DESIGN AND FABRICATION OF BENCH SAW BRAKING SYSTEM

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ABSTRACT

This revolutionary technology was developed to reduce the potential for a serious injury in the event of accidental contact with the saw blade. Table saws are the first saws ever built to be smart enough to know the difference between you and the wood you are cutting. The safety system includes two components, an electronic detection unit and a fast-acting brake. The electronic detection unit detects when a person contacts the blade. A small electrical signal is induced onto the blade by electrodes placed around the arbor. Although this low voltage, high frequency signal is too small to feel, it can be measured by the detection system. When human skin comes into contact with the blade (or arbor), a portion of the signal is absorbed by the body due to the inherent electrical capacitance of the human body. As a result, the signal on the blade gets smaller and the detection unit recognizes this as contact. Wood and other non-conductive materials such as plastic, foam, cardboard, melamine, etc., do not cause a drop in the signal because those materials do not absorb the signal on the blade. Conductive materials such as aluminum and other metals, carbon fiber materials, etc., will ground the blade to the cast-iron table top, thus causing the signal on the blade to drop to zero and activating the brake. If you need to cut these conductive materials, the safety system can be placed in "Bypass" mode to temporarily disable the brake.

Keyword: - Saw Blade, Electrical Signal, Electrodes, Arbor, etc……

1.INTRODUCTION:

Circular saw benches are the machines that cause the most woodworking accidents. Many of these result in the amputation of fingers. Analysis of accidents investigated by HSE has found that most were caused by inadequate or missing guards. Many of these accidents could have been avoided by having a correctly adjusted saw guard and using a push-stick. Inadequate or lack of training for the operator was also found to be a major cause. It is therefore very important that only properly trained and authorized operators are allowed to use circular saws. Kickback of the work piece has caused serious and even fatal accidents. Dull, badly set and badly ground saw blades produce poor quality work. They also increase the effort required for feeding and the risk of accidents from kickback. Deposits of gum or resin near the teeth tend to cause a saw to stall or the timber to stick. Adequate work piece support is essential for all operations at a circular saw bench. Large work pieces should be supported using extension tables or roller supports at both the indeed and out feed ends. If there is a second operator at the out feed end to remove cut pieces, the table should be extended so the distance between the saw blade spindle and the rear edge of the table is at least 1200 mm. The second operator should always remain at the out feed end of the extension and should not reach forward towards the saw. Although the riving knife reduces the risk of contact, it cannot prevent it.

1.1 SAW BLADE:

A circular saw is a power-saw using a toothed or abrasive disc or blade to cut different materials using a rotary motion spinning around an arbor. A hole saw and ring saw also use a rotary motion but are different from a circular saw. Circular saws may also be loosely used for the blade itself. Circular saws were invented in the late

18th century and were in common use in sawmills in the United States by the middle of the 19th century.

A circular saw is a tool for cutting many materials such as wood, masonry, plastic, or metal and may be hand-held or mounted to a machine. In woodworking the term "circular saw" refers specifically to the hand-held type and the table saw and chop saw are other common forms of circular saws. "Skilsaw" has become a generic trademark for conventional hand-held circular saws. Circular saw blades are specially designed for each particular material they are intended to cut and in cutting wood are specifically designed for making rip-cuts, cross-cuts, or a combination of both. Circular saws are commonly powered by electricity, but may be powered by a gasoline engine or a hydraulic motor which allows it to be fastened to heavy equipment, eliminating the need for a separate energy source.

2. PROBLEM IDENTIFICATION:

The literatures survey as given in chapter 2 overviews works related to precision machining, abrasive flow machining and finishing operations. The main considered parameters are surface roughness, metal removal rate, finishing time and number of cycles of rotation of work piece. An overall inference of identified efforts taken to bring an optimum and better results in above mentioned process parameters are examined with different experimental setups. From the literature Abrasive flow machining and finishing deals with machining of only inner surface of hollow geometric sections like hollow cylinder, inner surface of hollow frustum from conical work pieces etc.

Machining the surface of the wooden components makes the process limited to only particular components that is, dry wood, plywood, and other type of woods that have less or no moisture content. Hence identified a limitation and imparted an idea to construct an Abrasive machining process which machines the outer surface of work pieces like disks and plates with a respectable solid thickness.

3. EXPERIMENTAL METHOLOGY:

The machining setup consists of a motor, a variable frequency drive unit which is used to provide differentiable frequency of voltage by which desired RPM is achieved. The saw consists of a high intensity tungsten carbide swift blade enforced with an electrical conductive coating on it. This blade and the motor is set up on the table which has slot for the rising and retraction of the

3.1 DESCRIPTION

This is the circuit diagram of a small touch plate controller using IC NE 555 .This circuit is ideally useful for making touch operated doorbells, buzzers, toys etc. which when touched on the touch plate operates the relay for a present time and the turns off automatically. This circuit is realized by utilizing the high input impedance of trigger pin of the 555 IC.When the IC is triggered by the induced voltage of human body the output goes high for a time determined by R1 and C1.The transistor is used to drive the relay. The relay contacts can be used to drive the load like bell, motor , lights etc

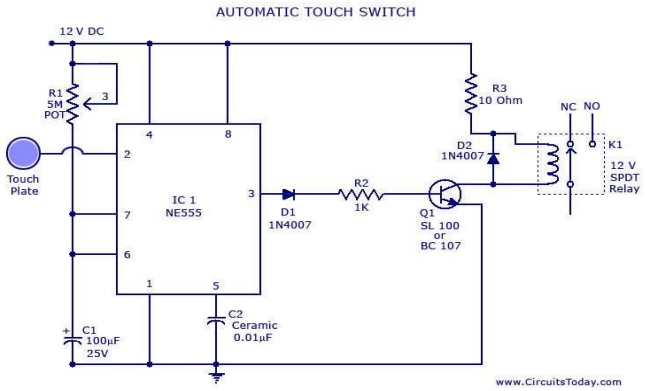

Fig 1 Circuit Diagram

4. WORKING PRINCIPLE

The working principle of the saw stop is when the flesh or finger is came into contact with the blade, the triggering system would trigger the braking unit in the setup. Given the speed of the blade, it would have to stop in about 1/100 of a second — or at about an eighth of an inch of rotation after making contact. To stop the blade this quickly would require about 1,000 pounds of force to decelerate the blade in 10 milliseconds. When the finger of the user or the worker, accidently touches the high speed rotating blade, the low voltage electricity which is maintained constantly on the blade will drop because of the result of skin contact and conduction. This power loss can be detected by the microprocessor and the microprocessor sends the signals to the control unit. This control unit triggers the emergency braking system to actuate and stop the blade at once using the braking mechanism The braking force required to stop the blade would be equivalent to 1000 pounds and the whole concept of braking is executed within the time frame of 10 milliseconds. The fast- acting brake includes a small fuse that holds a strong spring in compression. If the electronic detection unit detects contact while the blade is spinning (including coast down), the fuse is burned by a surge of electric current. The spring then pushes the brake into the teeth if the spinning blade. The teeth cut into the pawl, stopping the blade almost instantly.

4.1 STOPPING MECHANISM

Stopping mechanism is used to bring the saw blade rotating at a very high speed suddenly to a halt, thereby reducing damage to limbs here, we are designing a stopping mechanism which works with the help of an electromagnet when the touch sensor is activated, and it triggers the stopping mechanism using a relay circuit. The stopping mechanism has a metal strip attached to a permanent magnet kept close to an electromagnet; the whole system is kept close to the saw blade. When the electromagnet is powered using an AC supply , the metal strips oscillates with a very frequency of the AC .During this oscillation ,It continuously hits the blade and stops the blade within a short period without causing much damage to the blade as well as the person touching it .

The system is activated only the touch of human limbs or such bodies with a small associated potential. Even though it may cause slight Damage the saw blade, it does not do much damage to the saw as a whole. It can be reused without replacing many parts, in the extreme case the saw blade or the metal strip used for stopping may have to be replaced. Most importantly it keeps the limbs of the saw operator intact.

5. CONCLUSION

The framework of the proposed system is developed for a safety in bench saw braking system electrical conductivity phenomena and to design a bench saw with more safety for the user while operating in the standard conditions. This technology could be further enhanced and modelled in more efficient ways in the near future. The same technology can be implemented in aircrafts, submarines. But automatic brakes cannot be used always. So it can be replaced by action of automatic diversion with the help of various sensors such as radar sensors, distance sensors, etc., the results displayed are that of a combined approach which outperforms than a feature-based approach in a disturbed environment.

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