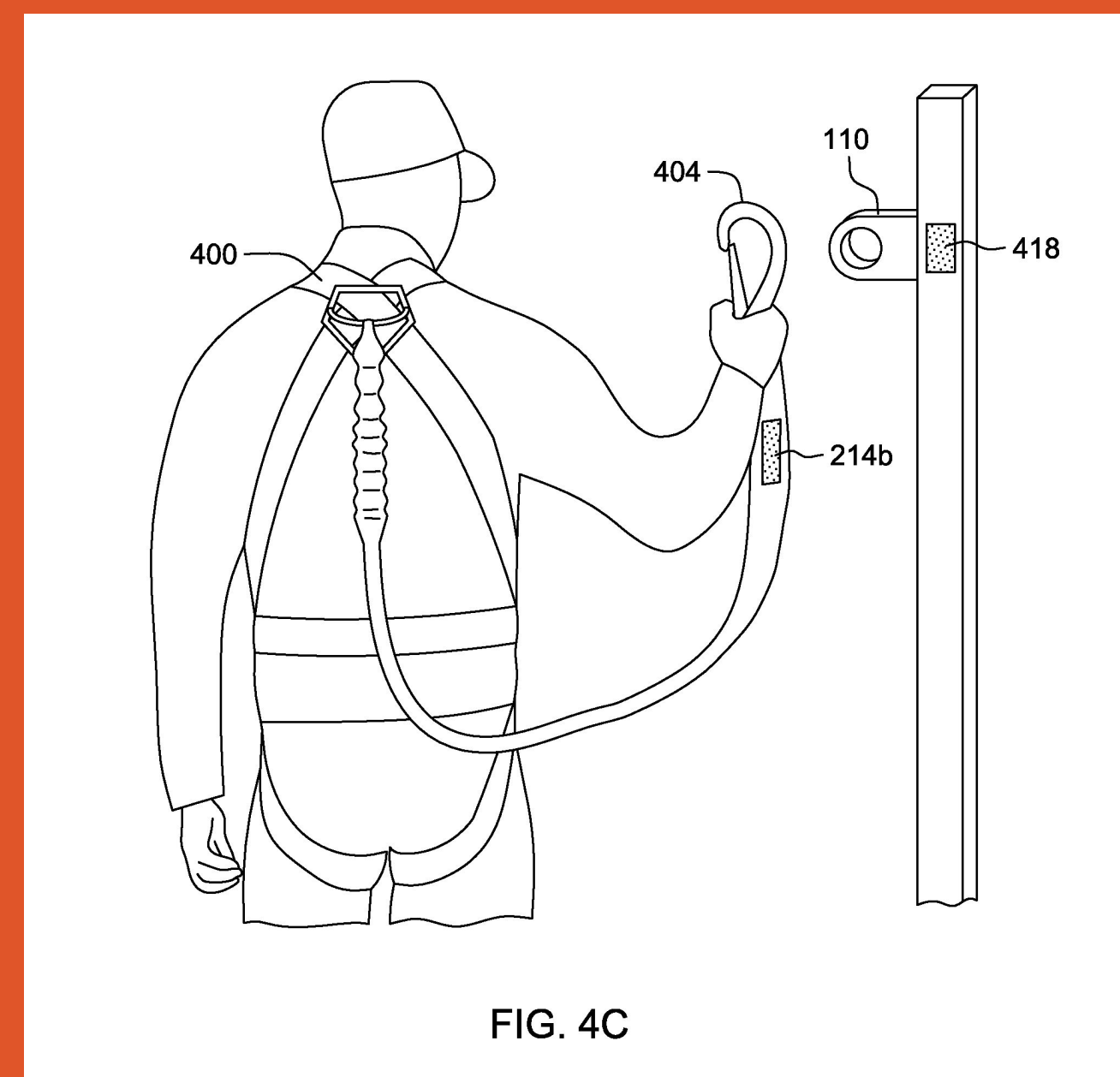
Approximately 33% of yearly construction based casualties are caused by fatal falls. This number can be greatly reduced with the use of safety harnesses. However many actively avoid using them or use them improperly to be more comfortable.

Is there a need?

Currently there are not any solutions to monitor compliance to proper safety harness use besides having someone actually watch the roofers.

Products Similar in the Market?

There are not any similar products in the market specifically for roofers. However a lot of inspiration for this solution came from a monitoring system for powerline workers.



US6112416R - Safety harness monitoring and alerting system - Google Patents

This system utilizes detecting conductivity in the powerline to ensure that the worker is clipped in at all times.



Initial Trials

First trials consist of each sensor having code created to take inputs from the sensor and displaying the results. Testing each sensor allows for obtainable values and variables to be tabulated. This shows the system works.

```
Harness Closed
Harness Opened
Harness Closed
Harness Opened
```

```
// Read switch or magnet; switch code.
const int Switch_PIN = 2; // Pin connect to Read switch.
const int LED_PIN = 13; // LED on Arduino board; used as an Indicator
volatile bool flag = false;

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  pinMode(Switch_PIN, INPUT_PULLUP);
  pinMode(LED_PIN, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:
  int proximity = digitalRead(Switch_PIN);

  if (proximity == LOW && flag == false) {
    // proximity to the switch is close or touching will trigger closed
    Serial.println("Harness Closed");
    digitalWrite(LED_PIN, HIGH); // LED turns on; Indicator
    flag = true;
  }

  if (proximity == HIGH && flag == true) {
    // proximity is anything else but low, it will trigger opened.
    Serial.println("Harness Opened");
    digitalWrite(LED_PIN, LOW); // LED turns off; Indicator
    flag = false;
  }
}
```

Results from Trials

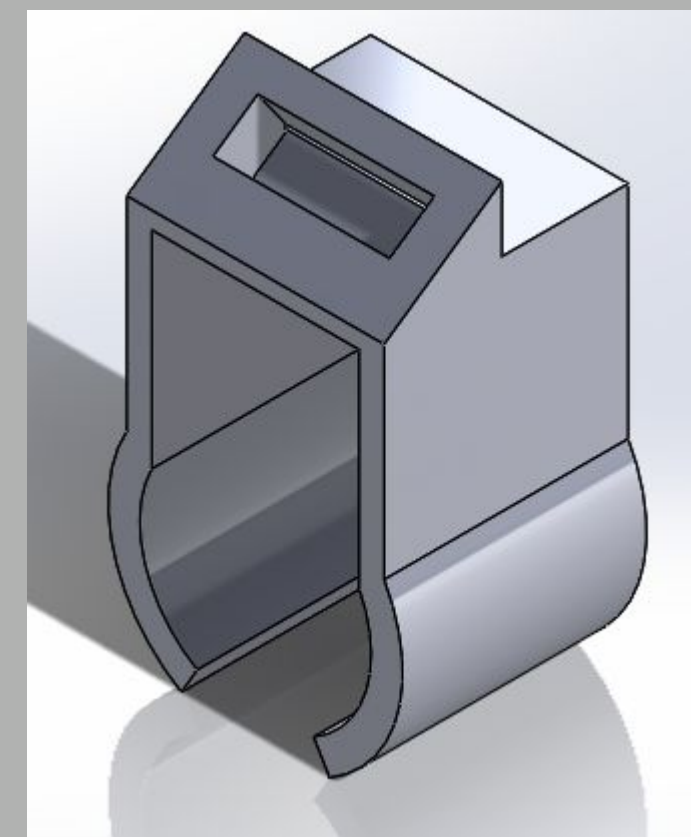
- Open/Close - Displays a True or False statement
- Metal Detection - Displays voltage between the sensor and metal.
- Load Sensor - Displays weight times gravity and shows a force relative to the sensor.

[Data tables or graphs will be displayed here once system is tested]

Design Features

Open/ Closed Sensing:

Use of magnetic switches show when the harness is taken off or on, and when adjusted.



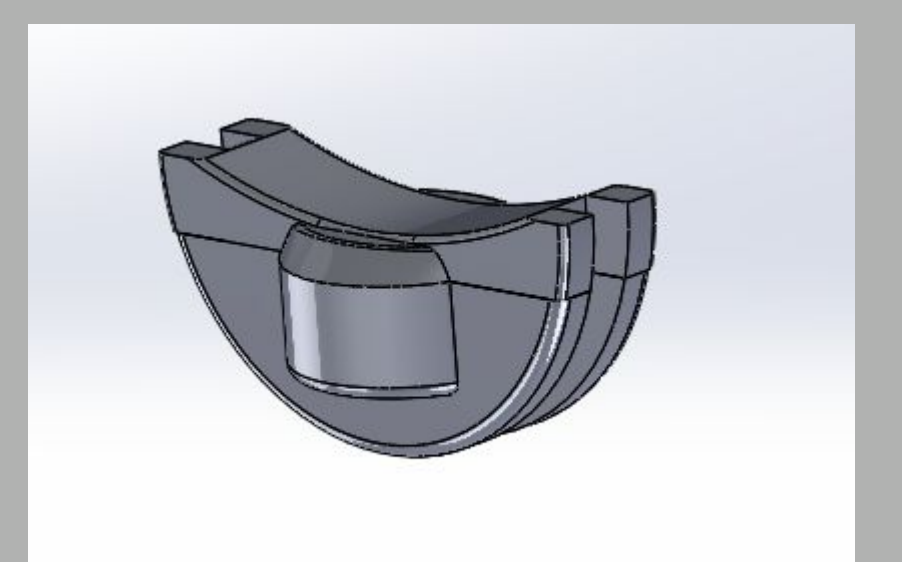
Metal Detection:

An inductive sensor attached to the harness will detect metal at the connection point preventing the harness from being attached somewhere other than the anchor.



Load Sensing:

Use of a load cell tracks the changing forces acting on the harness to ensure its being worn.



Sponsors

The OSU Prototype Development Lab (Professor Parmigiani)

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