United States Patent [19]

Kidson

[11] **3,835,768**

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[54] **CAN CRUSHERS**

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[73] Assignee: **Hunt Brothers (Oldbury) Limited,** Worcestershire, England

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[52] **U.S. Cl.** **100/94,** 100/DIG. 2, 222/87

[51] **Int. Cl.** **B30b 9/00**

[58] **Field of Search** ..... 30/4 R, 16, 6.4; 222/83, 222/83.5, 87, 88; 100/94, 95, DIG. 2

[56] **References Cited**

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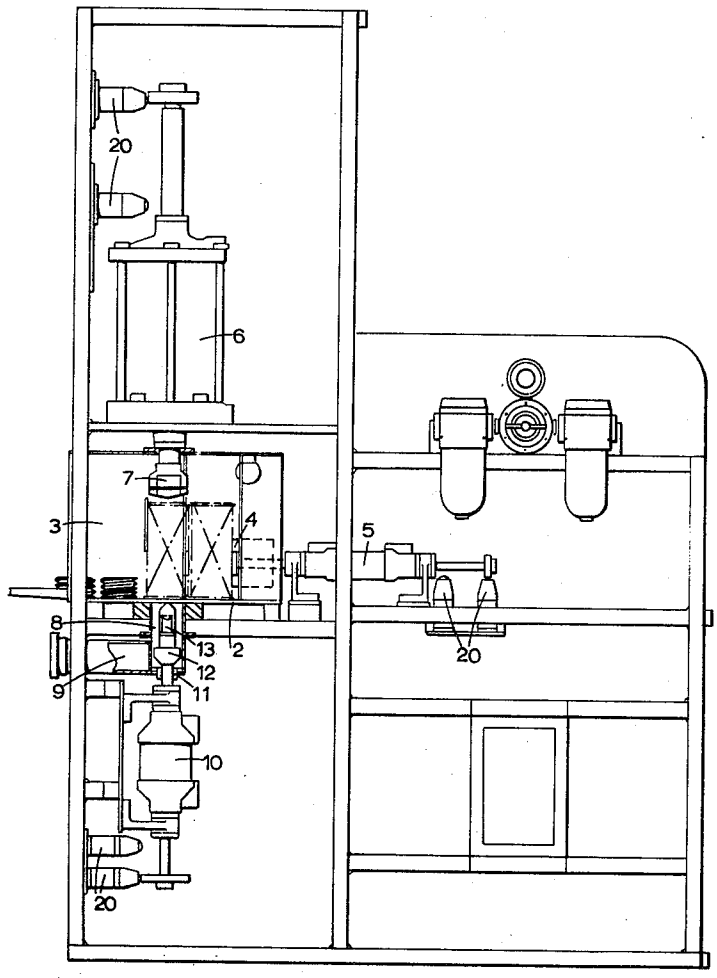
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Primary Examiner—Robert B. Reeves
Assistant Examiner—Larry H. Martin
Attorney, Agent, or Firm—Scrivener Parker Scrivener & Clarke

[57] **ABSTRACT**

A can crusher comprises piercing means operative to pierce the underside of a metal can so as to form an opening or openings in the underside of the can, and crushing means operative to crush the pierced can so as to cause or assist in causing the contents of the can to be expelled through the opening or openings. The piercing means includes a piercing tool which is formed with an overhanging portion, preferably in the form of a barb, such that when the tool pierces the underside of the can to form an opening in it, that portion enters the can, and when the tool is subsequently withdrawn through the opening the overhanging portion pulls downwards the adjacent part of the can bordering the opening. The tool may be of symmetrical form with a tapering head, a shank of constant width, and a stock provided with a threaded stud by means of which the tool is mounted in the crusher.

3 Claims, 8 Drawing Figures



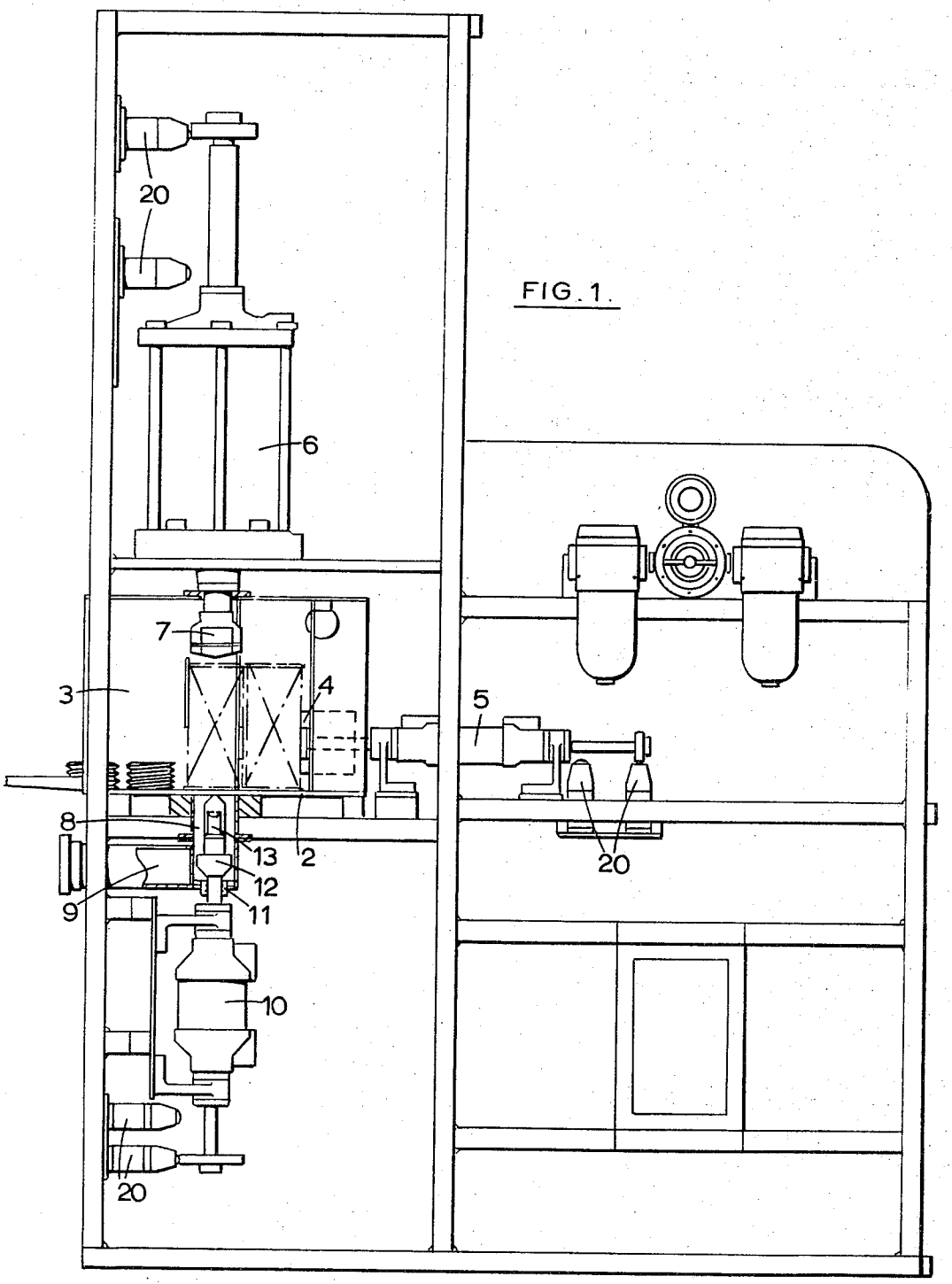


FIG. 1.

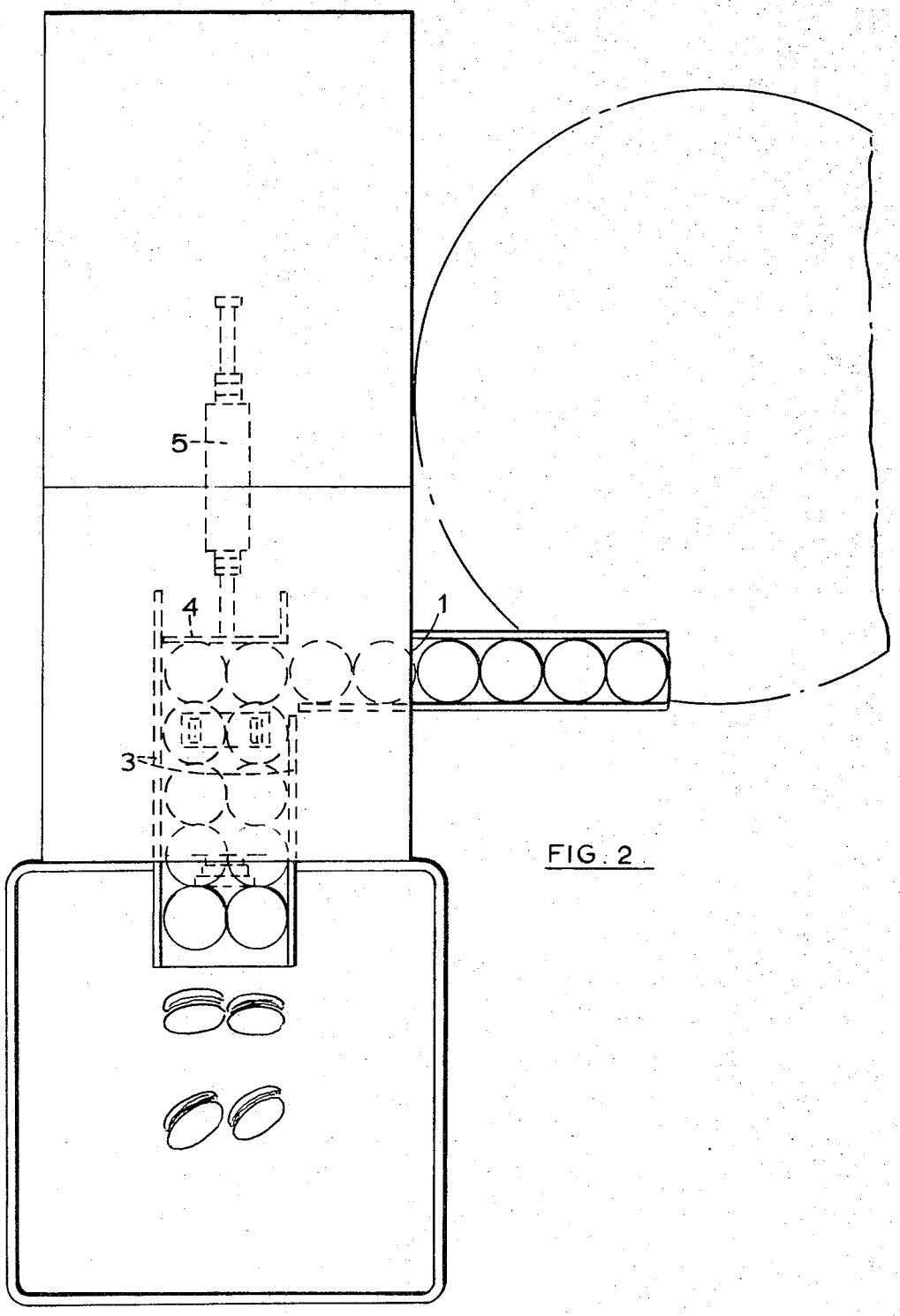


FIG. 2

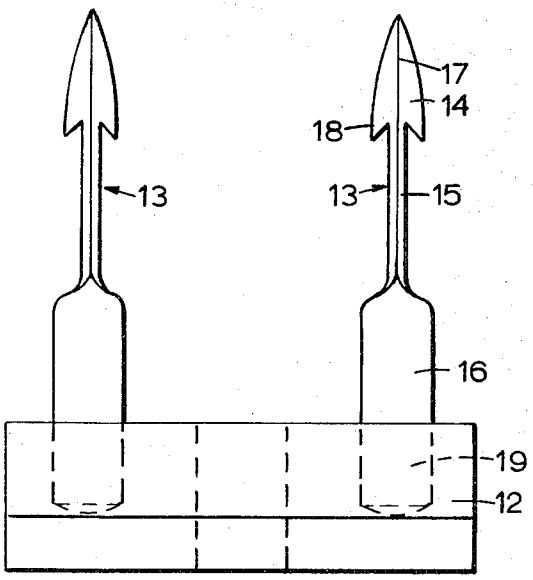


FIG. 3.

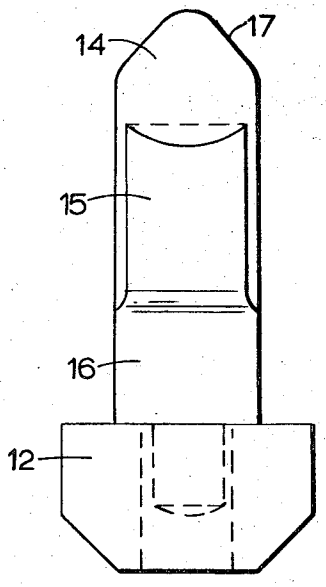


FIG. 4.

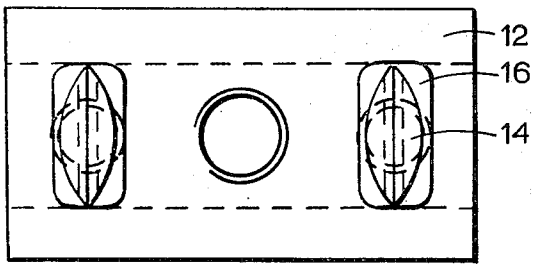


FIG. 5.

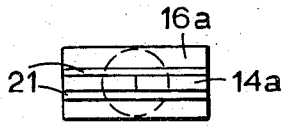


FIG. 8.

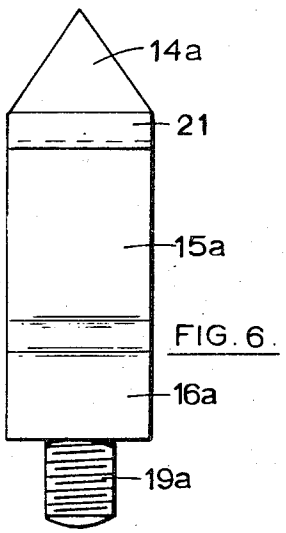


FIG. 6.

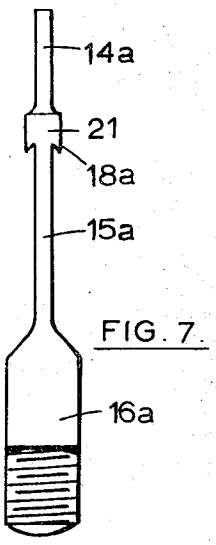


FIG. 7.

CAN CRUSHERS

This invention is concerned with improvements in and relating to can crushers of the kind (hereinafter referred to as the kind specified) comprising piercing means operative to pierce the underside of a metal can so as to form an opening or openings in the underside of the can, and crushing means operative to crush the pierced can so as to cause or assist in causing the contents of the can to be expelled through the opening or openings.

Can crushers of the kind specified have been developed for a number of applications. For example where cans are being filled with liquid and then sealed by means of automatic machinery which operates at high speed, if a fault develops such that the cans are imperfect or the liquid in the cans is other than required it may well happen that a relatively large number of cans are wrongly filled with liquid before the machinery is brought to a halt or the fault is corrected. A can crusher can then be used to remove the liquid, or most of it, from the cans and to reduce the bulk of the cans very considerably so that they can easily be taken way for scrap. In another application liquids, such as concentrated fruit juices, are supplied to a manufacturer in cans of relatively large volume, and a can crusher is used to empty the liquids from the cans and at the same time to enable the volume of the scrapped, empty cans to be as small as possible.

Clearly it is desirable to remove as much of the contents of the cans as possible when they are crushed, particularly if the contents are valuable and are to be withdrawn from the crusher and used elsewhere. The aim of the present invention is to provide means enabling a greater porportion of the contents to be removed from the crushed cans than has been usual hitherto.

The present invention consists in a can crusher of the kind specified in which piercing means comprising at least one can piercing tool formed with at least one overhanging portion such that when the tool pierces the underside of a can to form an opening in it, that portion or each of those portions enters the can, and when the tool is subsequently withdrawn through the opening the overhanging portion or each of the overhanging portions pulls downwards the adjacent part of the can bordering the opening.

The invention also consists in a piercing tool for use in a can crusher in accordance with the last preceding paragraph.

Preferably the piercing tool is of tapered shape and has at least one overhanging portion shaped like a barb.

When a piercing tool in accordance with the invention is in use it it pushed upwards into the underside of the can, pierces an opening in the can and continues to move upwards until the overhanging portion or each of such portions is inside the can. The metal bordering the opening is pushed aside by the overhanging portion or portions and although that metal is in general permanently deformed, it retains some resilience so that when the overhanging portion or each of such portions has passed it and entered the interior of the can the metal tends to return some way towards its original position and in so doing moves to a position beneath the overhanging portion or portions of the piercing tool. When the tool is then moved downwards to withdraw it from

the can the overhanging portion or each of the overhanging portions engages part of the metal bordering the opening and pulls it downwards until the tool is freed from the can. This tends to cause the metal bordering the opening to be directed downwards, below the original level of the underside of the can, so that it assumes a funnel-like shape which enables the contents of the can to drain from the can. Hitherto it has been the general practice to use a piercing tool of tapered form which merely pushes the metal bordering the opening upwards and aside, so that the opening has usually been above the original level of the underside of the can.

A can crusher and two forms of piercing tool suitable for use therewith and embodying the invention will now be described, by way of example only, with reference to and as shown in the accompanying drawings, in which:

FIG. **1** is a side view of the can crusher with its side covers removed and suitable parts sectioned to enable the interior of the machine to be seen more clearly;

FIG. **2** is a plan view of the machine with selected internal details shown in dotted lines;

FIGS. **3, 4** and **5** are respectively a side elevation, an end view and a plan view of a mounting block carrying a pair of one kind of piercing tool; and

FIGS. **6, 7** and **8** are respectively a side elevation, an end view and a plan view of a second kind of piercing tool.

The can crusher is intended for use in crushing and emptying metal cans of the usual cylindrical shape. The cans are fed in a continuous line to an opening **1** at one side of the machine. Inside the opening **1** is a feed table **2** provided with a pair of parallel vertical guide plates **3** spaced apart just far enough to allow two cans to pass along the table side-by-side. The cans in two rows are moved along the feed tabel **2** in a direction at right angles to the direction in which they are fed through the opening **1** to the table. This movement is effected by means of a reciprocable feed plate **4,** at one end of the table, operated by a pneumatic piston-and-cylinder unit **5.**

Forward movement of the feed plate **4** pushes the leading pair of cans on the feed table **2** to the crushing station. A pneumatic piston-and-cylinder unit **6** above the crushing station then causes a crushing head **7** to be lowered onto the two cans. When the crushing head **7** comes into abutment with the cans the back pressure in the cylinder is sensed and the head is temporarily halted while the undersides of the cans are pierced.

Beneath each can, at the crushing station, there is a hole in the table which is considerably smaller than the base of the can and which is aligned with the middle of the base. A cylindrical duct **8** extends downwards beneath the holes and at its lower end has a lateral port leading to an outlet duct **9.** The piston rod of another piston-and-cylinder unit **10** projects upwards into the cylindrical duct **8** through an axial hole at the bottom of the duct; and a gland **11** prevents the escape of liquid from the duct around the piston rod. At its upper end the piston rod carries a block **12** on which two piercing tools **13** of the kind which is characteristic of the present invention are mounted, one below each can at the crushing station.

The block **12** and piercing tools **13** are shown in detail in FIGS. **3, 4** and **5.** Each piercing tool is formed as a unitary component from stainless steel and has three

portions, a head **14**, a shank **15** and a stock **16.** As seen in FIG. **4** the stock **16** and the shank **15,** which are the same width, are of substantially square shape, while the head **14** tapers upwards in the shape of an isosceles right-angle triangle with rounded corners. The stock **16** is relatively thick, and is rounded at the vertical side edges, whereas the shank **15** is relatively thin and feather-edges. Where the stock and the shank join each other the tool is tapered and curved so that one part merges or blends into the other.

The head **14** of the tool is rather thicker than the shank **15** to which it is integrally joined though considerably less thick than the stock **16.** Each of the upper, inclined sides of the head is tapered to an edge **17** which assists entry of the head into a can. The edge **17** of the head is continuous with the feather-edges of the shank **15** on both sides of the shank. Where the head **14** joins the shank **15** the head is undercut so that viewed from its edge the head appears barbed on both sides as seen at **18** in FIG. **3.** Each piercing tool is provided with a threaded stud **19** projecting from the base of its stock **16.** The studs **19** are screwed into complementary threaded holes in the block **12** to fix the tools in position on the block.

When the machine is in operation cans are fed in pairs to the crushing station and the crushing head **7** part lowered to hold the cans in position as described above. The lower, vertical pneumatic piston-and-cylinder unit **10** is then operated to raise the piercing tools **13.** The heads **14** of the tools pierce the underside of each can so as to bend upwards and outwards the metal from which the underside of each can is formed. The deformed metal resiliently bends inwards when the head has risen above it, and is subsequently caught by the barbs **18** of the head as the head descends. Finally the metal is pulled downwards below the original level of the underside of the can.

Immediately the tools have been withdrawn from the cans into the cylindrical duct **8** below the table **2** the crushing head **7** is forced further downwards crushing the cans and assisting in the expulsion of the liquid from them.

The crushing head is raised again to its uppermost position and the feed plate **4** is retracted to allow two more cans to pass through the opening onto the feed table **2.** Finally, when the next cycle starts, with the feed plate **4** moving forwards to push two more cans to the crushing station, the cans moving to the crushing station push two previously crushed cans off the edge of the table into an appropriate scrap container.

Each piston-and-cylinder unit is arranged to operate pneumatic sensing switches **20** when the piston reaches its limit of travel in either direction. The switches can be so interconnected that the completion of each step initiates the next subsequent step and the can crusher operates continuously until switched off by the operator.

Alternative forms of piercing tool embodying the invention may be used. One such form of piercing tool is illustrated in FIGS. **6, 7** and **8.** Like the above described piercing tool the illustrated alternative is formed as a unitary component from stainless steel and has three portions, a head **14*a***, a shank **15*a*** and a stock **16*a***. The stock and shank which are of the same width are of substantially square shape, while the head **14*a*** is in the shape of an equilateral triangle the side dimension of which is equal to the width of the stock and shank. The head and shank are of equal thickness but the stock is thicker. Where the head **14*a*** and the shank **15*a*** meet the tool is provided on both sides with a transverse rib **21** the lower face of which is undercut in the form of a barb **18*a***. The tool is also provided with a threaded stud **19*a*** projecting from the base of the stock **16*a***.

The type of piercing tool shown in FIGS. **6, 7** and **8** is particularly suitable for use with small cans and can readily be produced by machining operations. The type of piercing tool shown in FIGS. **3, 4** and **5** is suitable for use with large cans but since it has a number of curved surfaces and edges a considerable amount of grinding is required in order to form it.

The can crusher has been described as being pneumatically operated but hydraulic operation may be used. The sensing switching **20** may be of any suitable form, pneumatic, hydraulic or electric. The machine described is arranged to crush pairs of cans simultaneously but other arrangements may be used in which other numbers of cans are crushed at one time and in particular where large cans are to be crushed the machine may be arranged to crush only one can at a time. Many other modifications may be made to the machine while remaining within the scope of the invention.

I claim:

1. A can crusher comprising a piercing tool provided with at least one overhanging portion, piercing means operative to cause said tool to pierce a can and to insert said tool into the can through the opening thus formed in the can to an extent such that said overhand enters the can, withdrawal means operative to cause said tool to be withdrawn from the can through said opening whereby said overhanging portion pulls outwards the adjacent said opening, crushing means operative to crush said can and means operative to effect operation of said crushing means so that at least the final stages of crushing occur after the withdrawal of said tool.

2. A can crusher according to claim **1** in which said crushing means comprises a movable crushing head which is operative to locate the can while said tool pierces the can, and is also operative to crush the can after it has been pierced.

3. A can crusher according to claim **1** in which said at least one overhanging portion comprises two parallel overhanging portions which are long in comparison with the distance between them and which are disposed on opposite sides of said tool, whereby said opening is shaped substantially as a slot, and said overhanging portions are operative to pull outwards the parts of the can bordering the longer sides of that slot when said tool is withdrawn from the can.

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