This invention relates to the method of manufacturing a punch block assembly which utilizes a casting resin to form punch pin guiding and retaining apertures and the article of manufacture produced thereby.

Teletypewriter perforations typically employ a punch block assembly, of the type depicted in Patent No. 2,308,543, issued to A. H. Raiber on January 19, 1943, to make intelligence-bearing perforations in a tape in the form of a code, such as the 5 unit Baudot code. Since the perforations are intelligence bearing, the punch pins in such an assembly must respond quickly and accurately so as to faithfully reproduce the intelligence coming into the perforator. Such punch pin response necessary requires that the method of manufacture used to produce the punch pin assembly meet very exacting manufacturing requirements. The principal difficulty involved in the manufacture of such a punch block assembly is the forming of the apertures which guide and retain the punch pins. To insure quick response of the punch pins, and accurate positioning of the perforations produced thereby, the pins must be closely retained by the apertures so as to prevent any lateral movement of the pins during a punching operation yet the apertures must be sufficiently large so as not to bind the punch pin during its punching movement. Previously, such pin assemblies were manufactured by securing a guide plate above and below a generally inverted U-shaped casting. A die plate was then secured to the upper guide plate and the punch pin guiding and retaining apertures were drilled simultaneously through each of the three plates. To meet the aforementioned exact manufacturing requirements, each punch pin was then individually lapped into its respective aperture. Obviously, such a customized method of manufacture was time consuming, tedious and extremely expensive.

It is an object of this invention to provide a method of manufacturing a punch block assembly which is inexpensive and easy to practice.

A further object of the invention is to provide a method of manufacturing a punch block assembly in which a casting resin is employed to provide punch pin guiding and retaining means.

A feature of the present invention is the forming of punch pin receiving slots in a punch block assembly by the crush grinding process.

Another feature of the present invention is the surrounding of a lubricant coated punch pin, disposed in a punch pin receiving slot formed in a die plate and punch block assembly, with a casting resin so as to provide punch pin retaining and guiding means.

A more complete understanding of the present invention may be obtained from the following detailed description of the method of manufacturing a punch block assembly when read in conjunction with the appended drawings in which:

FIG. 1 is a plan view of the punch block assembly.
FIG. 2 is a plan view of the die plate assembly secured to the punch block showing a plurality of punch pin receiving slots formed in the assembly, a portion of the die plate being broken away for clarity.
FIG. 3 is an elevational view showing punch pins being displaced from the slot formed in the die plate and punch block prior to a casting operation.
FIG. 4 is a cross sectional view taken along the line 4--4 in FIG. 3 in the direction of the arrows as viewed after the completion of the casting operation; and
FIG. 5 is a cross sectional view taken along the line 5--5 in FIG. 4 in the direction of the arrows as viewed.

Referring now to the drawings and more particularly to FIG. 1, there is shown a punch block 10 having a cavity 11 formed therein which serves as a die mold in a casting operation. Openings 12 and 13, leading into the cavity 11, are provided with counter sunk portions 14 and 15, respectively, the purpose of which portions will be described in full infra. Also shown in FIG. 1 is a die plate 16 displaced from the punch block 10 preparatory to being secured to the punch block. A slot 17 is formed in the punch block 10 to provide a passageway between the punch block and the die plate for a web of material such as a strand of tape.

After the die plate 16 has been secured to the punch block 10 in a suitable manner, as by threaded fasteners 18, a plurality of punch pin receiving slots 19, as illustrated in FIG. 2, are formed simultaneously in the die plate 16 and punch block 10 by a crush grinding process.

The crush grinding process is well known in the art and derives its name from the method used to dress or shape the periphery of a grinding wheel. The periphery of the grinding wheel is shaped by applying to the face of the wheel, under pressure, steel or cast iron rolls having the same profile as the indentations to be formed in a work piece. The pressure applied by the steel or iron rolls to the face of the grinding wheel crushes the abrasive grains from the bonding agent comprising the grinding wheel to produce the desired form. Thereafter the punch block and die-plate have the slots ground therein by the wheel, the surface of which has been dressed to the desired contour. It will be understood that the punch pin receiving slots can be formed in any conventional manner, the crush grinding process being set forth merely by way of example.

After the plurality of punch pin receiving slots have been formed in the assembly and the assembly has been cleaned with a suitable cleaning agent, the assembly is placed upon a suitable flat surface, such as the top of a work bench in a casting shop, with the surface of the punch block into which the countersunk portions 14 and 15 open, downward.

Preparatory to being placed in the slots 19, the punch pins 20 are cleaned, with a suitable cleaning agent, and coated with a suitable lubricant or mold release compound such as wax or silicone mold release compound. Typically, after being cleaned, the pins 20 are immersed in a solution of silicone mold release compound in an organic solvent. The pins are withdrawn from the solvent in a vertical position and allowed to dry while remaining in the vertical position. The pins 20 are then placed in the slots 19, as may be seen in FIG. 3, preferably such that the pin is midway between its upper and lower operating positions whereby the bow effect, introduced in the pins when they are moved upward into their punching positions, is minimized. It will be noted that the punch pins span the cavity 11 formed in the die block 10, extend through the die plate 16 and through the slots formed in the punch block above and below the cavity formed in the punch block.

An epoxy resin, such as for example, any of those discussed in Cisian Patents 2,324,483 and 2,444,333, granted July 20, 1943, and June 29, 1948, respectively, Greene Patents 2,494,295 and 2,511,913, granted January 10, 1950, and June 20, 1950, respectively, and Bradley Patent 2,500,600, granted March 14, 1950, the disclosures of which are hereby incorporated by reference as if fully set forth herein, is poured into the cavity, the openings 12 and 13, countersunk portions 14 and 15 and to surround circumferentially the portions of
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the punch pins spanning the cavity 11. The epoxy resin is prevented from flowing into the punch pin receiving slots 19 formed in the punch block 10 by one of several methods well known in the casting art such as filling the slots with plaster, a rubber-like substance or a suitably designed metal die.

Epoxy resins are well known in the art and have a high order of utility in a casting operation, such as that employed in the present invention, due to their characteristics of permitting casting at low temperature and under low pressure, possessing good physical properties, especially resistance to shock and abrasion, and possessing good chemical properties particularly as to low solubility in acids and organic solvents. It will be noted that the epoxy resin described in the aforementioned patent is suggested merely by way of example, and that the present invention is not limited to the use of the particular resin disclosed therein, but may be practiced with any of a number of epoxy resins which exhibit similar general characteristics. Accordingly, it is further noted that the present invention is not dependent upon the characteristics of the particular epoxy resins incorporated herein by reference.

The epoxy resin filling the countersunk portions 14 and 15 will serve as retainer flanges to assure that the body of resin will not become dislodged from the cavity 11, due to shock attendant the operation of the punch block assembly, should there be insufficient adhesive force between the resin and walls of the cavity to retain the body of resin in the cavity.

Inspection of the resulting punch block assembly reveals that the punch pin guiding and retaining apertures formed solely by the epoxy resin which surrounds circumferentially the punch pins 20, as shown in FIG. 5, will be customized to fit each individual punch pin and will obviate the afore-mentioned time consuming and expensive requirement of lapping each punch pin receiving aperture to fit the individual pin. Manifestly, the present invention reduces the number of manufacturing steps involved in making a punch block assembly and greatly decreases the manufacturing cost thereof.

It will be understood that the above-described embodiment is merely representative of the instant invention and that many variations may be made therein without departing from the spirit and scope of the present invention.

What is claimed is:

1. A punch block comprising a member of U-shaped cross-section composed of one material and having a pair of legs and a base, a plurality of projections on the extremities of said legs forming therebetween a plurality of longitudinally aligned receiving slots having bearing surfaces thereon, a plurality of slidable punch pins of greater length than the distance between the legs and of a diameter less than the length of said projections, said pins being disposed in said receiving slots, and being guided by said bearing surfaces, and a member composed of a resino us plastic material disposed between said legs and base of said first-mentioned member and surrounding each of said individual slidable punch pins to retain each of said punch pins against its respective bearing surface.

2. A punch block assembly for punching intelligence bearing holes in a web of material, comprising a die plate having a plurality of punch pin receiving slots formed therein, a punch block composed of a first material having a base and a pair of legs defining a cavity with said base, a plurality of projections at the edges of said legs, each adjacent pair of projections having therebetween longitudinally aligned bearing surfaces, a plurality of pins laid on said bearing surfaces in slidable engagement therewith and spanning said cavity, and a retaining and guiding member composed of a plastic material extending from said base of said block to surround the pins to retain each of said pins against its respective bearing surfaces and to guide the portions of the pins intermediate said bearing surfaces on said legs.

3. A punch block assembly comprising a block of metallic material having a cavity defined by surrounding walls, at least one of said walls having an irregularity therein, a plurality of projections at the edges of said legs, each of said individual pins to retain each of said pins against its respective bearing surface and guiding the portion of the pins intermediate said certain of the walls.

4. A punch block assembly comprising a unitary metallic block having a cavity formed therein, said block having a plurality of longitudinally aligned slots formed in opposed side walls of said block, said slots having bearing surfaces thereon, a plurality of punch pins supported for slidable movement in said slots, and a pin retaining and guiding means in said cavity and surrounding each of said individual pins to retain each of said pins against its respective bearing surfaces and guiding said punch pins during their movements.

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