# THE HISTORY OF THE *casino chip*

***George Melas examines the evolution of the seemingly mundane casino chip and discovers exactly how complex the new 'pseudo intelligent' versions can be***

THE CONCEPT OF representing currency by means of game counters or tokens offers the advantages of exclusivity, speed of gaming and portability for both the operator and the player. For the operator it also provides the means to issue a personalised currency the denomination of which reflects the quality of the clientele and the financial resources of the house.

The concept is not new.Archaeology offers numerous examples of Greek and Roman tokens used not only for admitting spectators to games but also for home entertainment.

## Early Gaming Chips

The early tokens were made of bone, ivory and metal. Advances in technology and manufacturing processes brought with them the introduction of materials such as glass, porcelain, metallurgical compounds and polymer. Nowadays, there are many types of gaming chips in casinos worldwide whether in the form of wheel checks, cash chips, plaques or tokens, for slots, chip sorting machines and tables; whatever the choice the chips have become more intricate in appearance, construction and use.

In the latter part of the sixteenth century, gaming chips that had been traditionally made of bone were outclassed by ones fashioned from materials less prone to counterfeiting, such as the smoother and denser ivory or Mother of Pearl.

Even porcelain was used, allowing a choice of spectacular designs — whether in terms of shape ( circular, square, polygonal) or by the detailed work of the hand-carved surface. Dale Seymour gives a detailed pictorial account of the early evolution of chips in his 285-page book entitled 'Antique Gamhling Chips', published by Past Pleasures.

## Celluloid chips

Celluloid, the oldest of the synthetic plastics, is made of cellulose nitrate compounded with a plasticiser, usually camphor. It dates back to the work of the French chemist Braconnet in 1833; it was not until 1869, however, that John Wesley patented the use of cellulose nitrate as a solid mass, forming the basis of the plastics moulding industry.

Celluloid gaming chips were fairly solid and non-flammable, but proved hard to work on.The emergence of Celluloid and the Celluloid compounds containing ivory particles presaged the demise of the carving of pure ivory chips — much to the relief of the elephant. With increasing demands for more chips it became evident that a cheaper and simpler alternative, more

*The financial security of the house depends upon the integrity of its gaming chips. It is through the effective tracking of these chips that management is able to maintain security, to assess gaming action trends and to take responsive action when appropriate*

suited to mass production, was needed — it was time for the 'composition' or 'clay' chip, the result of compression moulding of clay with shellac.

United States patent registrations on the design of gaming chips suggest that the earliest and the simplest filing was in April 1887 (US patent D 17,249) by Annie Ball; it claimed the design of "two circular concentric grooves" on the face of the chip. By the turn of the century, the design subject matter included both regular and abstract forms — like monograms, sports, plants, people and animals, as well as landscapes.

Fig. 1

Fig. 2

The early clay chips were widely available, but limited to very few colours, insufficient to identify more than just a handful of players at any one time. Some players took advantage of the manufacturing restrictions and resorted into 'pushing' their own chips during gaming action. There have been stories of operators finding at the close of play nearly twice as many chips as they had when they started gaming.

## Inlaid chips

By the late 1880's, chip manufacturers were offering various styles of engraved, embossed, inlaid, decal and plain chips. Within a short time embossing superseded the labour intensive engraving method, until the inlaid chips with a wide range of colours and designs, became part of the standard table float.

The concept of the inlaid chips has remained the same over the decades; numerous combinations of colour are realised through the inlay of an insert of one colour design into the body of a chip of a contrasting colour. Research programmes, in the late 1920's, identified the production of synthetic fibres from polymides and in 1936 W. H. Carothers led to the fabrication of nylon, the product of the catalytic hydrogenation of benzene. The technology advanced rapidly after World War II and by the late 1960's French jettons (*fig. 1*) and inlaid chips (*fig. 2*, c.1925) were in use worldwide.

The recent evolution in casino chip design may be conveniently assumed to have started by Bernard B. Jones claiming in his patent (US patent no. 3,968,582) the addition of "one or more coins" at the centre of an injection moulded chip and by the mid 1980's he patented (US patent no. 4,435,911) the "relatively flat non-metallic annular ring having injection molded indicia", a familiar chip in most chip floats.

## Clay chips

After the much publicised forgeries of the compression moulded 'clay' chips in the late 1980's, evolution of chip construction continued in leaps and bounds. One of the incidents reported by the Las Vegas Review Journal (July 1988) involved two Woodcliff Lake residents who were: "accused of theft by deception, conspiracy and violations of the Casino Control Act, which prohibits the use of bogus gaming chips".

With today's high technology readily available at modest prices, manufacturers have endeavoured not only to stay ahead of the forgers, but also to satisfy the operators' needs with respect to internal security and the speed up of financial tracking. Pushing the frontiers of chip technology calls for expensive research programmes which not every manufacturer is keen to undertake.

Clearly, some manufacturers have been more successful than others in introducing products to satisfy most budgets and user needs.

## U.V. Chips

By the late 1980's certain manufacturers injected fluorescent 'fillers' into the body of the chip, so that when the chip was exposed to Ultra Violet (U.V.) radiation it displayed the casino name. This enhanced security and operators could authenticate the chip by means of a low cost, portable U.V. light.

For example, *fig. 3a* when viewed under normal light does not display the clubs, hearts, diamonds and spades which have been sublimated into the decal; the signs, however, become visible in *fig. 3b* when illuminated by U.V. light. Similarly, *fig. 4* illustrates another example of a nearly invisible legend which becomes legible under U.V.

Fig. 3a

Fig. 3b

## Decalcomania

The term decal is an abbreviation of decalcomania, which refers to a process of transferring designs from

Fig. 4

specially prepared paper to another surface. The concept is very old and manufacturers have spent much time and energy in their efforts to stop people from trying to remove the decals.

Designs allow for very secure fixing, destruct-when-removed decals, graphic sublimation and invisible bar coding, progressing to more elaborate diffraction grating and holographic decals. *Fig.5* illustrates a moulding with a diffraction grating decal depicting a musician; depending on the angle of viewing both the head and the musical notes change colour.

## Binary-tag chips

The optical security aspects of the chips (like bar-codes, holograms, U.V., Infra Red, as well as visual patterns) are designed for visual and remote video identification. They are not suitable for detecting a chip when the chip has been concealed on someone's person.

Operators are keen to know if and when their chips leave (or enter) the casino and on whom. This calls for a different form of technology and the sensing of electronic tags embedded in the polymer offer several advantages. At the bottom of the benefits ladder is the 'smart chip', the technology of which has been known for a long time and is now fairly well documented. The word 'smart' has been used (and abused) to describe the latest versions of almost everything from appliances to automobiles, as well as the state-of-the-art design and manufacturing procedures used in their development.

The basic 'smart chip' is often referred to as the 'binary tag'; at its heart is a tuned circuit. The term binary refers to the two possible states of the chip implant — active or inactive. Binary tags may take many different shapes and forms, ranging from a pair of crossed wires, to a coil of wire the cross-section of which is illustrated in *fig.6*.

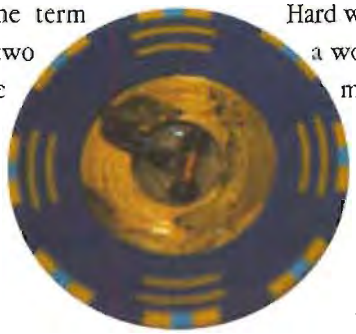


Fig. 6

In theory, when the suitably embedded chip goes through the sensor posts the implant resonates, absorbing power from the source. This power loss triggers an alarm (whether audible or silent), usually activating a CCTV camera as well as alerting the security officer. In practice, binary tags provide little information, are relatively easy to duplicate and are prone to misbehaviour at the hands of electronics experts.

## Transponder chips

After many years of research, the Summer of 1989 saw intensive research activity and many feasibility studies on both sides of the Atlantic. The programmes suggested that in order to overcome the shortcomings of the binary tag, a more sophisticated implant was needed and in particular a kind of tag that would prove impossible to counterfeit and which could be used not only on tables and chip sorting machines but also in very high denomination slots.

Hard work paid dividends — a working prototype was made and a few months later its description was published in the Huxley Newsheet (Issue No.5, page 2) entitled the 'Smart Chip' and it was defined as the first "chip within a chip" in the world.

The Newsheet aroused great interest, and at the 46th Amusement Trades Exhibition at Olympia (January 8, 1990) John Huxley demonstrated their 'Smart Chip', a Bud Jones high security injection moulding with an embedded identification transponder circuit (*fig.7*).

The phase encoded transponder (US patent no. 4,463,353 to Kuzara) is a passive device capable of response to an interrogating signal which causes it to transmit an individual unique identification code.

The code sent back to the interrogating device, having identified the

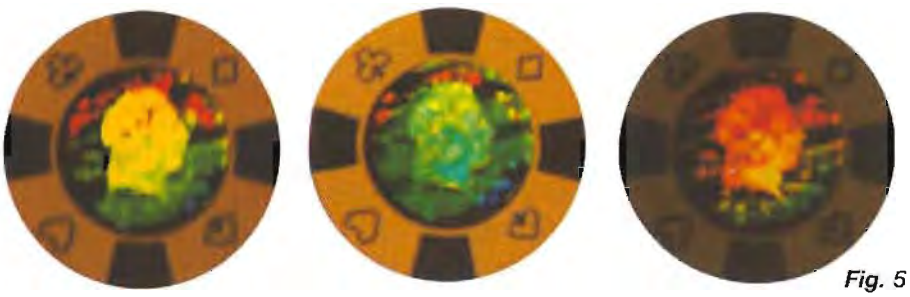
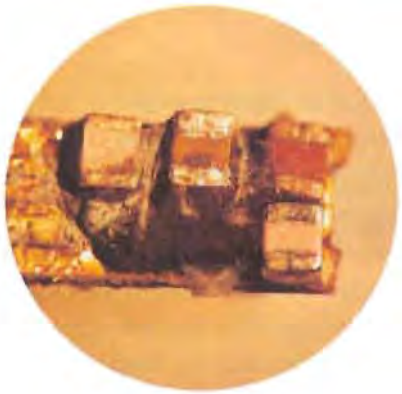


Fig. 5



*Figs. 7 and 8*

transponder (US patent no. 4,114,151 to Raymond et al), caused its details to be displayed on the VDU of a Personal Computer. In the show demonstration the following details were included:

- The name of the Chip;
- The Denomination;
- The Casino Name;
- The Identification (ID) Number.

The ID number can be very long; in fact over 34 billion individual code numbers are available as the circuit is capable of transmitting a message composed of up to eight ten-bit 'words'.

The transponder technology offers huge benefits, unfortunately at present with similar price tags. However, it is only a matter of time before the cost is reduced to acceptable levels, allowing operators to proximity programme and interrogate a chip anywhere on the gaming floor.

## Chip Database

In order to realise the benefits of transponder or bar coded chips, casinos must maintain their own 'chip database'. The database would list every valid chip in use at that site by its ID number, along with other relevant information such as the individual chips' names and their values.

It may be appreciated that the operation of a transponder/database system requires the installation of suitable hardware, the precise nature of which (and price) would depend upon the individual casino's expectation of system performance.

## Criteria For Choosing Chips

An increasingly large number of gaming chip manufacturers provide products covering the entire range of quality. The criteria for a given casino's choice of preferred chips vary according to the experience, perception and budget of its buyer; in general, however, the following aspects might well be taken into consideration:

- Quality;
- Availability;
- The type of service the brand name provides;
- Additional Features, like security;
- Price.

This list does not include such subjective issues as the emotions or personal attitude of the buyer or the effect of the buyer's background. Indeed, many buyers' choices are swayed towards a chip which just

**GAMING CHIPS**

- Bone, Ivory, Pearls, shellac, celluloid, etc.
- Early Composition / Polymer chips (late 1930's)
- **Compression Moulded ('Clay') (c.1965)**
  - Intricate surface texture
  - edge inserts
  - embossed
  - decals (external)
  - crest & seal
  - decals (internal)
  - graphic designs
  - metal/coin-inlay/bar codes, binary tags, etc.
- **Injection Moulded (mid 1970's)**
  - single colour
  - multi-colour
  - decals (polymer)
  - coin-inlay
  - security patterns
  - high security coin-inlay (c.1987)
  - graphic designs
  - U.V. encoded (1988/9) – inserts / logo
  - Diffraction Grating & Holographic decals (1989)
  - Infra-Red video monitoring
  - Binary tags
  - Transponder tags (Dec. 1989)

'feels' or 'sounds' right to them. Because of the need to take security considerations into account, a buyer's choice for a chip of higher denomination will be biased in favour of more elaborate design and higher technology construction, notwithstanding the greater purchase price this entails.

The graph, ***above left***, conveniently illustrates something like the progression of chip complexity over time, caused by the ever increasing requirements of higher security.

## Future trends

It would seem that the chip of the future will be a low cost, high quality moulding, incorporating a pseudo-intelligent device capable of providing information about its environment.

The in-build device must enable the reliable identification, verification and validation of the chip on the gaming floor, in real time.

It is only then that the house can evaluate instantaneous profit or loss, identify any adverse gaming trends, track the players and take appropriate action as and when required. The INPADOC patent database confirms that no less than eleven patents on gaming chips have gone to grant in as many recent years.

The control over the evolutionary process of the gaming tokens has remained with the players, but it is the operators that get the benefits. The evolution continues. ■

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