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PATENTS ACT 1952

599836

APPLICATION FOR A STANDARD PATENT

I\We,

FAEL S.A.

of 17, RUE DE LA MUSINIERE
CH-2072 ST-BLAISE
SWITZERLAND

hereby apply for the grant of a standard patent for an invention entitled:

A METHOD AND APPARATUS FOR PRODUCING CAN BODIES OF A NON-CIRCULAR CROSS-SECTION

which is described in the accompanying complete specification

Details of basic application(s):

Number of basic application	Name of Convention country in which basic application was filed	Date of basic application
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My/our address for service is care of GRIFFITH HACK & CO., Patent Attorneys, 601 St. Kilda Road, Melbourne 3004, Victoria, Australia.

DATED this 28th day of September 1988

FAEL S.A.

GRIFFITH HACK & CO.

TO: The Commissioner of Patents.

M003172 28/09/88

ACCEPTED AND AMENDMENTS 15-5-90.

CLEMENT HACK & CO. Australia Patent Declaration Form

Forms 7 and 8

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DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

No. 22893/88

Name(s) of Applicant(s)

In support of the application/made by FAEL S.A.

Title

for a patent for an invention entitled A METHOD AND APPARATUS FOR PRODUCING CAN BODIES OF A NON-CIRCULAR CROSS-SECTION

Name(s) and address(es) of person(s) making declaration

I/We, Peter Schreiber and Philippe Roueche
c/o 17 rue de la Musiniere, CH-2072 Saint-Blaise
Switzerland

do solemnly and sincerely declare as follows:-

1. I am/we are the applicant(s) for the patent, or am/are authorised by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in Switzerland on 22nd October 1987
by Fael S.A.
in _____ on _____ 19____
by _____

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention is/are Hans Rolli, Chemin des Chenes 15, CH-2072 St-Blaise Switzerland and
Jakob Muller, Les Esserts, CH-2072 Enges, Switzerland

See reverse side of this form for guidance in completing this part

5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-
The said applicant is the assignee of the actual inventors

DECLARED at Saint-Blaise this 11th day of October 1988

MELBOURNE S/O

7 NOV 88 9:0

This form may be completed and filed after the filing of a patent application but the form must not be signed until after it has been completely filled in as indicated by the marginal notes. The place and date of signing must be filled in. Company stamps or

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(71) Applicant(s)
FAEL S.A.

(72) Inventor(s)
HANS ROLLI; JAKOB MULLER

(74) Attorney or Agent
GRIFFITH HACK & CO. MELBOURNE

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AU 13583/70 73.4
AU 200154 6516/55 73.8
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(57) Claim

1. A method of producing can bodies of a non-circular cross-section from planar blanks of which the oppositely located edges of each blank will be interconnected in a longitudinal seam, said blanks having an outer contour corresponding to the can bodies to be produced being deformed in a deforming station by means of bending tools for respectively producing a plurality of can body sidewalls such that the edges to be interconnected are positioned opposite of each other, comprising the steps of moving the blanks stepwise by means of a conveying apparatus through said deforming station in which at least one respective bend of the blank is produced by a respective one of a set of a plurality of bending tools being arranged one after the other in the direction of movement of the conveying apparatus and working simultaneously stepwise during each stop interval of the conveying apparatus such that a plurality of sidewalls is consecutively produced on the same blank, and then conveying

.../2

the deformed blanks by said conveying apparatus to a working station located after the deforming station for interconnecting the edges of each deformed blank by producing a longitudinal seam.

6 7. An apparatus for producing can bodies of a non-circular cross-section, specifically for practicing the method set forth in claim 1, comprising a deforming station including a plurality of bending tools operative for a step-wise deforming of blanks conveyed in succession through said deforming station for the production of can bodies having a non-circular cross-section; comprising further a conveying apparatus operative for conveying the can bodies through said deforming station and along a conveying path, and a working station for producing a longitudinal seam, and adjoining the end of said conveying route and including at the zone thereof a calibrating apparatus for can bodies of a non-circular cross-section.

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Form 10

COMPLETE SPECIFICATION

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TO BE COMPLETED BY APPLICANT

Name of Applicant: FAEL S.A.

Address of Applicant: 17, RUE DE LA MUSINIERE
CH-2072 ST-BLAISE
SWITZERLAND

Actual Inventor:

Address for Service: GRIFFITH HACK & CO.,
601 St. Kilda Road,
Melbourne, Victoria 3004,
Australia.

Complete Specification for the invention entitled:
A METHOD AND APPARATUS FOR PRODUCING CAN BODIES OF A NON-CIRCULAR CROSS-SECTION

The following statement is a full description of this invention including the best method of performing it known to me:-

A METHOD AND APPARATUS FOR PRODUCING CAN BODIES OF A NON-CIRCULAR CROSS-SECTION

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to a method of producing can bodies of a non-circular cross-section from planar blanks of which the oppositely located edges of the blank will be interconnected in a longitudinal seam. The invention relates further to an apparatus for practicing said method.

2. DESCRIPTION OF THE PRIOR ART

Resistance roll-welding machines for the production of can bodies from planar blanks which include in addition to the welding device a bending apparatus for deforming the blanks and allow a production of a high number of can bodies per minute are generally known; these known machines are, however, suitable only for the production of cylindrical can bodies. Cans of non-circular cross-section, specifically such of a rectangular cross-section for receipt of foodstuff which are available on the market in high numbers have until now been produced predominantly by means of a soldering procedure during which the can bodies which have been shaped from planar blanks are conveyed through a soldering bath. The soldering material consists, however, to the largest

part of lead and should therefore not come into contact with foodstuff, such that due to the presently increased attention given to the environment to be less burdened by noxious material there is the desire to substitute a different production method for the soldering method practiced for the production of cans. Cans are for instance generally known which have been produced by a soldering method and which have a rectangular cross-section and which taper towards their top and which due to this shape have the consumer recognizing that a specific content, such as a specifically prepared beef, is contained therein. This can having the function of a trade-mark shall quite obviously be maintained but at the same token it is desired to do away with the soldering method which until now has not been possible. Such cans are in many instances provided further with a tear-open strip extending therearound and defined by pre-scored scoring lines and including a tear-open flap located at one end such to allow an easy opening of the can without having to use a specific tool. This tear-open flap projects from one edge of the planar blank from which the can is produced, and due to this tear-open flap the production of such a can is made difficult still more if it cannot be produced by aid of the known soldering method.

In order to produce cans of a rectangular cross-section a compromise has already been made in that initially cylindrical cans were produced by the known resistance seam-welding method and thereafter deformed to a non-circular cross-section. If it is desired, however, to produce in addition to such rectangular shape a can which tapers towards one end by such method it is not possible to do such without a severe straining of the sheet metal due to the stretching or expanding of the sheet metal at the end having the larger cross-section. It is possible that the material ruptures and during the

expanding of such a can body considerable stresses are generated therein which can lead to a bursting of the pre-scored lines. Such a production method is hardly advantageous and apart from such method there is quite a large necessity of machinery and correspondingly high investment costs therefore.

The blanks used for producing cylindrical can bodies are exactly rectangular whereas the blanks needed for a tapering can body must have a development of a truncated cone in which two opposite edges extend curvilinearly. The shape of the blank for a can body having a rectangular cross-section and rounded corners and in which additionally the size or magnitude of the cross-section changes continuously along the length of the can, i.e. in which a taper is present, is similar to above described development of the jacket of a truncated cone, but including rectilinearly extending partial sections at both outer edges. Such a blank leads after its deforming to a can body without any inner tensions and it is possible to conclude from the difference between the shapes of the blanks without any further ado that a can body which initially has been produced cylindrically can thereafter be forced only by a large expenditure of force into a rectangular and additionally tapering shape.

SUMMARY OF THE INVENTION

The present invention provides a method of producing can bodies of a non-circular cross-section from planar blanks of which the oppositely located edges of each blank will be interconnected in a longitudinal seam, said blanks having an outer contour corresponding to the can bodies to be produced being deformed in a deforming station by means of bending tools for respectively producing a plurality of can body sidewalls such that the edges to be interconnected are positioned opposite of each other, comprising the steps of moving the blanks stepwise by means

of a conveying apparatus through said deforming station in which at least one respective bend of the blank is produced by a respective one of a set of a plurality of bending tools being arranged one after the other in the direction of movement of the conveying apparatus and working simultaneously stepwise during each stop interval of the conveying apparatus such that a plurality of sidewalls is consecutively produced on the same blank, and then conveying the deformed blanks by said conveying apparatus to a working station located after the deforming station for interconnecting the edges of each deformed blank by producing a longitudinal seam.

The invention also provides apparatus for carrying out the above method comprising a deforming station including a plurality of bending tools operative for a step-wise deforming of blanks conveyed in succession through said deforming station for the production of can bodies having a non-circular cross-section; comprising further a conveying apparatus operative for conveying the can bodies through said deforming station and along a conveying path, and a working station for producing a longitudinal seam, and adjoining the end of said conveying route and including at the zone thereof a calibrating apparatus for can bodies of a non-circular cross-section.

~~thereof a calibration apparatus for can bodies of a non-circular cross-section~~.

The advantages of the new method and apparatus are that specifically shaped can bodies and such including a tear-open strip can be produced from planar blanks of a magazine can be produced by machine and in high numbers per unit of time.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

Fig. 1 is a front view of the apparatus for deforming the blanks and producing of the can bodies by welding;

Fig. 2 is a side-view of the apparatus of Fig.1 in the direction according to the arrow A of Fig. 1;

Fig. 3 is a side-view of the most important parts of the apparatus of Fig. 1 in the direction of the arrow B of Fig. 1;

Fig. 4 illustrates on an enlarged scale a section of a part of the blank deforming station included in a press;

Fig. 5 illustrates on an enlarged scale the blank for the production of can bodies having a rectangular cross-section;

Figs. 6a, b and c illustrate the principle of the step-wise deforming of the blanks on a schematic view of the apparatus, in Figs. 6a and b in a side view and in Fig. 6c in a top view;

Fig. 7 a cut-out of the apparatus of Fig. 1 on an enlarged scale and including a front view of the members for conveying and welding of the can bodies;

Fig. 8 is a top view of the most important parts of the members of the apparatus illustrated in Fig. 1, below the line 7-7 thereof;

Fig. 9 is a side view in direction of the arrow C of Fig. 7 of the most important members below the line 7-7 of Fig. 7;

Fig. 10 illustrates the guide rail including an abutment stop, schematically and on an enlarged scale.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus of which various views are illustrated in Figs. 1 to 3 is an apparatus for the production of can bodies from planar blanks by application of an electrical resistance welding by aid of welding electrode rollers, which apparatus is also termed resistance roll-welding machine and includes at the machine frame 1 in Fig. 1 at the left side a magazine 2 for receipt of a stack of planar blanks 3. The blanks 3 of which one is illustrated in Fig. 5 on an enlarged scale are individually removed from the stack in the magazine 2 and arrive at the intermediate table 4 of the deforming station 5 which operates such as a press. This station 5 is also designed on the basis of a press and includes a lower press table 7 which in accordance with Fig. 3 is guided along guide columns and is movable upwards and downwards. An upper pressing table 8 is located oppositely thereof. A blank 3 drawn from the stack in the magazine 2 is firstly provided in the pressing or deforming station by means of a not illustrated pressing or stamping tool with flat corrugations 9 illustrated in Fig. 5 and lo-

cated in the areas of the blank which will form later the larger side walls of the can body of a rectangular cross-section. These flat corrugations or impressments 9 lead to a stiffening of the side walls of the can body. The principle of the production of such corrugations is generally known and, therefore, not illustrated.

The blank 3 which is drawn in Fig. 5 on an enlarged scale includes at its two opposite ends two edges 10 and 11 which are to be welded together. The blank includes, furthermore, a tear-open strip 13 defined by prescored lines 12 which tear-open strip 13 ends in a tear-open flap 14 projecting over the edge 10 and extending over the entire length of the blank.

Following the producing of the corrugations 9 in the blank 3, the four rounded corners of the can body of rectangular cross-section are made in the deforming station. A bending tool 20 used for this task is illustrated in Fig. 4, which Figure discloses the arrangement inside the deforming station 5. The principle of the bending procedure is shown in Figs. 6a, b and c. First of all, the areas of the blank which adjoin the two edges 10 and 11 of the blank which are to be welded together are bent in a measure corresponding respectively to half a sidewall of the can body upwards from the blank by 90°. The welding seam will be located later at the center of this sidewall of the can body having a rectangular cross-section.

According to the illustration of Fig. 6 these bending steps have already been terminated, they follow, however, the same principles according to the illustration of Fig. 6. A separate bending tool 20 is provided for every bending step and the blank is conveyed further from one to the next bending tool in a timed step-wise fashion. According to the illustration of Fig. 6, three bends formed on the basis on this principle have already been made, i.e. the two areas of the blank adjoining the edges 10 and 11 to be welded together are bent upwards,

and, furthermore, one of the broader side surfaces of the can body is bent upwards. Each bending tool 20 includes a shaping member 21 as a counter tool which is held stationary inside of the can body to be produced, which shaping member 21 possesses a curvilinear outer surface 22 having a radius of curvature which in correspondance with the elasticity and thickness of the sheet metal is smaller than the radius of curvature of the rounded corner of the can body to be produced. A shaping member section 21a adjoins the curvilinear surface 22. The shaping member 21 is held stationary above the blank 3. The bending tool 20 includes further a pressing tool 23, 24 operative to press against from the outer side. It includes a supporting body 23 for a roller 24 supported in this supporting body, further a guide 25 for the supporting body 23 on which the supporting body is guided for a longitudinal shifting movement, and a pressure spring 26 by means of which the roller 24 is pressed onto the blank if the guide 25 which is pivotable around an axis 27 extending parallel to the bending edge formed by the curvilinear surface 22 is moved according to Fig. 6a upwards and along the curvilinear surface 22 of the shaping member 21 by means of a pivotably supported lifting rod 28 such to bend the blank 3 around. The condition arrived at thereby is illustrated in Fig. 6b. In order to allow for the elasticity of the material and the large radius of the bend this bending must be made along an arc of more than 90° such to obtain thereafter a finally remaining bend of 90°. This bending beyond 90° is disclosed in Fig. 6, which Figure discloses further that thereby the already previously bent and oppositely located broad sidewall of the can body which at the beginning of the fourth bending step still stand upwards in a perpendicular state, which is illustrated in Fig. 6b by broken lines impeds this bending procedure beyond 90° and must, therefore, be temporarily pressed out of the way. To this end only the

bending tool 20 illustrated in Fig. 6 and operative to produce the forth bend includes additionally a double arm lever 20 which is pivotable around an axis 31 extending parallel to the bending edge 22 whereby the pivot plane is located in front of the shaping member 21. One lever arm 32 of the double arm lever 30 is pivoted upwards by the supporting body 23 for the roller 24 during the upwards movement of the supporting body 23 and due to this movement the other lever arm 33 of the double arm lever 30 which is offset towards the inside of the can body being produced is also pivoted and presses therefore the sidewall of the can body being produced temporarily outwards. The offset state of the double arm lever is illustrated in Fig. 6c. Such as already mentioned this double arm lever 30 is not provided in the other bending tools which have otherwise the same design and are operative to produce the previously made bends.

According to the illustration of Fig. 4 the blank is held tightly on the intermediate table 4 during the producing of the bend by means of an arresting device 34 and cooperating spring 35. Below the intermediate table 4 is located a conveying apparatus formed by a ledge 40 which is reciprocatably movable in the advancing direction and includes pawls 41 mounted pivotably and at mutual distance thereon. The principle of conveying or feeding by pawls is generally known. The pawls 41 pivot completely into the ledge 40 when the ledge returns under a can body and are moved upwards by action of spring 42 such to come into abutment at the rear edge of a can body formed from the blank. A part of this feeding ledge 40 with pawls 41 and springs 42 is illustrated in Fig. 7 and can be seen clearly in this Figure. The feeding ledge 40 shown in Fig. 7 partly broken away extends from the beginning of the deforming station 5 completely therethrough and beyond same as will be explained later more

in detail. The bending tools 20 are arranged one after the other relative to the direction of feed of this feeding ledge, the blank 3 is fed by the feeding ledge 40 and pawl 41 in timed steps from one to the next bending station 20 and one bend is thereby produced by each bending tool 20, and specifically at all consecutive blanks 3 at the same instance in that the lifting rods 28 at all bending tools 20 are moved upwards by the movable table 7 of the press.

Such as illustrated in Fig. 1 a conveying path 45 for the can bodies formed from the blanks 3 follows the deforming station 5 which conveying path extends up to shortly ahead of the welding station 46 located at the end thereof, in which station the two welding electrode rollers 47 and 48 for the producing of the welding seam are located. The reciprocatably operated conveying apparatus 40, 41 including the ledge 40 with the pawls 41 extends through the entire deforming station 5 and along the conveying path 45 to which a crank drive 50 for the reciprocating movement of the ledge 40 and illustrated in Fig. 1 belongs, too. The crank 51 moves a carriage 53 mounted thereto via a connecting member 52 which carriage 53 is guided on two guide columns 54 mounted side by side. Two vertical supports 55 located at the front and the rear end of the carriage 53 of which one is illustrated in Fig. 7 broken away support the reciprocatingly moved ledge 40. A ledge 56 located at the forward support 55 and extending forward relative to the direction of feed includes at its opposite side surfaces one respective control can 57. A lever 59 supporting a roller 58 at one end thereof is pressed against each control cam which lever 59 is pivotable around an axis 60. A roller 61 is located at the upper end of the lever 59 by means of which the lever 59 presses from the side against a not yet welded can body 3. This occurs at both opposite sides of the can body 3 in order to press the two edges 10 and

11 of the can body formed from the blank 3 against the guide rail 62. The pressing against by the two levers 59 proceeds during the position of the conveying apparatus with the reciprocatably moved ledge 40 as shown in Figs. 7 and 8, which moves forwards during the following movement step in feeding direction, wherewith the pivotable levers 59 are pivoted by the control cams 57 away from the can body and simultaneously a next following can body 3 is fed into the final conveying position ahead of the welding electrode rollers 47 and 48.

The blank 3 of the embodiment illustrated in Figs. 7 and 8 comprises at the edge 10 to be welded a projecting tear-open flap 14 at the end of the tear-open strip 13 and the can body tapers towards its one end. In this case the further feeding of the can body 3 located according to Figs. 7 and 8 into the final feeding position ahead of the welding electrode rollers 47 and 48 occurs by independently driven further conveying means in form of a double tongue 70, 71 consisting of two mutually parallel and simultaneously operated tongues 70 and 71, which double tongue 70, 71 grips the edges 10 and 11 to be welded on top at the rear edge and leads it further in the direction of feed between the welding electrode rollers 47 and 48, such as illustrated in Fig. 9 in which Figure the two tongues 70 and 71 located side by side can be seen clearly. In order to open and close the two tongues 70 and 71 are operated by pressurized air to which end the pressurized air flows through a conduit 72 into an apparatus 73 for the generation of the operating stroke. The two tongues 70 and 71 are mounted on a tongue carriage 74 which is moved by a spring 75 in the direction of feed and is suitably guided for a reciprocating movement which is not illustrated in detail. The return movement of the tongue carriage 74 into the position illustrated in Fig. 7 proceeds by a separate, further carriage 76 which is coupled via a crank drive 77 to a se-

parate drive. Accordingly, the first conveying means comprising the ledge 40 and pawls 41, and the second conveying means comprising the double tongue 70, 71 are driven independently from each other and are exactly tuned relative to each other for their timed stepwise operation.

In order to weld the two edges 10 and 11 of the blank the Z-shaped guiding rail employed in the known resistance seam welding machines can not be used if a projecting tear-off flap 14 projects from the edge 10 of the blank. Therefore, the guide rail 62 used in this case and illustrated in Fig. 10 on an enlarged scale includes merely in a short guide rail section 63 at one end of the guide rail a groove 64 for receipt of the edge 10 of the blank 10, whereby the tear-open flap 10 projecting from this edge will come to lie ahead of the guide rail section 63. In order to have a further abutment for the edge of the blank for the exact positioning in the overlap position of the edges necessary for the welding together of the edges an abutment body 65 is arranged in the zone of the other end of the guide rail 62 and located at the end of a pivotably supported double armed lever 66. A roller 67 is located at the other end of this lever 66 which rides on the control cam 68 of a ledge 69. This ledge 69 is mounted to the tongue carriage 74 and moves forward together with same such that after a certain length of the path the pivotable lever 65 is pivoted such that the abutment 65 is moved away from the edge 10 of the blank such that the tear-open flap 14 can pass this location. The abutment body 65 must also be pivoted out of the way to allow the double tongue 70, 71 which tightly holds the can body 3 during this feeding movement for an inserting of the can body inbetween the welding electrode rollers move past the abutment body 65. The guide rail 62 includes an uninterrupted groove 62a for the other edge 11 of the blank.

A calibrating apparatus in form of four rollers 80 to 83 which rest against the four rounded corners of the can body having a rectangular cross-section is located in the area of the two welding electrode rollers 47 and 48. If the can body as in the present case includes a cross-section which changes its size continuously along the longitudinal extent of the can, i.e. tapers towards the one end, the can body is conveyed with its smaller cross-section at the leading end such that the calibrating rollers 80 - 83 must yield sideways because the cross-section of the can body is larger at the trailing end. Accordingly, the two rollers 80 and 81 are located at the end of pivotally supported levers 84 and 85, which are movable in a horizontal plane. The two rollers 82 and 83 are respectively acted upon by a pressure spring 86 which is supported against the roller and against a supporting device 87. The rollers 80 - 83 have a concave outer profile having a radius of curvature which corresponds to the radius of curvature of the rounded corners of the can body 3.

By means of the above described apparatus it is possible to produce can bodies with a rectangular cross-section and rounded corners at which at the same time the magnitude of the cross-section changes continuously along the length of the can body, i.e. when a taper is present. If such is not the case, one can for instance delete the abutment 65 at the guide rail 62 which can be swung out of the way and make use of a different guide rail which allows a guiding and conveying of the can body in such a way that the tear-open flap 14 is located thereby at the front zone of the can body relative to its direction of feed such that a groove can be provided behind this tear-open flap which is long enough for the edge. By means of small modifications of the above described apparatus it thus is possible to produce various kinds of can bodies by an electric resistance welding.

By means of an alternate embodiment of the welding apparatus it would be possible to produce a longitudinal seam also by a laser welding technique. Furthermore, the longitudinal seam may also be produced by a bonding process including a bonding agent.

While there are shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of producing can bodies of a non-circular cross-section from planar blanks of which the oppositely located edges of each blank will be interconnected in a longitudinal seam, said blanks having an outer contour corresponding to the can bodies to be produced being deformed in a deforming station by means of bending tools for respectively producing a plurality of can body sidewalls such that the edges to be interconnected are positioned opposite of each other, comprising the steps of moving the blanks stepwise by means of a conveying apparatus through said deforming station in which at least one respective bend of the blank is produced by a respective one of a set of a plurality of bending tools being arranged one after the other in the direction of movement of the conveying apparatus and working simultaneously stepwise during each stop interval of the conveying apparatus such that a plurality of sidewalls is consecutively produced on the same blank, and then conveying the deformed blanks by said conveying apparatus to a working station located after the deforming station for interconnecting the edges of each deformed blank by producing a longitudinal seam.

2. The method of claim 1, wherein blanks removed individually from a stack of superimposed blanks are provided by means of drawing tools prior to or between the individual deforming steps for producing a non-circular can body in at least one area intended to form one sidewall of the can body, preferably in areas to be located oppositely of each other, with a flat corrugation for a stiffening of the sidewall.

3. The method of claim 1, in which in order to

produce a can body having a rectangular cross-section and rounded edges initially the areas of a planar blank adjacent of the two edges of the blank which are to be interconnected are bent inwards and upwards by about 90° in said deforming station, which areas have a measure each corresponding to one half of a sidewall of the can body of the rectangular cross-section to be produced, said bending proceeding by means of a stationary held counter tool located at the inside and a moving pressing tool pressed thereagainst at the outside, further whereafter two further sidewalls are in succession bent upwards from the areas of the blank restrained at the center of the blank and having a magnitude corresponding to such of the sidewall to be located opposite of said edges, said bending being made by means of a stationary held counter tool located at the inside and of a moving pressing tool pressed thereagainst at the outside, each sidewall being bent out of the plane of the blank by more than 90° such to spring back elastically to a 90° angle such that every sidewall is bent to a 90° bend allowing for the elasticity of the material and the circular deflection from the plane of the blank, and wherein during the bending of the final sidewall the opposite sidewall which already projects upwards is temporarily pressed back by one lever arm of a two-armed lever which is pivotable around an axis extending parallel to the bending edge which lever arm is offset relative to the inner side of the two-armed lever and acts as pushing arm, the other lever arm being operated by said moving pressing tool.

4 5. The method of claim 1, wherein for a producing of can bodies having a non-circular cross-section and a size which continuously changes along the longitudinal extent of the can body and include a tear-open strip defined by pre-scored scoring grooves and a tear-off flap located at the end of said strip and projecting freely at an edge of said blank, the already formed can bodies are

conveyed by first conveying means of said conveying apparatus stepwise timed into a position immediately ahead of the working station operative to produce the longitudinal seam, in which position the edges which are to be interconnected are brought by pivotable levers pressing against opposite sidewalls of the can body into an overlap position determined by a guide rail, and wherein the respective can body positioned in such overlap position of its edges is thereafter grasped by independently driven second conveying means of said conveying apparatus by a grasping by means of a clamping and pushed into said working station operative to produce the longitudinal seam at a simultaneous pivoting away of said pivotable pressing levers, and wherein simultaneously an abutment stop for the edge of the blank body which includes a tear-off flap of a tear-off strip is pivotted away laterally such to let said tear-off flap pass, which abutment stop is controlled by the drive of said second ~~cinveying~~ conveying means and cooperates with said guide rail.

5 6. The method of claim 1, in which the edges of the blank which are located respectively opposite of each other after the deforming of the blank are interconnected by a longitudinal seam welding in a resistance roll-welding apparatus located after the deforming station.

6 7. An apparatus for producing can bodies of a non-circular cross-section, specifically for practicing the method set forth in claim 1, comprising a deforming station including a plurality of bending tools operative for a step-wise deforming of blanks conveyed in succession through said deforming station for the production of can bodies having a non-circular cross-section; comprising further a conveying apparatus operative for conveying the can bodies through said deforming station and along a conveying path, and a working station for producing a longitudinal seam, and adjoining the end of said conveying route and including at the zone thereof a calibrating apparatus for can bodies of a non-circular cross-section.

7 ~~8~~. The apparatus of claim 6 ~~7~~, in which every bending tool for the production of one respective bend at the can body of non-circular cross-section includes a shaping member kept stationary at the inner side of the can body as counter tool and having a surface bent curvilinearly corresponding to the radius of the bend, and includes a pressing tool operative for a pressing against from the outside and having preferably a roller and a bearing and supporting body thereof which pressing tool is longitudinally displaceable against the action of a spring on a guide which is pivotable around an axis extending parallel to the bending edge and perpendicularly to the guide, and in which said pressing tool is reciprocatably movable by means of a pivotably supported lifting rod along said curcilinear surface of said shaping member for deforming the can body blank between shaping member and pressing tool.

8 ~~9~~. The apparatus of claim 7 ~~8~~, in which all bending tools are located on a pressing table of a press which is in communication with an apparatus which includes a working station for producing the longitudinal seam, and in which all lifting rods are pivotably mounted to a movable part of the press for a simultaneous operating of said pressing tools.

9 ~~10~~. The apparatus of claim 7 ~~8~~ for producing can bodies having a rectangular cross-section and rounded corners, in which said curvilinear surface of said shaping member extends over a circular arc of about 115°, followed by a planar portion of said shaping member, in order to achieve a remaining bending of 90° by means of a bending step over more then 90° to thereby take into account the elasticity of the material.

10 ~~11~~. The apparatus of claim 7 or 9 ~~8 and 10~~, in which a double arm lever is arranged at said bending tool and pivotable around an axis extending parallel to the bending edge and of which one lever arm is operatable by the mov-

able supporting body of the pressing tool for a pivoting thereof, and of which the other lever arm is offset towards the inner side of the can body to be produced and abuts as pressing arm the already bent sidewall of the can body in order to temporarily press this sidewall back during the bending of the opposite sidewall by more than 90°.

11 ~~12~~. The apparatus of claim ~~9~~ 8, in which in order to produce can bodies having a rectangular cross-section and rounded corners additional drawing tools are located at the pressing table operating to produce flat corrugations preferably in two areas of the still planar blank intended to be ~~sahped~~ shaped into oppositely located sidewalls in order to provide a stiffening of the sidewalls.

12 ~~13~~. The apparatus of claim ~~10~~ 9, in which in order to produce can bodies of a non-circular cross-section and having a size which changes continuously along the length of the can body said conveying apparatus includes in addition to first conveying means consisting of an oscillating ledge and pawls independently driven second conveying means including a double tongue for grasping the can body at its rear end and at both sides of the edges to be interconnected at the final conveying position ahead of the working station for the production of the longitudinal seam and for inserting the can body thereinto, and includes further a tongue carriage moved in the can body feeding direction by a spring force and supporting said double tongue, and a drive respectively reconveying said tongue carriage.

13 ~~14~~. The apparatus of claim ~~7~~ 6, in which in order to produce can bodies having a rectangular cross-section and rounded corners said calibration apparatus comprises rollers located at the four corners of the can body and having a concave outer profile of which the radius of curvature corresponds to the rounded corners, and in which for the production of can bodies having a cross-section

which continuously changes along the length of the can body regarding its magnitude, said calibrating rollers are movably supported, preferably carried by springs in order to yield in case of the magnitude of the cross-section increasing from one end of the can body towards the other end.

14 ~~15~~. The apparatus of claim ~~13~~ 12, in which in order to produce can bodies of a non-circular cross-section of a size or magnitude, which continuously changes along the length of the can, and which can bodies include a tear-open strip limited by pre-punched scoring lines and at the end thereof a tear-open flap projecting freely at an edge of the blank, the apparatus includes ahead of the working station for the producing of the longitudinal seam a guiding rail with a continuous groove for receipt of one of the edges of the can body which are to be interconnected, and a short guide rail end section having a further groove for receipt of the other edge located above and having said projecting tear-open flap, and in which for the positioning of this edge located above in the overlapping state an abutment body located close to the other end of the guiding rod and cooperating with the guiding rod and intended to press said edge on is arranged at a lever pivotally mounted laterally of said guide rail, which abutment body is controlled to pivot laterally out of the way by means of said lever immediately prior to the passing of the tear-open flap projecting at the edge of the can body being conveyed further. 14

15 ~~16~~. The apparatus of claim ~~14~~ 15, in which the controlled pivoting movement of said abutment body is coupled to the advancing movement of said double tongue, and in which said reciprocatingly moved tongue carriage supporting said double tongue is provided with a ledge comprising a control cam abutted by one lever arm of said pivotally supported lever which includes at its other lever arm said abutment body.

16 ~~17~~. The apparatus of claim ~~15~~ 1, in which two pivotally supported levers are located at both sides of and at a distance from said guide rail and are operative to press against opposite can body outer surfaces, which levers are operative to press the two edges to be interconnected of the can body which due to the projecting tear-open flap is conveyed in a somewhat spread open state into said guide rail and the overlap position of the edges.

17 ~~18~~. The apparatus of claim ~~17~~ 16, in which the pivoting movement of the levers which are operative to press against the can body outer surfaces are coupled to the advancing movement of the conveying apparatus which includes the reciprocatingly moved ledge having the pawls and is controlled by control cams located at said conveying apparatus.

18 ~~19~~. The apparatus of claim ~~7~~ 6, in which said working station for producing the longitudinal seam at the can body is a resistance roll-welding machine having welding electrode rollers for an electric resistance welding.

DATED THIS 28TH DAY OF SEPTEMBER 1988

FAEL S.A.

By its Patent Attorneys:

GRIFFITH HACK & CO.

Fellows Institute of Patent
Attorneys of Australia.

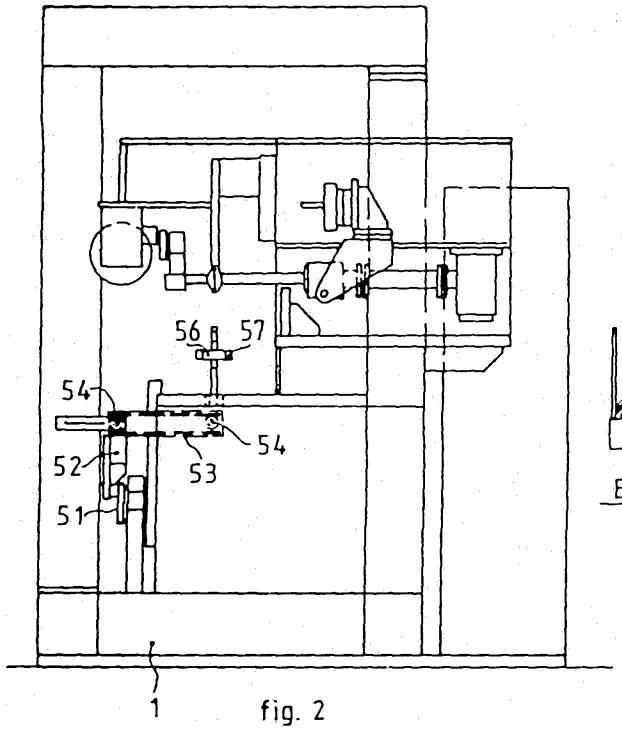
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fig. 2

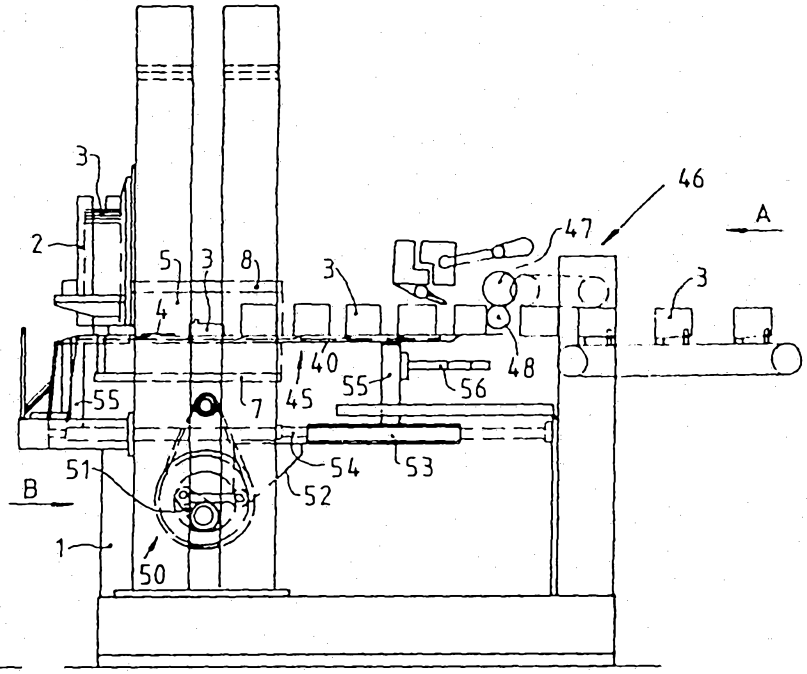
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fig. 1

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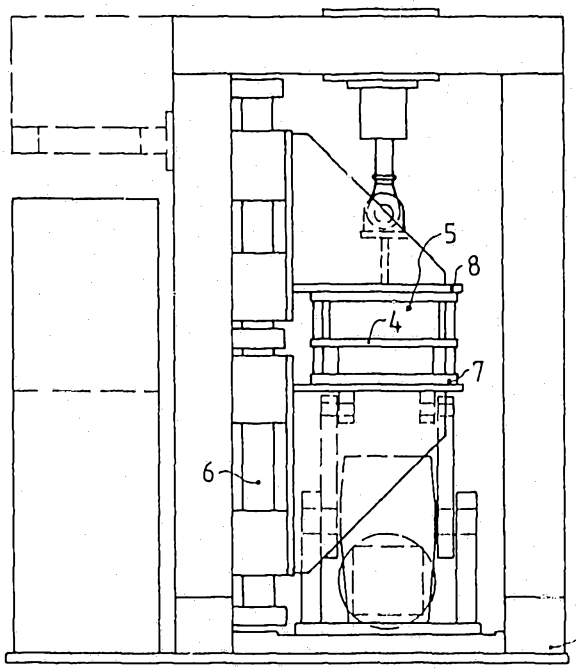

fig . 3

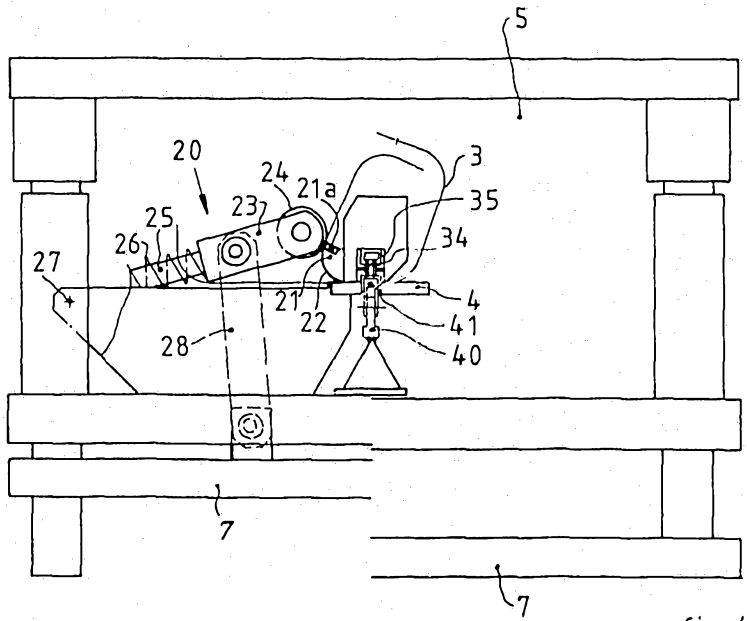

fig. 4

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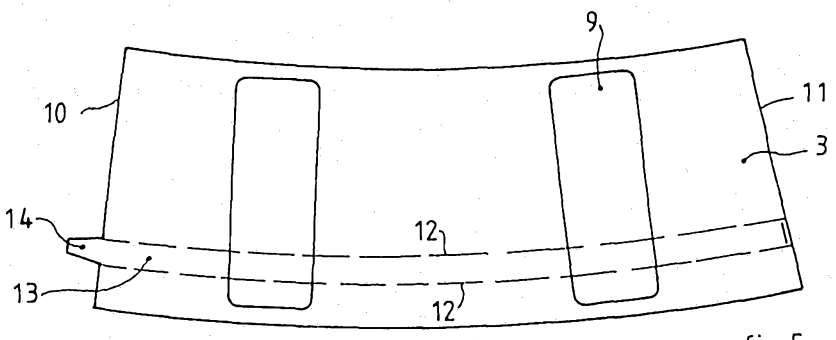
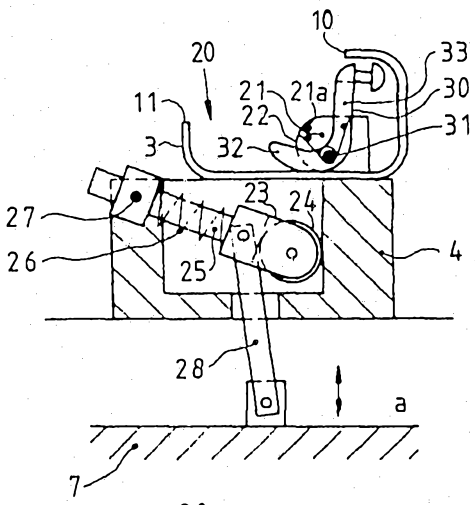


fig. 5



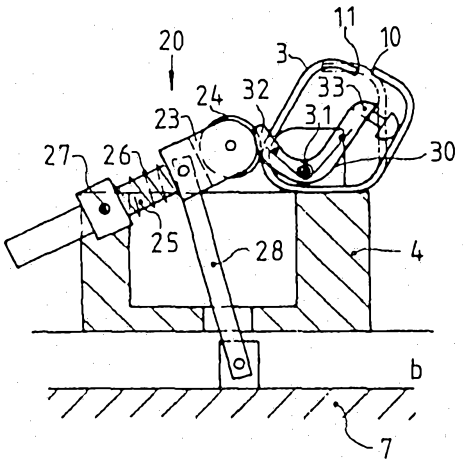


fig. 6

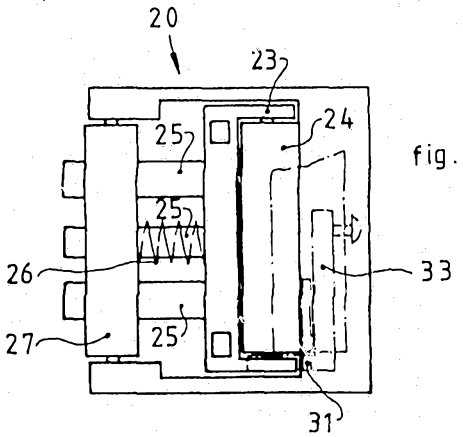


fig. 6c

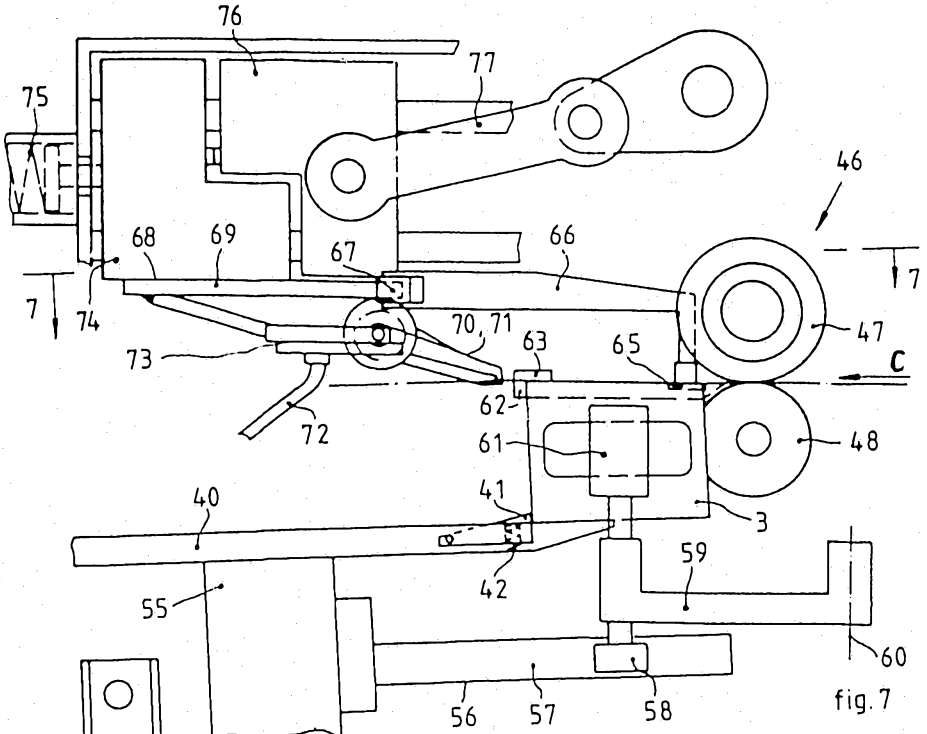


fig. 7

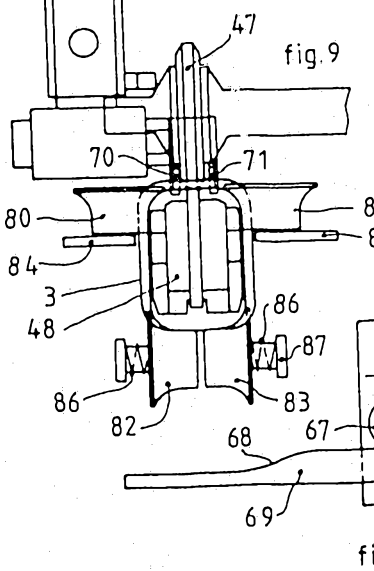


fig. 9

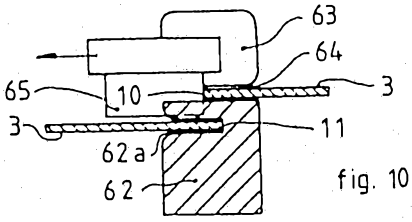


fig. 10

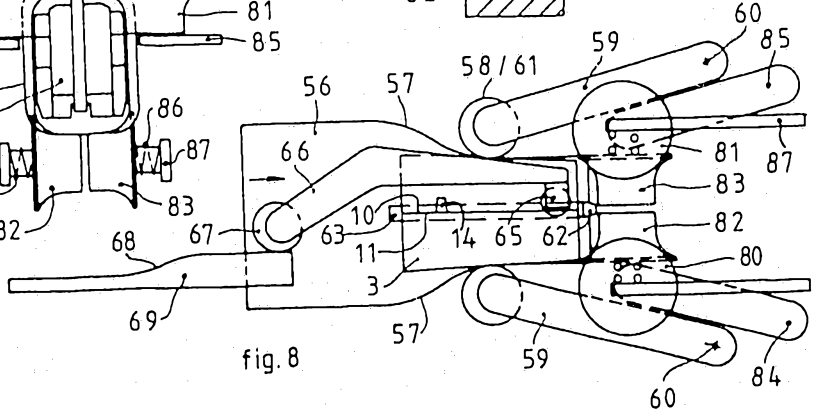


fig. 8