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Materials and Construction Methods

TV Remote

The remote control has changed our lives drastically, gone are the days where you must get up and tune the television to your preferred channel. Now you can sit back and relax knowing you have everything you need at hand for endless hours of entertainment at your pleasure. Though life without the remote control would seem a hard life to some, arguably the remote control has only made people become lazier giving us no excuse to pick ourselves up from our thrones. Nevertheless the control has bestowed us the convenience of god-like 'powers' to be able to control objects from a distance with the touch of a button.

History

The initial idea in the creation of the tv remote was to avoid adverts. In the 1950's Zenith Electronics engineers were given a challenge by Eugene F McDonald to create a device that could allow him to mute or skip to another channel. The device was game-changing, they called it the 'Flashmatic' (Polley, 1955) created by Eugene Polley a mechanical engineer. The Device was released in 1955 and largely mechanical in nature due to Polley's background. Before the 'Flashmatic' was the 'Lazy Bones' (Zenith Electronics, 1950) which wasn't wireless. One major downfall to the 'Flashmatic' was how accurate you needed to be when pointing towards the sensors. Arguably, because of sensory problem, the first wireless TV remote caused more stress than not having a remote at all. The remote used a beam which had to be aimed towards one of four photoelectric cells.

After going back to the drawing board, a new remote was created in 1956 using sound which was called Space Command (Adler, 1956). This time the device was created by an electrical engineer. Adler's idea was to use sound. The Space Command used ultrasonic waves which entailed hammers tapping aluminium rods inside. This would create different frequencies to turn the television on or off, mute or unmute or change channels.

In 1974 came the Ceefax (BBC, 1974) which didn't survive for long because viewers couldn't call up pages of sports, financial information and so on. The increasing need for more functions led to the use of infra-red light. Then in the 80's and 90's there was a dramatic rise of cable TV which in turn bloated the TV remote with too many buttons. But, after years of incremental but important developments in components and materials the TV remote gradually developed into an efficient gadget.

Materials and components

Once the back is removed you can see the only part visible is the printed circuit board, which contain battery contacts and electronics. Inside the remote you can see a chip called the 'TA11835' which is inside an 18 pin Dual Package (Forbes, Rice, Rogers, 1964).

A resistor and a capacitor sit next to the battery contacts, in this circuit when a key is pressed the chip can detect it. A Morse code type sequence is translated from the key which is different for each

one. The contents next to the diode include, a resonator, transistor, two resistors and a capacitor. The transistor receives a signal from the chip to amplify the signal in turn making it stronger.

Once the circuit board is removed you can see that it's a thin piece of fibre glass with copper wires etched on the surface. Circuit boards are easily mass produced which is why it's widely used for electronics. The whole process of adding the copper wires onto the fibre glass, and dropping the parts (resonators, transistors, etc.) onto the fibre glass sheets is inexpensive. The processes are also easy, such as soldering the parts to the copper wires.

The contact points on the board match up to the buttons, which are made from a rubbery sheet. The chip senses a connection when black conductive disks contacts the circuit board. At the end of the circuit board is a small bulb which is called an LED (Round et al., 1907). A remote produces invisible infrared light, this is the opposite to conventional LED's. It is possible to see this light through a camcorder, but not for the naked eye.

This is how the basic operation goes: A button is pressed. When that happens, a specific connection is completed. Then a connection is sent to the chip and knows you pressed. It produces a Morse code type signal specifically for that button. The signal is amplified by the transistors and sent to the LED, which is translated into infrared light. The sensors in the TV receive the infrared light and react appropriately.

The main material used in creating a TV remote is plastic. There are numerous plastics that can be used with different properties suited to the components function. ABS is used primarily for the outer case of the remote, which is injection moulded. Screens and covers are primarily made from acrylic, for example the LED cover. A more elastic type of plastic is needed for the buttons such as TPE's, for example Estane and Dynaflex.

Future Technology

The development of TV remotes had halted over the years with too many buttons and options implemented. But things have changed, now we can use our Smartphones to operate most of our home devices. It is a possibility that TV remotes will become redundant with Voice recognition technology becoming widely integrated in televisions. The days of searching for that lost remote are over. Motion sensory technology is another possible replacement, enabling viewers to use simple hand gestures to swipe across the apps and channels, as well as turn the TV on and off for example. For now, it is here to stay as many of older generation still prefer the remote.

The future for the remote is an uncertain one, but equally as exciting. The main questions are: Will the TV remote become extinct; or will it continually get developed for many years to come? After taking into consideration all the information, I can visualize the remote constantly developing its simplicity and avoid becoming redundant. I believe the remotes design will reach borderlines where it can hardly be labelled a remote due to newly invented functions, but nevertheless be around for years to come.

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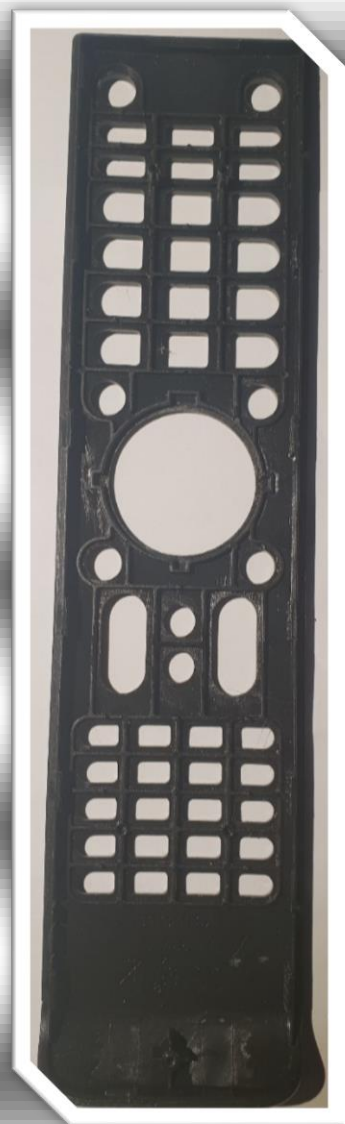
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TV Remote

Many remotes come with small screens, most have plastic covers that protect the signal area. For any remote to work it either sends infrared signal or a radio frequency to the TV it controls. The so-called eye sits at the pointing end of the control, which is protected by a plastic layer of polycarbonate or acrylic. Other clear plastics which is possible to use are thermoplastic elastomers, thermoplastic polyurethane and nylon, ABS, and styrene.

Typically, the case is formed from a moulded plastic such as ABS. This same material is used in drain-waste systems, which is formed by injection moulding. This process uses heat to form the shape, after moulding the heat is then dissipated using thermally conductive polymers. Shielding the remote from electromagnetic and radio frequency interference from other devices is often required.

While some remotes come equipped with small screens, all have plastic covering that encases the signal area of the remote. For a remote to work, it must send either an infrared signal or radio frequency to the device it controls.



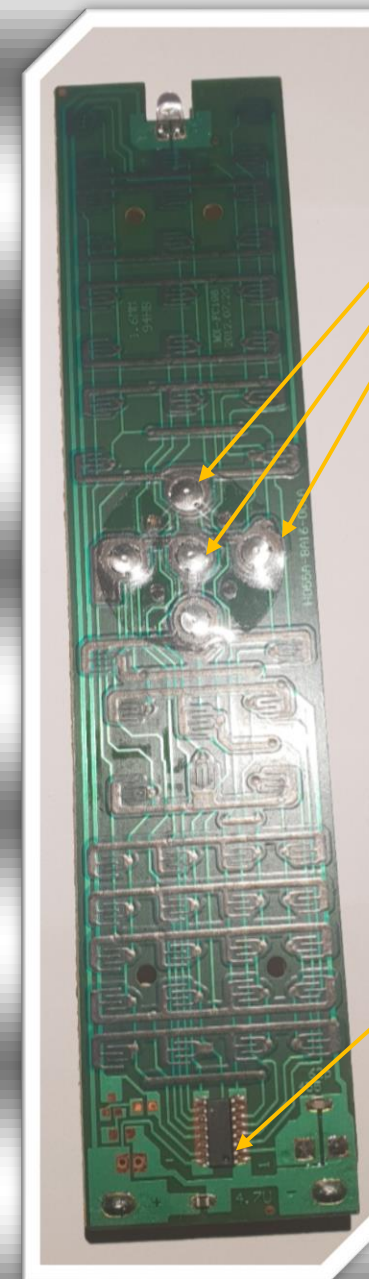
Front Cover



Keypad



Circuit board



Button
Contacts

Integrated
Circuit



Rear Cover

Buttons and keypads can be made from numerous types of thermoplastic elastomers mainly because of their 'rubbery' properties. Many thermoplastic elastomers used for keypads and buttons are trademarked and kept away from public knowledge. Some TPE's include Pellethane, Estane, Sarlink, and Polytrope. These plastics have a rubbery texture and elastic composition.

Fillers are often used in making TV remotes to increase strength of the plastic. This happens during the injection moulding process which could also include carbon, glass, aramid or stainless-steel fibres. The typical name for Aramid is Kevlar, which is used in bulletproof vests. Nomex is also used as a fire-retardant material, both equally provide extra strength without excess weight.