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SCORING DEVICE FOR LIDS OF CANS AND THE LIKE

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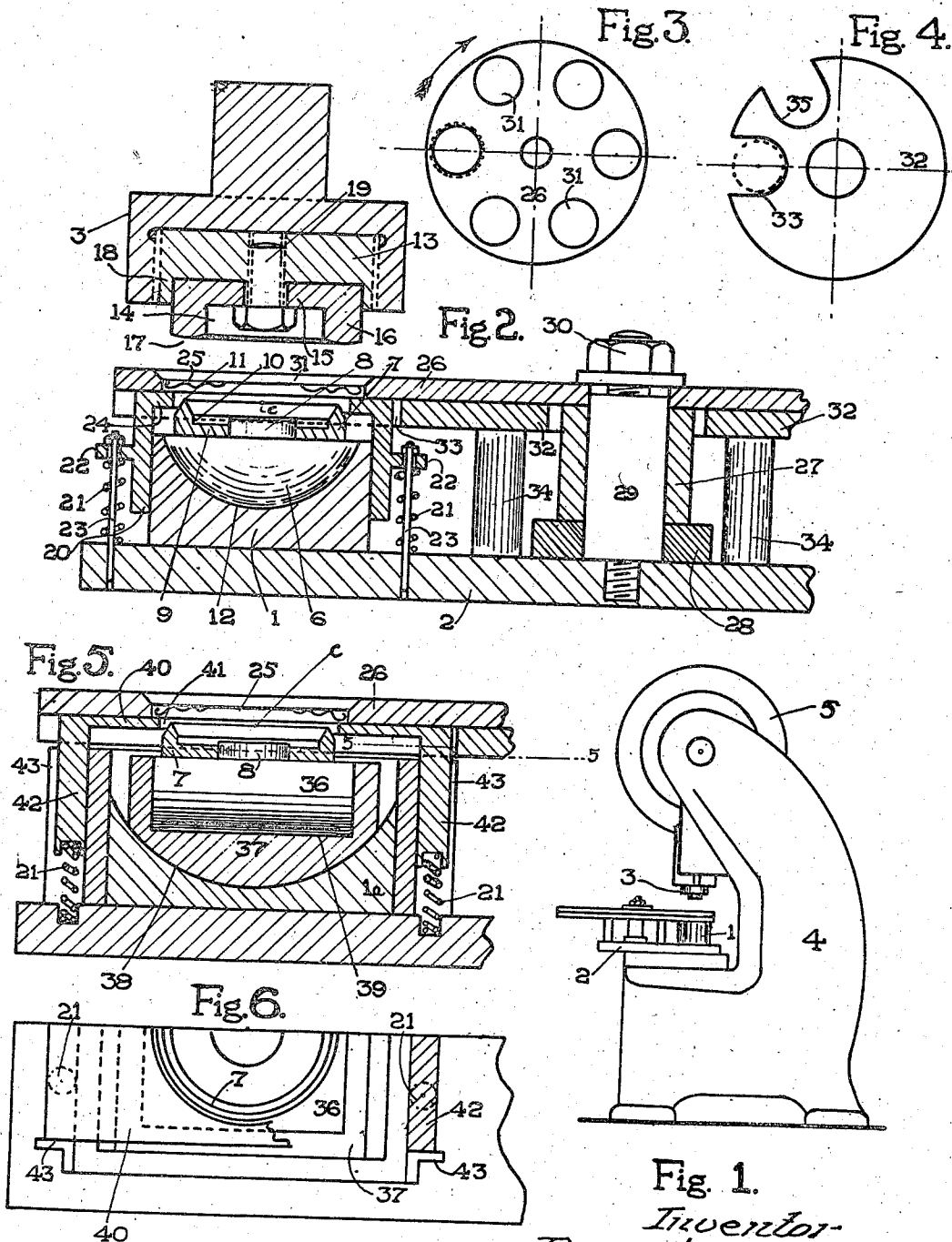


Fig. 1.

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SCORING DEVICE FOR LIDS OF CANS AND THE LIKE

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This invention relates to scoring devices, more particularly intended for scoring the metal lids or end closures for cans or like containers, to provide therein a weakening groove or grooves along which the lid or end closure is sheared for the purpose of opening the can to which such lid or end closure has been applied.

The invention is, however, applicable to scoring devices, for scoring sheet metal or other sheet material or blanks or like articles made therefrom, in general.

The invention has reference to scoring devices of the kind wherein the material to be scored is pressed between a scoring knife and a pressing or counter-pressure element which close together in like manner to a punch and die to form the score or weakening groove or grooves in said material.

Usually, the sheet material employed in industry and requiring to be scored, such as for example the thin sheets or plates known as tin plate, from which the lids or end closures for cans or like containers are made, has a thickness of the order of one or some hundredths of an inch and, when the score is made, the thickness of the material remaining between the bottom of the score and the underface of the material is of the order of some thousandths of an inch.

Accordingly, the scoring operation necessitates extreme accuracy in the scoring device and precise parallelism during the scoring operation, between the parts of the device which co-operate to form the score; otherwise a score which leaves a non-uniform thickness of material beneath it results, and this is undesirable.

A score which leaves such varying thickness of metal beneath it, beyond certain narrow limits, is particularly undesirable in the case of scored lids or end closures for cans, inasmuch as the lid or end closure then presents a varying resistance to shearing along the score in opening the can to which such lid or end closure has been applied, so creating difficulty in opening the can; while also the score may be so deep in a part or parts as unduly to weaken the lid or end closure, so that it fails to offer sufficient resistance to withstand the normal strains to which it is subjected and breaks away at the score, such undue weakening in a part or parts also rendering the lid or end closure liable to burst at the score when, as is sometimes the case, the closed can with its contents is subjected to processing operations or rough handling.

Non-parallelism between the parts of the tools which form the score may be due, inter alia, to

initial inaccurate setting of the tools in the press or to small displacement of one or other of the complementary tools, subsequent to a correct initial setting, or even, in some forms of presses, to slight malformation of the press itself, caused by stresses and strains arising in continued operation of the press.

According to the present invention, in a scoring device of the type set forth, having a non-rotary pressing or counter-pressure element to bear on and apply pressure or counter-pressure to an article, introduced between it and the scoring knife, to be scored, the scoring knife or the pressing or counter-pressure element, or each, is mounted so as to be capable of setting itself automatically to accommodate for any departure from parallelism between the knife edge and the co-operating part of the pressing or counter-pressure element when said element and the scoring knife are brought together to form the score.

Embodiments of the invention, intended for producing a circular score in lids or end closures for cans, are illustrated by the accompanying drawing.

In the drawing:

Figure 1 shows in side elevation, a press equipped with scoring means according to the invention.

Figure 2 shows, on a larger scale and in sectional elevation, the scoring means and means for feeding the blanks to be scored thereto and discharging the scored blanks therefrom.

Figure 3 shows, on a smaller scale and in top plan, a turntable forming the feeding means shown in Figure 2.

Figure 4 shows, on a similar scale and also in top plan, the fixed table forming the discharging means shown in Figure 2.

Figure 5 shows, in sectional elevation, a modified form of the mounting for the scoring knife, and

Figure 6 is a part sectional half-plan corresponding to Figure 5, with the feeding turntable and fixed table removed and the top of the spring-urged table shown broken away to show the under parts, the section being an irregular section taken on the line 5—5 on the right hand side of Figure 5.

In the embodiment illustrated by Figures 1 to 4, the numeral 1 indicates a fixed base block supported on a base plate 2, whilst 3 indicates a pressing head of a press, the pressing head being movable vertically in the frame 4 of the press towards and away from the base block 1, by a driving pulley 5, through any suitable mecha-

nism such as a crank, as will be appreciated by those skilled in the art without the necessity for illustration.

The base block 1 accommodates a support 6 for a scoring knife 7 which is removably mounted on the support.

The support 6 is in the form of a section of a sphere having a flat top and a central boss 8.

The scoring knife 7 consists of a centrally apertured disc or ring 9 with an upstanding rim 10 which is tapered to a knife edge 11 at the top.

The apertured disc 9 is engaged over the boss 8 and seats on the flat top of the support 6, the boss 8 centralising the knife 7. The base block 1 is formed with a cavity 12 of spherical curvature, corresponding to that of the knife support 6.

The knife support 6 is mounted in the cavity 12 of the base block 1 and, with the knife 7 mounted thereon, is capable of free universal movement in the base block 1.

The pressing head 3 carries a holder 13 for a pressing element 14.

The pressing element 14 comprises a centrally apertured disc 15, with a downwardly extended annular wall 16 formed with a convex bottom face 17 of somewhat flattened curvature, which constitutes the pressing face.

The pressing element 14 and the annular knife 7 have a common central vertical axis, and the pressing face 17 has its middle aligned with the knife edge 11.

The pressing element 14 is received in a circular cavity 18 of the holder 13 and is held therein by a bolt or screw 19.

The holder 13 is screwed into the pressing head 3, the screw-thread being of fine pitch so that micrometric axial adjustment of the pressing element 14, towards or away from the knife edge 11, can be effected.

The centre of curvature of the cavity 12 in the base block 1 is chosen so that it lies at the point C at which the central vertical axis common to the knife 7 and the pressing element 14 intersects the plane corresponding to the level of the knife edge 11. It may, however, lie in the close vicinity of the intersecting point C along the common central axis.

By adopting the point C as the centre of curvature, the minimum of diametrical movement of the knife edge 11, against the pressing face 17 of the pressing element 14, is obtained on self adjustment of the knife edge to parallelism which takes place when the scoring operation is performed, that is to say, the knife edge 11 moves in the lateral direction to a far smaller extent than would be the case if said centre of curvature lay at a higher or lower position along the common central vertical axis.

A sleeve 20 is mounted on the base block 1, so as to be capable of axial sliding movement thereon, and is urged upwards by springs 21 interposed between lugs 22 on the sleeve and the base plate 2, the springs surrounding headed guide posts 23 which pass freely through the lugs 22 and are secured in the base plate 2.

The sleeve 20 has an intumed lip 24 at its upper end to seat the lid 25 to be scored.

The sleeve 20 supports the lid 25, initially, in position above the knife 7.

As the pressing head 3 is lowered and the pressing element 14 is brought into contact with the lid 25, the sleeve 20 is moved downwards under pressure of the pressing element 14 against the action of the springs 21, and carries the lid 25 downwards on to the knife edge 11 whereupon,

under the continued pressure of the pressing element 14, the lid 25 is forced against the knife edge 11 to form the score.

When the pressing head 3 is raised, the sleeve 20 rises, under the pressure of the springs 21, so carrying the scored lid 25 upwards into the initial position above the knife edge to permit of its removal.

Lids to be scored are fed, one at a time, to the scoring device by an intermittently rotated turntable 26 which is secured on an upright sleeve 27 which turns about an upright post 29, so as to move over the top of the sleeve 20, it being held in position by a nut 30 screwed on to the top of the post 29, and bearing at its lower end on a ring 28.

The turntable 26 has a series of lid receiving openings 31, circularly spaced around its centre of rotation, and it is rotated intermittently or in steps, in the direction of the arrow (Figure 3), over a fixed table 32, which has a slot 33 located over and exposing the scoring knife 7. The fixed table 32 is supported on upright posts 34 on the base plate 2.

The arrangement is such that as the turntable 26 is rotated intermittently and the lids 25 are placed in the openings 31 therein, it carries each lid in turn over the opening 33 in the fixed table 32 and deposits it through said opening on to the lip 24 of the sleeve 20 to be acted on to form the score as previously described, the lids prior to reaching the opening 33 in the fixed table 32 and when passing beyond said opening resting on and sliding along the fixed table 32.

A second slot 35 (Figure 4) is formed at a suitable position in the fixed table 32 for the discharge of each lid in turn after it has been scored.

The turntable 26, in the embodiment illustrated, is turned intermittently by hand. Obviously, however, and as will be readily appreciated by those skilled in the art without any necessity for illustration, driving mechanism can be provided for the turntable 26, of any convenient kind which in operation can be timed to provide a pause in rotation of the turntable of sufficient duration to allow the scoring operation to be performed on one lid before the next is brought into position and deposited on the sleeve 20, the scored lid being raised by the sleeve 20 into its opening 31 in the turntable 26 so that it is carried on by the turntable 26 beyond the knife 7 for discharge through the slot 35 in the fixed table 32.

The possibility of axial adjustment of the holder 13 for the pressing element 14, facilitates very accurate setting of the device for a predetermined thickness of material to be left between the bottom of the score and the under-surface of that part of the lid in which the score is made.

In operation, should for any reason the knife edge 11 and the pressing face 17 of the pressing element 14 be moved out of parallelism, then as soon as the pressing face 17 bears on a lid 25 received on the knife edge 11 to be scored, the knife edge 11 will adjust itself automatically, by reason of the universal mounting, to restore parallelism during the pressing operation, so ensuring the exertion of an even or uniform pressure over the whole of the knife edge 11 with consequent uniformity in the thickness of material left below the bottom of the score.

In the modified form of construction illustrated by Figures 5 and 6, in which the same reference

numerals are used to indicate corresponding parts to those of the previous figures, the knife 7 is supported by a gimbal or cardan type of mounting. This mounting comprises two bodies 36 and 37, each in the form of a longitudinal section of a cylinder, the body 37 being received in a cavity 38 of corresponding curvature formed in the base block 1a and said body 37 having a transverse cavity 39 curved to correspond to the curvature of the other body 36, which is received in said transverse cavity 39 and is adapted to carry the knife 7.

The turning axes of these two bodies are thus disposed at right angles to each other and while the upper body 36, which carries the knife 7, can turn independently about its longitudinal axis, the lower body 37 in turning about its longitudinal turning axis, carries the upper body 36 with it and, under such conditions, the knife 7 is capable of a movement which approximates to or is substantially a universal movement.

With such a knife mounting, the minimum of diametrical movement of the knife edge against the pressing face 17 of the pressing element 14, on self-adjustment, is obtained when the intersection point of the two turning axes lies in the plane corresponding to the level of the knife edge and in the common central axis of the pressing element and the knife.

In the embodiment illustrated by Figures 5 and 6, a table comprising a table top 40 of substantially rectangular form having a central opening 41 and plane sides 42 bearing on springs 21 and guided between guides 43, replaces the spring-pressed sleeve 20 of Figure 2.

The invention is not restricted to the particular embodiments described, as these are merely illustrative and may be modified; while also the device can be employed for scoring metal or other sheets or articles besides lids or end closures for cans.

The pressing face 17 may have a contour other than convex as illustrated, for instance it may have a contour of concave form, or it may be flat.

The knife 7 and the pressing element 14 being readily removable, provide for renewal or exchange by others.

Before commencing the scoring operation with the device on a batch of lids, the knife 7 and the pressing face 17 of the pressing element 14 can be brought into direct contact with each other, to test or establish initial parallelism, and the element 7 can be set in the position it then assumes, for instance, by any known and convenient clamping device such as a screw or screws.

I claim:

1. In a scoring press, the combination of a scoring knife and an opposed non-rotating pressure element movable towards one another in the operation of the press to score an article introduced between them, supports for said scoring knife and said non-rotating pressure element which permit of their relative universal movement for ensuring parallelism between them in the scoring operation, a feeding device for feeding articles one at a time between said scoring knife and said pressure element, and an open-ended spring-urged element on to which said articles are deposited by said feeding device in position to be scored and by which the scored articles are released from the knife for discharge.

2. In a scoring press, the combination of a circular scoring knife and an opposed non-rotating pressure element having an annular pressing face

movable towards one another in the operation of the press to score an article introduced between them, a holder for fixedly holding said non-rotating pressure element in a pre-set position, a support for said knife, said knife support having a portion of spherical curvature, a holder for said knife support, said holder having a cavity of spherical curvature corresponding to that of said knife support to receive the spherically curved portion of said knife support, the centre of curvature being at the point where the central vertical axis common to said knife and said pressure element intersects the plane corresponding to the level of the knife edge, an apertured turntable for feeding articles one at a time between said scoring knife and said pressure element, a spring-urged open-ended sleeve having a lip on to which said articles are deposited by said turntable, and a fixed table having displaced notches therein to allow an article positioned on the lip of the sleeve to be pressed on to the knife by the pressure member to form the score therein and to allow the scored article to be released from said knife and discharged by said turntable, respectively.

3. In a scoring press, the combination of a scoring knife and an opposed non-rotating pressure element movable together in the operation of the press to score an article introduced between them, a holder for fixedly holding said non-rotating pressure element in a pre-set position, and a support for said knife, said knife support comprising two bodies each in the form of a longitudinal section of a cylinder, and a base block having a cavity of cylindrical curvature, one of said bodies being accommodated in said cavity and itself having a cavity, in transverse relation to the cavity in the base block and curved to correspond to the curvature of the other body which is received in said transverse cavity and carries said knife.

4. In a scoring press, the combination of a scoring knife and an opposed non-rotating pressure element movable together in the operation of the press to score an article introduced between them, a holder for fixedly holding said non-rotating pressure element in a pre-set position, and a support for said knife, said knife support comprising two bodies each in the form of a longitudinal section of a cylinder, and a base block having a cavity of cylindrical curvature, one of said bodies being accommodated in said cavity and itself having a cavity, in transverse relation to the cavity in the base block and curved to correspond to the curvature of the other body which is received in said transverse cavity and carries said knife, a spring-urged table with an opening therein over said knife, and a turn-table for depositing articles one at a time on to said table, to be scored by said knife and subsequently released by said table from the knife for discharge by said turntable.

5. A scoring press having the combination of elements claimed in claim 3, wherein the longitudinal axes of the cylindrical curvatures of the two cylindrically curved bodies intersect on the centre line of the press.

6. A scoring press having the combination of elements claimed in claim 3, wherein the longitudinal axes of the cylindrical curvatures of the two cylindrically curved bodies intersect in the plane of the knife edge on the centre line of the press.

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