This invention relates to capsule handling apparatus and more particularly to apparatus for holding capsules of various types during transit and for removing the capsules from the holding means.

One of the objects of the invention is to provide capsule handling apparatus which is simple and extremely inexpensive to manufacture and yet which provides an efficient and secure holding means for capsules of various types.

Another object of the invention is to provide a capsule tray in which a series of capsules may beyieldingly held against spilling or the like.

Still another object of the invention is to provide a capsule tray in which the ends of the capsules may readily be exposed for inspection.

A further object of the invention is to provide capsule handling apparatus including a tray yieldingly gripping the capsules and unloading means cooperating with the tray for removing the capsules therefrom.

A still further object of the invention is to provide capsule unloading means for quickly and easily removing a series of capsules from a tray or the like in which they are supported.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of a capsule tray according to the invention;

Figure 2 is a view similar to Figure 1 with the covers of the tray open;

Figure 3 is a top plan view of the tray with the successive layers broken away;

Figure 4 is a perspective view with parts broken away and in section showing the mounting of capsules in the tray;

Figure 5 is an enlarged partial section through one of the capsule holding openings in the tray;

Figure 6 is a partial plan view looking from the bottom in Figure 5 as indicated by the arrows 6–6;

Figure 7 is a view similar to Figure 5 of an alternative construction;

Figure 8 is a plan view looking from the bottom in Figure 7 as indicated by the arrows 8–8;

Figure 9 is a partial section illustrating the manner of loading a capsule into the tray;

Figure 10 is a section on the line 10–10 of Figure 9;

Figure 11 is a plan view of an unloading device with a tray in position thereon;

Figure 12 is a section on the line 12–12 of Figure 11;

Figures 13 and 14 are partial enlarged sections similar to Figure 12 illustrating two steps in the unloading of a tray; and

Figure 15 is a perspective section of the tray substantially on the line 12–12 of Figure 11.

The handling apparatus of the present invention comprises, first a tray in which capsules of various types may be carried and handled conveniently, and, second an unloading device cooperating with the tray to remove the capsules therefrom.

The invention is particularly useful in connection with the handling of small detonator caps for various types of ammunition, but it can also be employed for handling small size shells as well as capsules of various other types.

The tray as illustrated in Figures 1 to 10 comprises a block 19 formed of a series of laminations 11 of chipboard or the like, secured together in face to face relation to provide a block of the desired thickness. In the block illustrated, four laminations of chipboard are employed but it will be understood that for heavier blocks either more or thicker laminations might be used.

The laminations 11 are formed with registering openings to provide cylindrical openings 13 extending completely through the block of a size slightly larger than the capsules to be supported. This is best seen, for example, in Figure 5, in which a capsule 14 is shown in place in one of the openings 13 with clearance around the capsule.

In order to support the capsules in the openings yielding gripping means are provided to engage the sides of the capsules and hold them yieldingly in place. As shown, such means are formed by a flexible sheet of paper or the like 15 secured between the two central laminations and having openings therein registering with the openings 13 but of smaller diameter than the capsules 14. The sheet is formed with a series of slits or notches 16 around the sides of the opening, four such notches being shown in the embodiment of Figures 1 to 6. This provides four flexible tongues between the notches projecting into the openings 13 to support the capsules.

The opposite sides of the block may be covered by hinged covers 17 connected to the block by a strip of adhesive tape or the like 18 in the form of a book. If desired, one or both of the covers may be ruled as indicated in Figure 1 for suitable indicia to receive inspection or other desirable information relating to the capsules.

When the covers are closed as shown in Figures 1 and 4, the opposite ends of the capsules are pro-
ected and for inspecting the ends of the capsules the covers may be separately opened to permit free access to the capsules.

In loading the tray, the capsules may be forced into the openings in the block to engage the projecting tongues formed by the sheet 15 so that the tongues will be bent slightly as indicated in Figure 5 yieldingly to grip the sides of the capsules. In this way, the capsules are yieldingly held in place in the block against accidental displacement and against any severe shock due to dropping and the like.

Figures 7 and 8 illustrate an alternative construction, parts therein corresponding to like parts in Figures 1 to 6 being indicated by the same reference numerals. In this construction the central laminations 11 are formed with openings 19 of larger diameter than the openings in the outermost laminations to provide an enlarged portion in the central part of the openings 13. The sheet 15 intersects this enlarged portion centrally so that the tongues formed in the sheet can be of greater length without requiring the entire openings through the block to be of excessive size thereby to provide greater flexibility in the tongues. Also, as shown in these figures, the sheet 15 is formed with a plurality of slits or cuts 21 around the opening so that the tongues form a substantially continuous support for the capsules.

As best seen in Figures 9 and 10, when the capsule is originally placed in the opening it tends to be supported by the edges of the tongues formed by the sheet 15 and a slight pressure must be exerted on the capsule to deform the tongues as the capsule enters the opening.

The unloading means for removing the capsules from the tray is best seen in Figures 11 to 15 and comprises a flat plate 22 carrying a series of pins or projections 23 having conical tapered upper ends as shown at 24. The plate carries around three sides guide flanges 25 leaving the fourth side open. The guide flanges, as best seen in Figures 12 and 15, have guide surfaces 26 at right angles to the plate extending outwardly therefrom a distance at least as great as the length of the pins 23 above the plate and preferably in excess thereof. Above the guide portions 26 the flanges are formed with outwardly flaring guide surfaces 27 merging into the surfaces 26 for guiding a tray properly against these last-named surfaces.

In using the unloading device, a tray filled with capsules has both of its covers 17 folded back to open position as shown in Figure 12 and the block is then placed against the guide surfaces and pressed downwardly toward the plate. The pins are so related to the guide surfaces that each pin will register with one of the openings 13 in the block so that as the block is forced downwardly as indicated in Figure 13, the upper reduced ends 24 of the pins will engage the capsules and force them from the block as shown in Figure 14. It will be noted from this figure, that the pins are of such a length as to press the capsules beyond the flexible sheet 15 to assure that they will be fully released for free removal, but are not long enough to damage the flexible tongues formed by the sheet.

Preferably the pins 23 are loosely mounted in bores in the plate 22 with reduced stems projecting into the bores and enlarged head overlying the plate to form the projections thereon. In this way, the pins can easily and quickly be changed to pins of different lengths for use with trays holding capsules of different lengths.

While several embodiments of the invention have been shown and described in detail, it will be understood that these embodiments are illustrative only and are not intended as definitions of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A capsule tray comprising a block formed with a series of openings therein adapted to receive capsules, and means in each of the openings forming a series of coplanar flexible tongues intermediate the ends of the openings with their ends spaced apart a distance less than the diameter of the openings yieldingly to grip the capsule.

2. A capsule tray comprising a block formed of a plurality of laminations and having a series of openings therein adapted to receive capsules, and a sheet interposed between adjacent laminations having openings registering with and of smaller diameter than the openings in the block, the sheet being slit around the openings therein to form a series of flexible tongues yieldingly to grip the capsules.

3. A capsule tray comprising a block formed with a series of openings extending completely therethrough and adapted to receive capsules, means in each of the openings forming a series of coplanar flexible tongues intermediate the ends of the openings yieldingly to grip the capsule, and hinged covers overlying the opposite sides of the block.

4. A capsule tray comprising a block formed with a series of openings adapted to receive capsules, the openings having enlarged portions intermediate their ends, and means in the enlarged portion of each opening forming a series of coplanar flexible tongues yieldingly to grip the capsules.

5. A capsule tray comprising a block formed of a plurality of laminations and having a series of openings therein adapted to receive capsules, the openings having enlarged portions intermediate their ends, and a sheet of flexible material between adjacent laminations having openings registering with and of smaller diameter than the openings in the block and intersecting said enlarged portions, the sheet being slit around the openings therein to form a series of flexible tongues yieldingly to grip the capsules.

6. A capsule tray comprising a block formed by a series of laminations secured together face to face and having registering openings therein, the openings in two adjacent central laminations being of larger diameter than the openings in the other laminations, and a flexible sheet secured between the two central laminations and having openings therein of smaller diameter than the openings in the laminations and registering with the openings in the laminations, the sheet being slit around the openings therein to form flexible tongues yieldingly to grip the capsules.

SIDNEY E. VAN TUYL.