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(54) IMPROVEMENTS RELATING TO SAFES AND SIMILAR SECURITY STRUCTURES AND TO SLABS ON PANELS THEREFOR

(71) We, CHUBB & SON'S LOCK AND SAFE COMPANY LIMITED, a British company, of Wednesfield Road, Wolverhampton, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to safes and similar security structures such as strong rooms and is particularly concerned with slabs or panels for use in such structures and intended to improve the protection of such structures against penetration by drilling or punching. One form of slab or panel available for this purpose comprises particles or nuggets of hard material such as that available under the Registered Trade Mark "Aloxite" embedded in a matrix of softer metal. Such a slab may be manufactured by filling a casing with the nuggets and then casting the matrix in situ round them. Such a slab is highly resistant to drilling and can be made large enough to cover the whole of the door of a safe for example. A construction of this type may, however, be ultimately vulnerable to a combination of alternate drilling and punching partly caused by the fact that the hard material may split or crater.

According to the present invention a slab or panel for use in a safe or similar structure comprises a steel plate having a number of bodies of tungsten carbide each fixed in a correspondingly shaped recess which is only very slightly larger than the respective body, the outer surface of each body having a smooth regular finish which does not project beyond the surface of the plate. Generally speaking tungsten carbide is almost completely drill-resistant but is liable to be shattered under the impact from a punch. The effect of the surrounding body of steel however reinforces the tungsten carbide against such shattering and the composite construction thus provides very high resistance both against drilling and against punching. In this respect the steel is much more effective than soft, readily castable materials such as aluminium which yield and deform under the lateral forces produced in the hard particle by the impact of a punch, thus allowing the profile of the particle to be moved outwardly into the mass, and allowing splitting of the particle within to take place.

Preferably the bodies of tungsten carbide are fixed in position by means of a brazing alloy and since each recess needs to be only very slightly larger than the corresponding body of tungsten carbide, the layer of brazing alloy is very thin, e.g. a few thousandths of an inch. In order to provide the necessary close fit of each body within its recess, the recess itself may be machined by means of a boring operation and each body is therefore preferably in the form of a circular disc. This is not essential, however, and other shapes are quite possible.

In order to guard against the risk of a body of tungsten carbide being entirely removed from the steel plate by making a cut through the plate right round the body, e.g. by means of a holesaw, a strip of hard material may be fitted to extend outwardly from each body in the general plane of the plate. Such a strip may be provided, for example, by filling a groove in the plate with hard weld deposit.

In general, a slab or panel in accordance with the invention will be fitted so as to protect particularly vulnerable points in a safe door, for example and rather than cover the whole area of the door, the individual bodies of tungsten carbide may be located so as to provide individual protection for such points. For example, if the wheels of a combination lock are to be protected, an annular body is required, conveniently in the form of an annular plate. This can be in one piece, but it is usually more convenient for it to be formed of a number of similar pieces.

Each body of tungsten carbide needs to

fit into its recess sufficiently far as not to project beyond the surface of the plate. In general, the surface of each body should lie flush with or slightly below the surface of the plate, but if an annular plate of tungsten carbide is made in a number of pieces as just mentioned, this introduces a further problem, i.e. the risk of cratering at the joints between the pieces. To assist in avoiding this the surface of the annular plate may lie appreciably below that of the steel plate, being covered by a steel ring, the surface of which is substantially flush with that of the steel plate.

A construction of slab in accordance with the invention, and intended for fitting to the door of a safe so as to protect vulnerable parts of the locking mechanism, will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is an elevation of the slab; and

Figure 2 is a sectional view on the line II-II in Figure 1.

The main body of the slab comprises a rectangular steel plate 1 the dimensions of which are suited to the door of the safe in question. A total of six discs 2 of tungsten carbide are fitted in recesses in the face of the plate and are so situated as to protect vulnerable parts of the locking mechanism which lie immediately behind the respective discs. In a particular example the discs 2 of tungsten carbide are 1.250″ in diameter, and have a thickness of 0.220″, the diameter of the recess in the steel plate 1 being 1.256″ and its depth 0.281″. Each disc therefore clears the side wall of the cavity by 0.003″, which clearance is filled by the brazing alloy. In its final position the top surface of each disc is below the general surface of the plate 1 by 0.061″, i.e. 1/16th inch. Adjacent each of the discs 2 a groove 3 filled with hard weld deposit extends outwardly in the general plane of the plate, so as to guard against the risk of an encircling cut which might otherwise remove the disc as a whole.

The slab illustrated is intended for the protection of a safe fitted with a combination lock and in order to protect the wheels of this lock, an annular body 4 of tungsten carbide made up of four separate quarters 5 is fitted as illustrated with a central opening 6 for the fitting of the dial of the lock. The thickness of this body is the same as for the discs 2 but its recess is appreciably deeper, thus leaving space for a covering steel ring 8, the surface of which is flush with that of the plate 1, and which protects the separate quarters 5 from the effects of cratering at the joints between them.

A silver brazing alloy is found to be particularly suitable for holding the discs 2 and body 4 in position, and it is also desirable that the tungsten carbide from which the discs 2 and body 4 are formed should incorporate a relatively high proportion of cobalt binder, which helps to hold the particles together and reduce the overall brittleness.

WHAT WE CLAIM IS:—

1. A protective slab or panel for use in a safe or similar structure, comprising a steel plate having a number of bodies of tungsten carbide each fixed in a correspondingly shaped recess which is only very slightly larger than the respective body, the outer surface of each body having a smooth regular finish which does not project beyond the surface of the plate.

2. A slab or panel according to claim 1, in which the bodies are fixed in position by means of a very thin layer of brazing alloy.

3. A slab or panel according to claim 1 or claim 2, in which at least some of the bodies are in the form of circular discs.

4. A slab or panel according to any one of the preceding claims including a strip of hard material extending outwardly from each body in the general plane of the plate.

5. A slab or panel according to any one of the preceding claims, in which one of the bodies is in the form of an annular plate for the protection of the wheels of a combination lock.

6. A slab or panel according to claim 5, in which the annular plate is formed of a number of pieces of like configuration.

7. A slab or panel according to claim 6, in which the surface of the annular plate lies below the surface of the steel plate, being covered by a steel ring, the surface of which is substantially flush with that of the steel plate.

8. A slab or panel according to any one of claims 1 to 3, in which the bodies of tungsten carbide are substantially as described herein.

9. A safe or similar structure having a door fitted with a slab or panel according to any one of the preceding claims, the bodies of tungsten carbide being so located as to protect vulnerable parts of the locking mechanism.

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