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DIE LUBRICANT

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The invention relates to the working of metals by or through dies and is particularly directed to a die lubricant for use in the working of metals of low malleability such as, for instance, magnesium, magnesium base alloys, and certain aluminum base alloys.

The object of the present invention is the provision of a die lubricant which permits the metal to flow readily, which protects the surfaces of the dies, and which allows of the production of a worked product having a smooth surface of pleasing appearance.

A further object of the invention is the provision of a die lubricant which will overcome the difficulties hereinafter noted.

While the problems of metal working which have led me to devise my present invention have been principally encountered in connection with the working of magnesium and its various alloys, and will be described in connection therewith, my novel die lubricant is useful in connection with the working of other metals where similar problems arise.

Magnesium and its alloys have only recently been adapted to various fabrication processes. The metal has a high affinity for oxygen and certain other gases, and it had formerly been difficult to provide sound working stock from alloys capable of developing satisfactory mechanical properties. Not the least of the difficulties has been the problem of causing the magnesium base alloy working stock to flow easily and evenly, for instance, into depressions or around projections in forging dies or through extrusion dies. Although this discussion is applicable to any working process in which the metal surface is caused to flow relative to forging dies, extrusion dies, etc., for the sake of convenience and as an illustration, the problems will be outlined with relation to the forging process.

Shortly after attempts to forge magnesium base alloys were instituted, it was noted that the oils commonly used to lubricate the dies in forging, for instance, aluminum base alloys caused a serious surface defect on the magnesium forgings. This defect usually started as small surface tears which developed into sizable fissures on further forging unless they were removed by grinding or filing intermediate the working steps. If no lubricating oils are used on the dies, this defect disappears but the metal does not flow well and the dies frequently become scored, necessitating complete replacement or, at least, refinishing. A number of "dry" lu-

bricants were tried with little or no success. The metal did not flow well; the dies were marred; the surface of the resulting worked article was unsatisfactory; and working was difficult and frequently productive of failures.

I have discovered that a very successful die lubricant is obtained by preparing a suspension of powdered graphite in a volatile liquid and applying this to the surfaces of the dies. I prefer to use, as a volatile liquid, carbon tetrachloride. A very convenient and practical method of applying the lubricant to the die consists in spraying it on with a spray gun connected to an air pressure line. The relative proportions of the constituents of the lubricant are not critical provided sufficient liquid is present to impart fluidity and sufficient solid is present to leave a substantially homogeneous graphite coating over the working surfaces of the dies.

Other volatile liquids such as the lighter hydrocarbons and alcohols, etc. may be readily used provided that they be unharmed to the metal and volatile at the temperature of the die. In certain instances where, either by prearrangement or as a result of working with heated stock, the dies are at an elevated temperature, water may be substituted as a liquid constituent since under these conditions its rapid evaporation classifies it as volatile for the purposes of this invention.

The wrought articles produced from dies lubricated with the graphite suspension in the manner described have a highly polished surface, and the dies even after extended service are not appreciably scored or disfigured in any way. The metal flows readily and more intricate wrought articles may be made with a considerable reduction of the practical difficulties heretofore encountered.

I claim:

1. A die lubricant for magnesium base alloys consisting of a suspension of comminuted graphite in carbon tetrachloride.

2. A lubricant for the working surfaces of metal working dies, consisting of a suspension of powdered graphite in carbon tetrachloride.

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