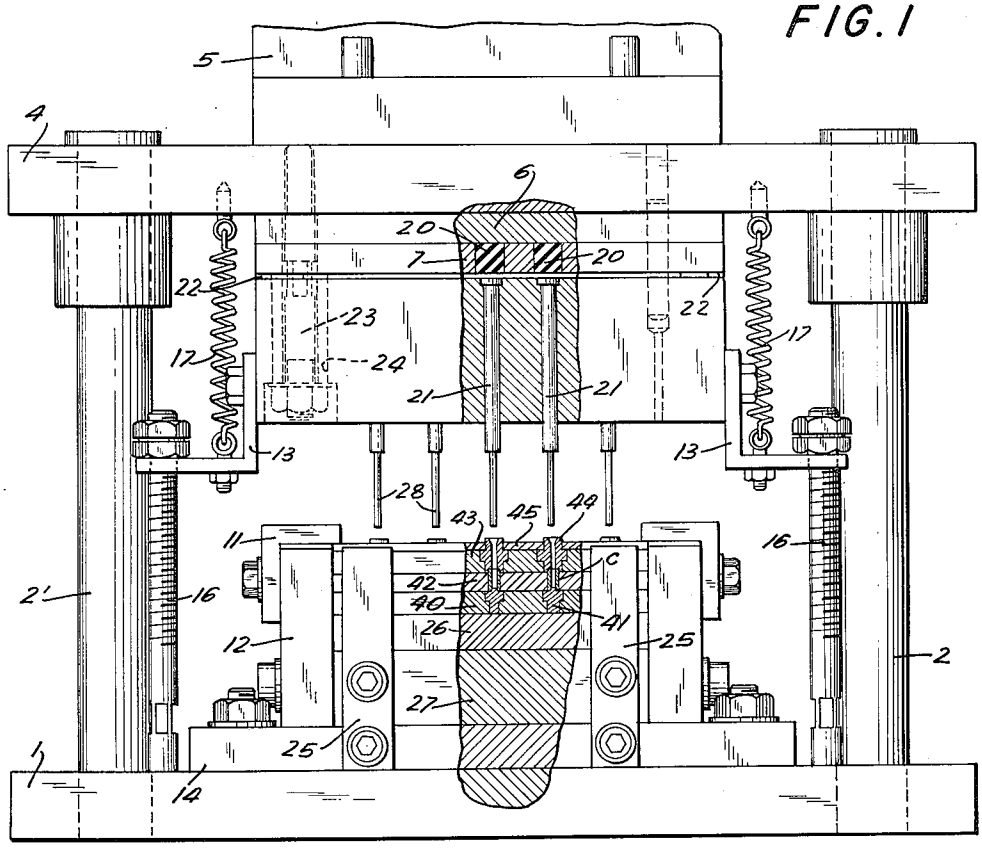
Feb. 6, 1962 R. J. HUNT 3,019,688

DEVICE FOR DETECTING LOW OR MISSING CHARGES IN THE ASSEMBLY OF AMMUNITION COMPONENTS

Filed March 25, 1958 2 Sheets-Sheet 1

FIG. 1



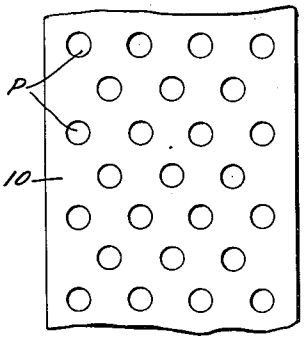


FIG. 4

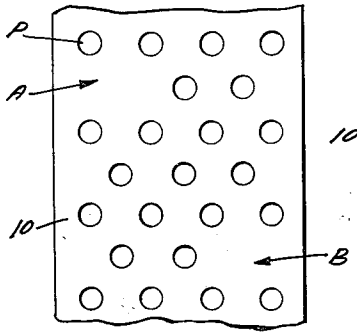


FIG. 5

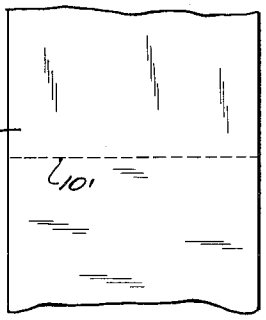


FIG. 6

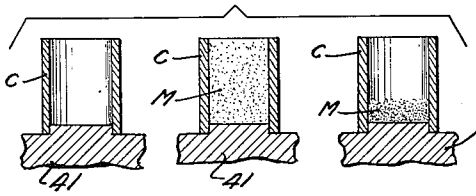


FIG. 7

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Feb. 6, 1962 R. J. HUNT 3,019,688

DEVICE FOR DETECTING LOW OR MISSING CHARGES IN THE ASSEMBLY OF AMMUNITION COMPONENTS

Filed March 25, 1958 2 Sheets-Sheet 2

FIG. 2

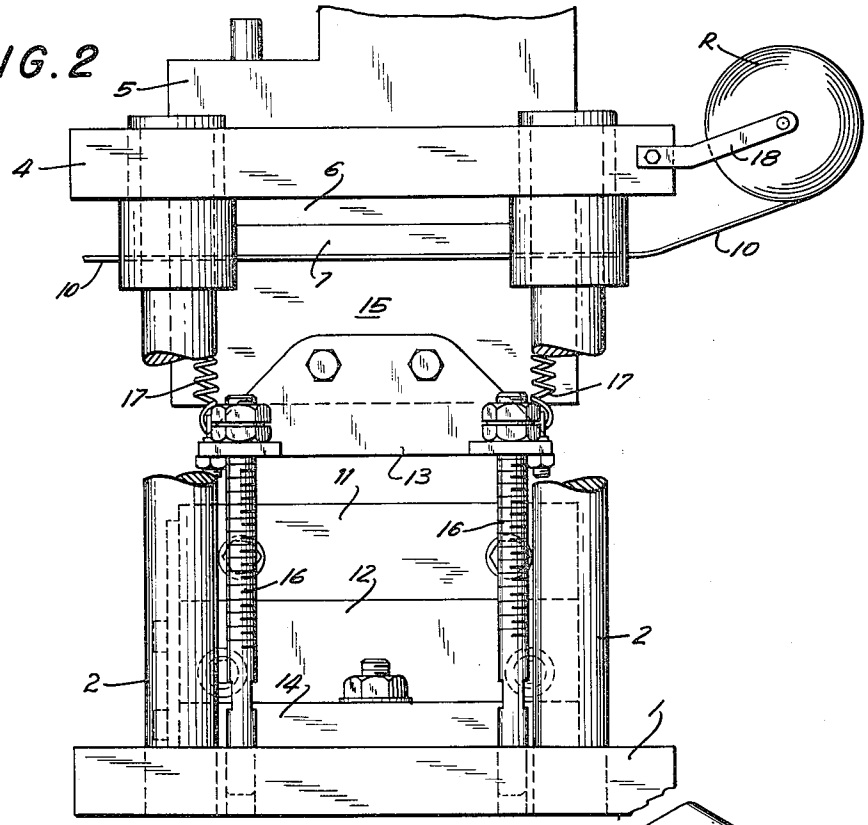
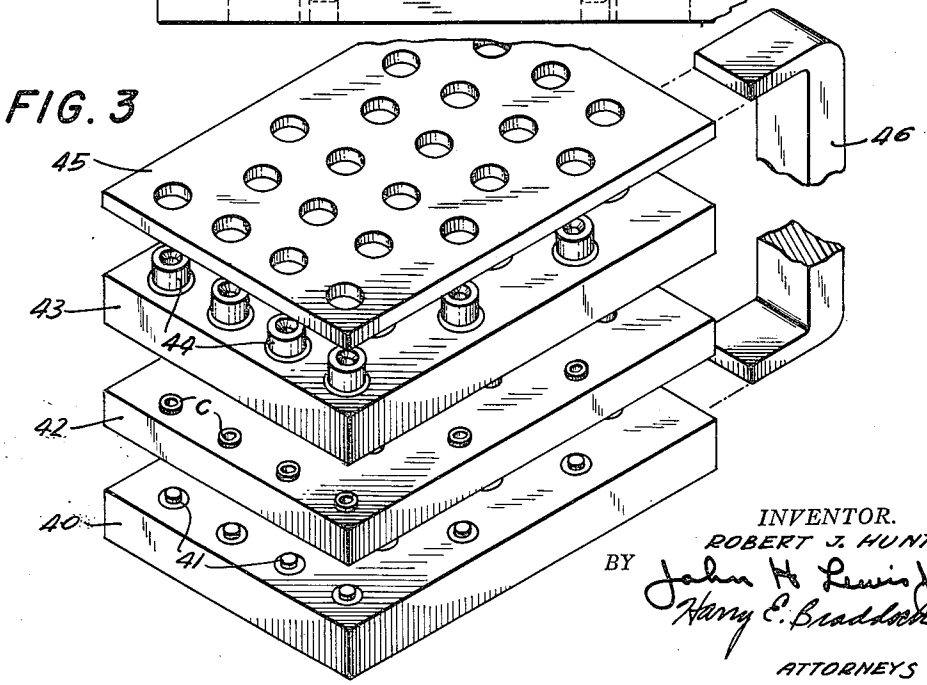


FIG. 3



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DEVICE FOR DETECTING LOW OR MISSING CHARGES IN THE ASSEMBLY OF AMMUNITION COMPONENTS

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3 Claims. (Cl. 86—23)

This invention relates to the field of ammunition manufacture and the problem of accurately loading and compressing small amounts of material into very small containers. More specifically, it relates to the loading and consolidation of explosive compositions into small cup or tube elements such as detonators and is concerned with an arrangement which will enable the detection of low or missing charges in a group of the loaded cup or tube elements in a simple and efficient fashion.

It is customary to consolidate or compress the explosive composition in a series of detonator cups to the desired density by arranging a group of cups containing the composition in a funnel plate assembly and placing the funnel plate assembly, with the detonator cups, in a multiple pin or spindle press so that on the pressure stroke each press pin compresses the composition in one of the detonator cups. The detonator cups are usually very small, as are the press pins. In addition, the quantity of explosive composition is very small for initiation or detonating purposes. The small size of the components makes the detection of low or missing charges of explosive composition very difficult and time-consuming. If detonator cups, defective by reason of low or missing charges, are not detected early in the manufacturing operation it means a considerable amount of waste by processing such defective to a later point in the operation or even to operational testing.

It is an object of this invention to provide a process and equipment which will enable the expeditious detection of low or missing charges of material in small containers as each group of containers containing the material is operated upon by a press device to consolidate the material in the containers.

It is a further object of the invention to provide a means for accurately recording and presenting the results of the detection operation for rapid visual inspection by an operator, identifying accurately the location of a low or missing charge of the loaded material.

The features of the present invention which are believed to be novel are set forth with particularly in the appended claims. This invention, both as to its organization and manner of operation, together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

FIGURE 1 is a front view of a vertical type multi-pin press, partly in section, embodying the features of my invention.

FIGURE 2 is a side view of the press structure shown in FIGURE 1.

FIGURE 3 is an exploded perspective view of the funnel plate assembly supporting a group of detonator cups containing the loose explosive composition and which clamped together is placed in the press mechanism.

FIGURE 4 is a plan view of a piece of the pressure sensitive record material on which is shown the results of applying the detection features of my invention to a group of detonator cups, no low or missing charges being present.

FIGURE 5 is a plan view of a piece of the pressure sensitive record material on which is shown the results

of a detection operation, missing charges appearing at the points indicated.

FIGURE 6 illustrates the perforations or weakened sections of the pressure sensitive record material to enable easy removal of the recorded results for each group of detonator cups tested.

FIGURE 7 shows one particular form of detonator tube in position on the bottom plate of the funnel plate assembly illustrating the empty tube, the tube with uncompressed explosive material, and the tube after the material has been compressed or consolidated therein.

The present invention is concerned more directly with one particular step in the fabrication and loading of material into small containers; explosive material into detonator cups in the preferred embodiment.

This particular step is concerned with the containers after they have been filled or partly filled with loose explosive material and require the material in each to be compressed or compacted by some means.

Referring to FIGURE 3 a plurality of detonator containers C, tubular in this example, are arranged in a funnel plate assembly comprising a bottom plate 40, plate 42 containing the detonators C, a funnel plate 43 containing funnel elements 44 and an upper plate 45, all clamped together by frictional clamp element 46. Bottom plate 40 has a series of inserts 41 which are adapted to hold containers C for a later operation which does not constitute part of the present invention. When each detonator container C is provided with the required amount of material M to be compressed the entire assembly is inserted in the press on riser blocks 14, 27 and 26 against movement-limiting or positioning stops 25. The press is then actuated to move the upper plate 4 and associated structure including the press pins 21 downwardly to compress the material in each container C to the desired density. Mounted on the upper surface of plate 4 is element 5 which is contacted by the ram of the press.

Heretofore, it has been highly difficult and impractical, if not impossible to detect low or missing charges in the detonator containers during subsequent operations to the loading step.

In order to determine quickly and accurately missing or low charges in the detonators at the pressing or charge consolidation operation without slowing down or appreciably delaying the overall process, I provide spacer strips 22 in the conventional press structure between the rubber plug holding plate 7 and the block 15 to provide a space therebetween. Block 15 is connected to plate 4 by means of a stud 23. Stud 23 is located in opening 24 of block 15. At the rear of the upper plate 4 of the die set I provide a bracket 18 on which is supported a roll R of pressure sensitive paper 10, perforated in desired lengths for easy detachment. This paper is led through the space provided between the block 15 and rubber plug holding plate 7. The moveable press structure associated with the upper plate 4 of the die set will now be described.

The main downward force of the press is exerted by conventional press arrangement on movable element 4 which is slidably mounted on cylindrical guide members 2 and 2' at front and back. Rigidly secured to the underside of element 4 is press pin backup plate 6 and rubber plug holding plate 7.

A press pin block 15 is positioned on element 4 directly below plates 6 and 7 and is so mounted that limited vertical movement can take place between it and plates 6 and 7 which are rigidly connected to element 4. Bracket plates 13 are secured to each side of the press pin block 15 and slidably engage four vertical post elements 16. Stop means on the upper extremity of each post element 16 engage the slidable brackets 13 to limit the upward

movement of the press pin block **15**. This opens the space between the press pin block **15** and the rubber plug holding block to its maximum width when the movable press structure is at its uppermost, or rest, position between work strikes. This arrangement permits the pressure sensitive strip **10** to be moved through this space to feed a new portion into proper position.

Springs **17** are connected in tension between the element **4** and brackets **13** of the press pin block **15** to urge these parts together when downward movement of the movable structure commences.

A plurality of vertical press pin elements **21** are slidably mounted for limited axial movement in the press pin block **15** and each is provided with an enlarged upper head which engages a plug **20** of rubber or like material aligned therewith in the plug holding plate **7**. This arrangement provides a cushioning effect especially desirable in compressing explosive materials. It can be seen that with the pressure sensitive strip **10** in position between press pin block **15** and rubber plug holding plate **7** that the heads of the press pins will be forced into engagement therewith during a pressure stroke of the press. The pressure sensitive sheet **10** is in my preferred embodiment, 0.009" (inch) thick manila paper material. Another suitable material is template paper of about 0.020" (inch) thickness. The heads of the press pins **21** will leave a pattern of impressions in the sheet **10**. Sheet **10** has a thickness which is related to the depth of material in the containers C so that if the desired amount of material is present in each container each pin will make a definite clear cut impression in the sheet and a missing charge of material will result in no impression at all as shown in FIGURE 5. Low charges will result in an indefinite or partial impression in the sheet which is also easily discernible.

After each press stroke the sheet section bearing the impression record is withdrawn from the press and a new section introduced into it from the roll at the rear. The sheet **10** is preferably perforated as at **10'** (FIGURE 6) for easy detachment of the individual portions.

The four support members **2** and **2'** are secured to a base element **1**. Secured to base element **1** is a rigid riser plate assembly composed of elements **11, 12, 14, 26** and **27** which support the funnel plate assembly containing the detonator C during the press stroke. The funnel plate assembly is slidably positioned in the riser plate assembly against stop elements **25** which align the containers C with the explosive material therein with the press pins **21**.

In the embodiment shown, the detonator containers are tubular in construction and the bottom plate **40** of the funnel plate assembly provides bottom support for the explosive material while under compression.

The operation of my novel process and associated equipment is summarized as follows:

The funnel plate assembly in assembled condition with the containers therein is received from the container filling operation. At this point each container C is filled or partially filled with the material M. The movable press structure is at its uppermost position in which the space between press pin block **15** and rubber plug holding plate **7** permits the insertion of a sheet of pressure sensitive material **10** from the roll R into position overlying the heads of the press pins **21**.

The funnel plate assembly with the filled containers is slidably positioned on plate **26** of the riser block assembly and aligned by the guide elements **12** and positioning stops **25**.

The press is actuated to commence the downward movement of elements **4, 5** and associated structure. As downward movement is commenced the rubber plug holding plate **7** will move into engagement with the press pin block **15**, gripping the pressure sensitive sheet **10** therebetween due to the tension of springs **17**. The brackets **13** slidably move downwardly guided by members **16**. This movement continues until the press pin portions **28** enter the containers C and commence to compress the material therein. The compression pressure is transmitted resiliently from plate **6** through plugs **20** to the heads of the press pins **21**. It can be seen that the relative movement of the heads of the pins, during the application of pressure to the material in the containers, with respect to the press pin block **15** and plugs **20** will cause impressions to be made in the sheet **10** according to the compressive work done by each pin.

After the return stroke which returns the movable elements to their uppermost position and opens the gap between elements **7** and **15**, the sheet **10** carrying the impressed record for the group of containers acted upon can be easily removed for inspection which will clearly indicate the presence of any low or missing charges. As the sheet portion is withdrawn from the front of the press the next portion is fed into position from the roll R in readiness for the next stroke on the next group of containers.

It can be seen that this inspection process can be carried out and checked without delaying the production operation and is almost foolproof in operation.

In compliance with the patent statutes I have illustrated and described a preferred embodiment of my invention, but it is to be understood that various modifications and changes could be made therefrom without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A press mechanism for simultaneously compressing a charge of material in each of a group of small containers comprising in combination, a fixed member, a movable assembly, said movable assembly comprising a block slidably supporting a plurality of pressure-applying elements for engaging a charge of material in said containers, a plate associated with said block containing a plurality of resilient cushion elements aligned with the ends of said pressure applying elements, a back up plate associated with said cushion element containing plate, a support means mounted on said fixed member to support a plurality of said containers between said fixed member and said movable assembly in alignment with said pressure applying elements, means for applying force to move said assembly, backup plate, cushion element-containing plate, block and pressure applying elements toward and away from said fixed member and containers supported thereon, and pressure sensitive means positioned and acting between said pressure-applying elements and said aligned cushion elements to detect and record the position of containers having low or missing charges of material therein during the material compressing operation.

2. A press mechanism for simultaneously applying pressure to a charge of material in each of a group of workpieces comprising in combination, a fixed member including means to support a plurality of workpieces, a movable driven member mounted on said press mechanism slidably supporting a plurality of press pin elements for engaging a charge of material in said workpieces, a plate associated with said movable member containing a plurality of resilient plugs aligned with the ends of said press pin elements, a back-up plate associated with said plug-containing plate, said fixed member supporting said workpieces in alignment with said press pin elements, means for applying force to move said movable member, backing plate, plug-containing plate, and press pin elements toward and away from said fixed member and said workpieces supported thereon, and a pressure sensitive material positioned and acting between said press pin elements and said aligned plugs to detect and record the position of workpieces having less material than required.

3. A press mechanism for simultaneously compressing a charge of explosive material in each of a group of

detonator cups comprising in combination, a fixed member, a movable assembly, said movable assembly comprising a block slidably supporting a plurality of press pins for engaging a charge of material in said cups, a plate associated with said block containing a plurality of rubber plugs aligned with the ends of said press pins, a back-up plate associated with said plug-containing plate, a support means mounted on said fixed member to support a plurality of detonator cups between said fixed member and said movable assembly in alignment with said press pins, means for applying force to move said assembly, back-up plate, plug-containing plate, block and press pins toward and away from said fixed member and

said cups supported thereon, and pressure sensitive paper positioned and acting between said press pins and said aligned plugs to detect and record the position of cups having low or missing charges of material therein during the material compressing operation.

References Cited in the file of this patent

UNITED STATES PATENTS

659,724	Wills	Oct. 16, 1900
845,065	Dunn	Feb. 26, 1907
1,546,376	Grotta	July 21, 1925
2,395,046	Grover	Feb. 19, 1946
2,395,494	Mosher	Feb. 26, 1946