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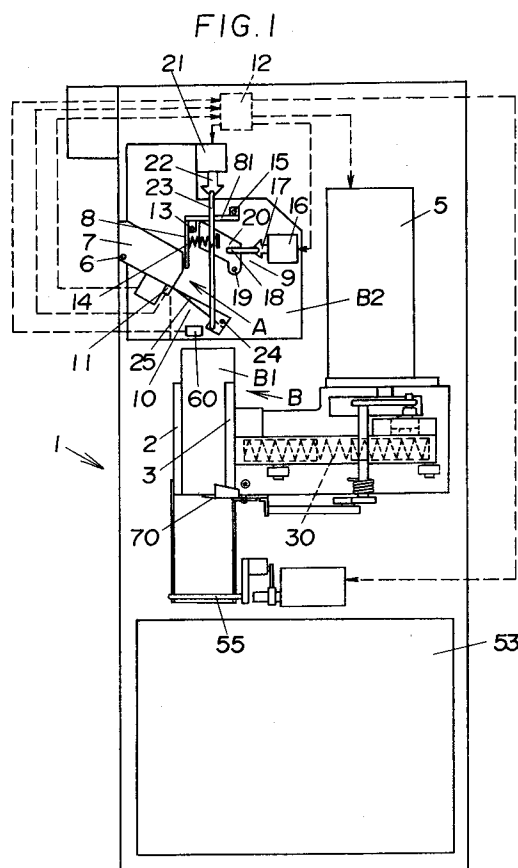
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(54) **Apparatus and method for disposing wasted cans.**

(57) A can disposal apparatus and method for disposing a wasted can, wherein the can is put into the gap between first and second press portions which are relatively movable toward and away from each other, and is supported by a supporting portion of a support plate which is positioned between both press portions at a level above the lower ends of both press portions. The pressing is effected by the relative movement between both press portions. Since the can is supported by the supporting portion of the support plate positioned above the lower ends of both press portions, the can is pressed without substantially leaving non-pressed portion. The support plate is suitably retracted during the pressing. In one form of the invention, the support plate is swung downward away from the lower ends of the press portions so that the support plate does never move into a space behind the moving press portion. In another form, a spring is provided on the moving press portion so as to move together with this press portion. When an abnormally heavy load is applied to the press portion, the spring is compressed to absorb the load, thereby protecting the driving system for driving the moving press portion.



BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an apparatus and a method for disposing empty wasted cans such as beer cans, fruit juice cans or the like by pressing these cans.

Description of the Related Art

The present inventor has proposed, in the specification of Japanese Patent Application No. 2-283657, a wasted can disposal apparatus which presses, between a movable press member and a stationary press member, wasted and which are received by a bottom plate.

Referring to Figs. 11 to 14 of Japanese Patent Application No. 2-283657, cans 4' put into the space between a stationary press member and a movable press member are received by a bottom plate 50' which is set at a level below the lower ends of both press members. and are pressed between these press members as the movable press member is moved towards the stationary press member, as shown in Figs. 13 to 16 attached hereto. For information, in Figs. 13 to 16, numeral 5' denotes a motor, 26' denotes a press member, 29' denotes a transmission member, 30' denotes an elastic member, 50a' denotes a bent portion, 51' denotes a motor, and 52' denotes a shaft.

The can 4', when pressed by the apparatus, is deformed not only in the direction of compression but also in the vertical direction perpendicular to the direction of pressing, so as to push the bottom plate 50' downward, thus swelling out downward beyond the lower ends of the pressing members. The portion of the can swelled out from the region between both pressing members is no more pressed, so that a non-pressed portion undesirably remains in the can after the press work.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to overcome the above-described problems of the prior art.

To this end, the present invention provides a can disposal apparatus and method in which a support plate for receiving and supporting cans is initially set at a level above the lower ends of first and second press members and is moved to down to a level below the lower ends of the press members at least during the pressing.

Thus, according to the invention, the wasted cans put into the gap between both press members are supported by the support plate and, when the pressing is commenced, the support plate is

retracted to the level below the lower ends of the press members. Consequently, any vertically swelled portion of each can is still within the region between the first and second press members so that the amount of swelling of the can out of the pressing region is reduced or substantially eliminated.

It may appear that the support plate undesirably tends to move into a space behind the moving press portion, due to the arrangement that the supporting portion of the support member is positioned above the level of the lower ends of the first and second press portions. This, however, does not take place actually because, in the present invention, the side tabs of the support plate engage with the guide portions in accordance with the operation of the advancing/retracting means, so as to downward rotate the support plate to a level below the level of the lower ends of the first and second press portions.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic sectional side elevational view of a can disposal apparatus as an embodiment of the present invention;

Fig. 2 is a schematic plan view of a critical portion of the apparatus shown in Fig. 1, in a state ready for receiving cans;

Fig. 3 is a schematic sectional side elevational view of a critical portion of the apparatus shown in Fig. 1, in a state immediately before commencement of pressing operation;

Fig. 4 is a schematic plan view of a critical portion of the apparatus shown in Fig. 1, in a state after completion of the pressing operation;

Fig. 5 is a schematic sectional side elevational view of the apparatus in the state shown in Fig. 4;

Fig. 6 is a schematic plan view of a critical portion of the apparatus, in a state for discharging pressed cans;

Fig. 7 is a schematic sectional side elevational view of a critical portion of the apparatus, in the state for discharging pressed cans;

Fig. 8 is a schematic perspective view of a portion of the apparatus, illustrative of the state of contact between a guide portion and a side portion;

Fig. 9 is a schematic perspective view of a portion of the apparatus, illustrative of the state of contact between the guide portion and the side portion, with a portion of the support plate having been swung;

Fig. 10 is an illustration of a can disposal apparatus as a second embodiment of the present invention, in a state ready for receiving cans to be pressed;

Fig. 11 is a schematic sectional side elevational view of the apparatus shown in Fig. 1 in a state before commencement of pressing operation;

Fig. 12 is a schematic perspective view of the apparatus of Fig. 1, as viewed from the driving side thereof; and

Figs. 13 to 16 are illustrations of a known can disposal apparatus of the type which is disclosed in Japanese Patent Application No. 2-283657, illustrating states in which a can is being compressed between a stationary press member and a movable press member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a can disposal apparatus as an embodiment of the present invention is generally denoted by 1. The apparatus 1 has a first press portion 2 and a second press portion 3 between which a can 4 to be disposed is placed. The second press portion is drivingly connected to a motor 5 through a mechanism for converting a rotational motion into a linear reciprocating motion, so that the second press portion 3 is moved towards the first press portion 2 so as to press the can 4 therebetween.

More specifically, the apparatus has a guide section A which decides whether the can 4 put into the apparatus is to be guided to a pressing chamber or to a non-pressing chamber, and a press section B for pressing the can 4 which has been introduced into the pressing chamber.

The guide portion A includes a door 7 rotatable about a pivot shaft 6, a stopper portion 8 which decides whether the weight of the can 4 put into the apparatus is greater than a predetermined weight, a releasing portion for releasing the stopper portion, and a guide 10 for selectively guiding the can 4 either to a passage B1 leading to the pressing chamber and a passage B2 leading to the non-pressing chamber.

A sensor 11 disposed in the vicinity of the door 7 is capable of sensing the state of the door 7, and delivers a signal to a controller 12 when the door has been moved from the open position to the close position.

The stopper portion 8 includes a lever 81 having an L-shaped sectional shape, pivotally supported by a pivot shaft 13.

A spring 14 is retained at its one end by the lever 81 and at its other end by a protruding portion provided on an activating member 20.

The arrangement is such that, when the weight of the can 4 exceeds a predetermined value, the spring 14 is compressed to allow the stopper portion 8 to rotate counterclockwise, so that the lever 81 interrupts the passage of light from a photoelec-

tric tube 15.

A signal is delivered to the controller 12 when the light is interrupted.

The releasing portion 9 is for releasing the can 4 from the stopper. The releasing portion 9 includes a first solenoid 16 cooperating with a first plunger 17 to which is secured a first arm 18. The aforesaid first activating member 20 is pivotally connected to the other end of the first arm 18.

Thus, the releasing portion 9 and the stopper portion 8 are connected together through the spring 14.

The guide 10 is adapted for selectively guiding the can 4 either to the aforementioned passage B1 leading to the pressing chamber and the aforementioned passage B2 leading to the non-pressing chamber. The guide 10 includes a second solenoid 21 cooperating with a second plunger 22 to which is secured a second arm 23. A guide member 25 is pivotally connected to the other end of the second arm 23 by means of a pivot shaft 24.

In Fig. 1, both the first and second solenoids 16 and 21 are shown in de-energized state, i.e., OFF state.

As will be seen from Figs. 2 to 7, the pressing section B, which is composed of the first and second press portions 2,3 and the support plate 70, clamp the can 4 which has been put into the gap between both press portions 2 and 3 through the guide 10 held in open state. As the motor 5 operates, the rotation output of the motor is converted into linear motion of the second press portion 3 so that the second press portion 3 is moved towards the first press portion 2 so as to press the can 4 and then moved away from the first press portion 2. The mechanism for converting the rotary motion of the motor shaft into linear reciprocating motion includes, as shown in Fig. 12, a roller 52' which is pressed into a channel 32' formed between a pair of transmission members 29' and 29". Lateral displacement of the roller 52' is converted into linear reciprocating motion of the second press portion 3, thereby moving the second press portion 3 towards and away from the first press portion 2. The apparatus also includes a first connecting rod 82 contacting a cam 81, a second connecting rod 83 connected to the first connecting rod 82, a third connecting rod 84 connected to the second connecting rod 83, and a fourth connecting rod 87 connected to the support plate 70 and having a projection 86 engaging with an elongated hole in the third connecting rod 84. These connecting rods are omitted from Fig. 12.

An expandable elastic member 30 enables the transmission members 29', 29" to move as a unit together with the second press portion 3, when the force acting on the pressing surface of the second press portion 3 is below a predetermined level,

e.g., 250 kg.

In contrast, when, for example, a spray can still containing inflammable gas is put into the gap between the first and second press portions 2 and 3, the force acting on the pressing surface of the second press portion 3 exceeds a predetermined level so that the second press portion 3 does not any more. Instead, the spring 30 is contracted to allow the transmission member 29 to move alone, thus protecting the motor 5 from overload.

The support plate 70 is placed at the lower end portion of the press apparatus so as to receive the can 4 which has been put into the gap between both press portions 2 and 3 as shown in Fig. 3. The support plate 70 is adapted to be retracted at least during discharging of the pressed can, so that the pressed can drops into a collecting box 53.

A sorting guide 55 is adapted for sorting the pressed cans according to the materials of the can, so that iron or steel cans are introduced into the collecting box 53, while aluminum cans are introduced into another collecting box which is not shown.

As will be seen from Figs. 2, 3, 8 and 9, the support plate 70 has two portions which are hinged to each other through a hinge 71 and are urged by a resilient member such as a spring 72. The bottom portion of the support plate 70 has slits 73 which divide the bottom portion into a central supporting portion 70a for supporting the can and the remainder wing portions 70b. The supporting portion 70a has been slightly bent upward so as to be positioned above the level of the wing portions 70b. Lateral ends of both wing portion 70b are bent upward to provide side tabs 74. Thus, the support plate 70 is divided into a stationary part and a movable part which are hinged together through the hinge 71 urged by the resilient member 72, and the movable part has slits 73 which define the central supporting portion 70a and the remainder both wing portions 70b, the supporting portion 70a being slightly bent upward so as to be positioned at a level slightly above the level of the remainder portions 70b.

The support plate 70 is associated with a advancing/retracting means 80 which is adapted to advance and retract the support plate 70.

The advancing/retracting means 80 includes, for example, a cam 81 driven by the motor 5, the first connecting rod 82 contacting the cam 81, the second connecting rod 83 connected to the first connecting rod 82, the third connecting rod 84 connected to the second connecting rod 83, and the fourth connecting rod 87 connected to the support plate 70 and having the projection 86 engaging with the elongated hole 85 in the third connecting rod 84, all of which are mentioned before. The first connecting rod 82 is urged by a

spring 88 so as to be held in contact with the cam 81, and the fourth connecting rod 87 is connected to the support plate 70.

Although an independent spring 88 is used for urging the end of the first connecting rod 82 into contact with the cam 81, such a spring 88 may be substituted by a spring 88' which is provided on an attaching plate 87' integrally secured to the fourth connecting rod 87 as shown in Figs. 10 and 11. Numeral 89 denotes a guide of the fourth connecting rod 87 provided on a bottom plate 89'.

A guide portion 90 provided at lateral sides of the pressing chamber C are adapted to contact with the side tabs 74 of the support plate 70 in accordance with the operation of the advancing/retracting means 80, so as to swing the support plate 74 downward away from the bottom ends of the first and second press portions 2 and 3 against the force of the spring 72. When the guide portions 90 do not contact with the side tabs 74, the supporting portion 70a of the support plate 70 is held at a level above the lower ends of the first and second press portions 2, 3, so as to support the can 4. The pressing operation is commenced in this state.

A description will now be given of the pressing operation. After the door 7 is opened, the can 4 is put into the apparatus and is guided by the guide portion 10 into the passage B1 leading to the pressing chamber. The can 4 is then supported by the supporting portion 70a of the support plate 70, the portion 70a in this state being placed between the first and second press portions 2 and 3 at a level above the lower ends of the first and second press portions. (first step)

In this first step, the distance between the first and second press portions 2 and 3 is maximized as shown in Fig. 2, and the end of the first connecting rod 82 is held in contact with the valley portion of the cam 81, while the support plate 70 has been fully advanced.

Dropping of the can 4 into the apparatus has already been detected by the photoelectric tube 60, so that the motor 5 starts to operate in response to the signal given by the photoelectric tube 60 so as to activate the second press portion 3 and the cam 81.

More specifically, the cam 81 rotates in the direction of an arrow shown in Fig. 2, so that the second press portion 3 is moved towards the first press portion 2 thereby pressing the can 4 therebetween. The pressed can is swelled downward so as to push downward the supporting portion 70a of the support plate 70, so that the supporting portion 70a is lowered to a level below the lower ends of both press portions 2 and 3. Then, the support plate 70 is removed from the region under the lower ends of the first and second press portions 2

and 3. (second step)

In this second step, the second press portion 3 is moved towards the first press portion 2, while the end of the connecting rod 82 is moved from the valley to the crest portion of the cam 81, whereby the support plate 70 starts to move backward, as shown in Figs. 4 and 5.

After the completion of this second step, the second press portion 3 is further moved towards the first press portion 2 so as to continue to press the can 4. (third step)

Subsequently to the third step, the second press portion 3 is moved away from the first press portion 2, so as to allow the pressed can 4 to be discharged, as shown in Figs. 6 and 7. (fourth step)

After the completion of the fourth step, while the first and second press portions 2 and 3 are spaced apart, the support plate 70 is reset so as to position the supporting portion 70a at a level above the level of the lower ends of the first and second press portions 2 and 3, thus preparing for the receipt of the next can. (fifth step)

Since the guide portions 90 and the side tabs 74 of the support plate 70 engage with each other, the support plate 70 is prevented from entering the space behind the moving press member which is, in this case, the second press portion 3.

In the illustrated embodiment, the retraction of the support plate 70 is commenced immediately after the start of the pressing. This, however, is only illustrative and the arrangement may be such that the retraction of the support plate is commenced when the pressing is being performed. It is even possible to retract the support plate 70 after the completion of the pressing. Such change of the timing of commencement of the retraction can be freely set by altering the rotational phase or contour of the cam 81. Thus, what is needed is that the support plate 70 has been removed from the region beneath the lower ends of the first and second press portions 2, 3 so as not to hamper the discharge of the pressed can.

Thus, one form of the can disposal method of the invention for disposing a wasted can, comprises: a first step of placing the wasted can into a gap formed between a first press portion and a second press portion such that the can is supported by a supporting portion of a support plate, the supporting portion being positioned at a level above the level of the lower ends of the first and second press portions; a second step for commencing a relative movement between the first and second press portions toward each other so as to start pressing the can, while moving the supporting portion of the support plate to a region below the lower ends of the first and second press portions; a third step for further continuing the relative move-

ment between the first and second press portions so as to further press the can, and then removing the support plate from the region under the lower ends of the first and second press portions during the pressing of the can; a fourth step for causing a relative movement between the first and second press members away from each other so as to release and discharge the pressed can; and resetting the support plate such that the supporting portion is positioned between the mutually spaced apart first and second press portions at a level above the level of the lower ends of the first and second press portions, thereby making the apparatus ready for receiving the next can.

Another form of the method for disposing a wasted can comprises: a first step of placing the wasted can into a gap formed between a first press portion and a second press portion such that the can is supported by a supporting portion of a support plate, the supporting portion being positioned at a level above the level of the lower ends of the first and second press portions; a second step for commencing a relative movement between the first and second press portions toward each other so as to start pressing the can, while moving the supporting portion of the support plate to a region below the lower ends of the first and second press portions; a third step for further continuing the relative movement between the first and second press portions so as to further press the can; a fourth step for removing the support plate from the region under the lower ends of the first and second press portions during the pressing of the can, and causing a relative movement between the first and second press members away from each other so as to release and discharge the pressed can; and resetting the support plate such that the supporting portion is positioned between the mutually spaced apart first and second press portions at a level above the level of the lower ends of the first and second press portions, thereby making the apparatus ready for receiving the next can.

According to the invention, both the second press portion 3 and the cam 81 are activated by the same motor 5, without requiring any sensor or the like for the purpose of control. Consequently, the control system is simplified and the operation speed can be increased.

As will be realized from the foregoing description, the present invention offers the following advantages.

According to the invention, since the supporting portion of the support plate for supporting the can is positioned at a level above the lower ends of the first and second press portions when the pressing stroke is commenced, the lower end of the can is still held within the region between both press portions, despite any downward swelling of the can

occurring during the pressing, so that swelling of the can material out of the lower ends of the press portions can be minimized, thus reducing non-pressed portion of the can which tends to appear in the conventional can disposal apparatus.

It may appear that the support plate undesirably tends to move into a space behind the moving press portion, due to the arrangement that the supporting portion of the support member is positioned above the level of the lower ends of the first and second press portions. This, however, does not take place actually because, in the present invention, the side tabs of the support plate engage with the guide portions in accordance with the operation of the advancing/retracting means, so as to downward rotate the support plate to a level below the level of the lower ends of the first and second press portions.

Furthermore, the spring associated with the second press portion, which normally moves together with the second press portion without contracting, is compressed when a load exceeding a predetermined level, so as to protect the driving system for driving the moving side of the apparatus, in particular the driving motor, against any overload.

The method of the present invention has the first step in which the can put into the space between the first and second press portions is supported by the supporting portion of the support plate, the supporting portion being set at a level above the lower ends of the first and second press portions, and the fourth step in which the support plate is retracted from the region beneath the lower ends of the first and second press portions at least when the pressed can is discharged. It is therefore possible to minimize any non-pressed portion of the can which tends to remain after the pressing operation.

It is possible to completely eliminate non-pressed portion, by suitably setting the initial level of the supporting portion of the support plate relative to the level of the lower ends of the first and second press portions, taking into account the amount of vertical swelling of the can occurring during the pressing.

Claims

1. A can disposal apparatus for disposing wasted cans by pressing, comprising:
 - a first press portion;
 - a second press portion;
 - a support plate for supporting a wasted can put into the space between said first and second press members; and
 - advancing/retracting means for advancing and retracting said support plate;

said support plate being pivotally supported and urged by a spring, said support plate having a bottom portion provided with slits which define a central supporting portion and remainder portions, said central supporting portion being bent so as to be positioned at a level above the level of said remainder portions, the lateral ends of said remainder being bent to provide side tabs;

said apparatus further comprising guide portions which, in accordance with the operation of said advancing/retracting means, engage with said side tabs of said support plate so as to rotate said support plate downward apart from the lower ends of said first and second press portions against the urging force of said spring;

wherein, while said guide portions are not in engagement with said side tabs during pressing of said can between said first and second press portions, said supporting portion of said support plate is placed by the urging force of said spring at a level above the level of the lower ends of said first and second press portions, whereas, when said guide portions have been brought into contact with said side tabs, said support plate is rotated downward apart from the lower ends of said first and second press members.

2. A can disposal apparatus for disposing wasted cans by pressing, comprising:
 - a first press portion;
 - a second press portion;
 - a support plate for supporting a wasted can put into the space between said first and second press members; and
 - advancing/retracting means for advancing and retracting said support plate;
 - said support plate being divided into a stationary part and a movable part which are pivotally connected to each other through a hinge urged by a spring, said movable part of said support plate being provided with slits which define a central supporting portion and remainder portions, said central supporting portion being bent so as to be positioned at a level above the level of said remainder portions;;
 - wherein said first and second press portions and said support plate provide a pressing section for pressing a wasted can put into the space between said press members and supported by a supporting portion of said support plate which is positioned at a level above the level of the lower ends of both press portions, and wherein, during pressing of said can by a movement of said second press portion to-

wards said first press portion, said can is swelled vertically so as to push said supporting portion of said support plate out of the region between said first and second press portions.

3. A can disposal apparatus for disposing wasted cans by pressing, comprising:

a first press portion which is stationary;

a second press portion which is movable;

a spring provided on said second press portion and normally movable together with said second press portion but is compressed when the load acting on said second press portion exceeds a predetermined level;

a support plate for supporting a wasted can put into the space between said first and second press members;

advancing/retracting means for advancing and retracting said support plate;

said support plate being divided into a stationary part and a movable part which are pivotally connected to each other through a hinge urged by a spring, said movable part of said support plate being provided with slits which define a central supporting portion and remainder portions, said central supporting portion being bent so as to be positioned at a level above the level of said remainder portions, said remainder portions being bent at their lateral ends so as to provide side tabs;

guide portions which are brought into engagement with said side tabs to cause a counterclockwise rotation of said support plate in accordance with the operation of said advancing/retracting means;

wherein said first and second press portions and said support plate provide a pressing section for pressing a wasted can put into the space between said press members and supported by a supporting portion of said support plate which is positioned at a level above the level of the lower ends of both press portions, and wherein, during pressing of said can by a movement of said second press portion towards said first press portion, said can is swelled vertically so as to push said supporting portion of said support plate out of the region between said first and second press portions, and wherein, when said support plate is retracted, said side tabs are brought into engagement with said guide portions so as to cause the counterclockwise rotation of said support plate, and wherein, when the load exceeding said predetermined level acts on said second press portion, said apparatus allows said can to be discharged without being pressed.

4. A can disposal method for disposing a wasted

can, comprising:

a first step of placing said wasted can into a gap formed between a first press portion and a second press portion such that the can is supported by a supporting portion of a support plate, said supporting portion being positioned at a level above the level of the lower ends of said first and second press portions;

a second step for commencing a relative movement between said first and second press portions toward each other so as to start pressing said can, while moving said supporting portion of said support plate to a region below the lower ends of said first and second press portions, and then removing said support plate from the region under the lower ends of said first and second press portions;

a third step for further continuing the relative movement between said first and second press portions so as to further press said can;

a fourth step for causing a relative movement between said first and second press members away from each other so as to release and discharge the pressed can; and

resetting said support plate such that said supporting portion is positioned between the mutually spaced apart first and second press portions at a level above the level of the lower ends of said first and second press portions, thereby making the apparatus ready for receiving the next can.

5. A can disposal method for disposing a wasted can, comprising:

a first step of placing said wasted can into a gap formed between a first press portion and a second press portion such that the can is supported by a supporting portion of a support plate, said supporting portion being positioned at a level above the level of the lower ends of said first and second press portions;

a second step for commencing a relative movement between said first and second press portions toward each other so as to start pressing said can, while moving said supporting portion of said support plate to a region below the lower ends of said first and second press portions;

a third step for further continuing the relative movement between said first and second press portions so as to further press said can, and then removing said support plate from the region under the lower ends of said first and second press portions during the pressing of said can;

a fourth step for causing a relative movement between said first and second press members away from each other so as to re-

lease and discharge the pressed can; and
 resetting said support plate such that said
 supporting portion is positioned between the
 mutually spaced apart first and second press
 portions at a level above the level of the lower
 ends of said first and second press portions,
 thereby making the apparatus ready for receiv-
 ing the next can.

6. A can disposal method for disposing a wasted
 can, comprising:

a first step of placing said wasted can into
 a gap formed between a first press portion and
 a second press portion such that the can is
 supported by a supporting portion of a support
 plate, said supporting portion being positioned
 at a level above the level of the lower ends of
 said first and second press portions;

a second step for commencing a relative
 movement between said first and second press
 portions toward each other so as to start press-
 ing said can, while moving said supporting
 portion of said support plate to a region below
 the lower ends of said first and second press
 portions;

a third step for further continuing the rela-
 tive movement between said first and second
 press portions so as to further press said can;

a fourth step for removing said support
 plate from the region under the lower ends of
 said first and second press portions during the
 pressing of said can, and causing a relative
 movement between said first and second press
 members away from each other so as to re-
 lease and discharge the pressed can; and

resetting said support plate such that said
 supporting portion is positioned between the
 mutually spaced apart first and second press
 portions at a level above the level of the lower
 ends of said first and second press portions,
 thereby making the apparatus ready for receiv-
 ing the next can.

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FIG. 1

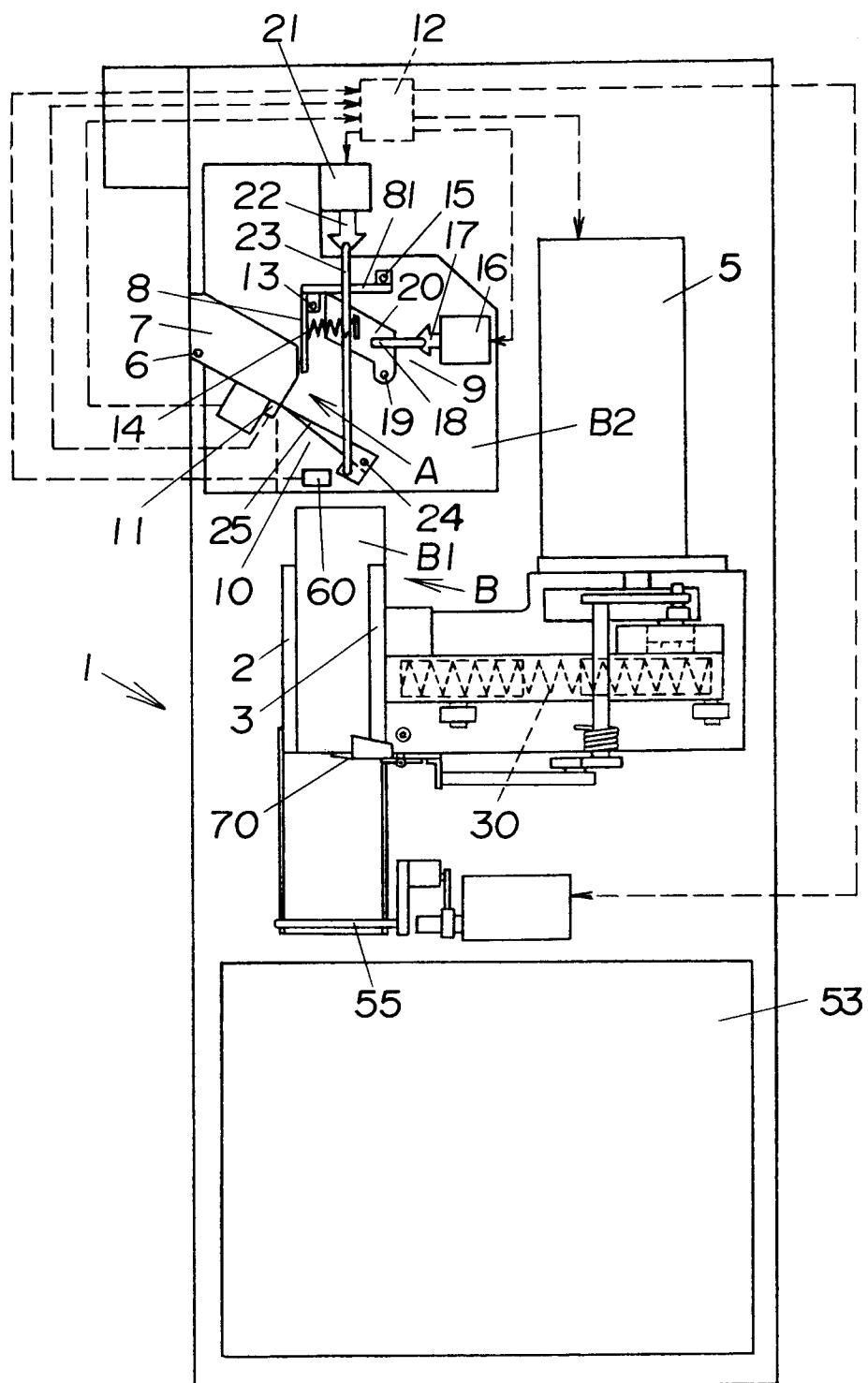


FIG. 2

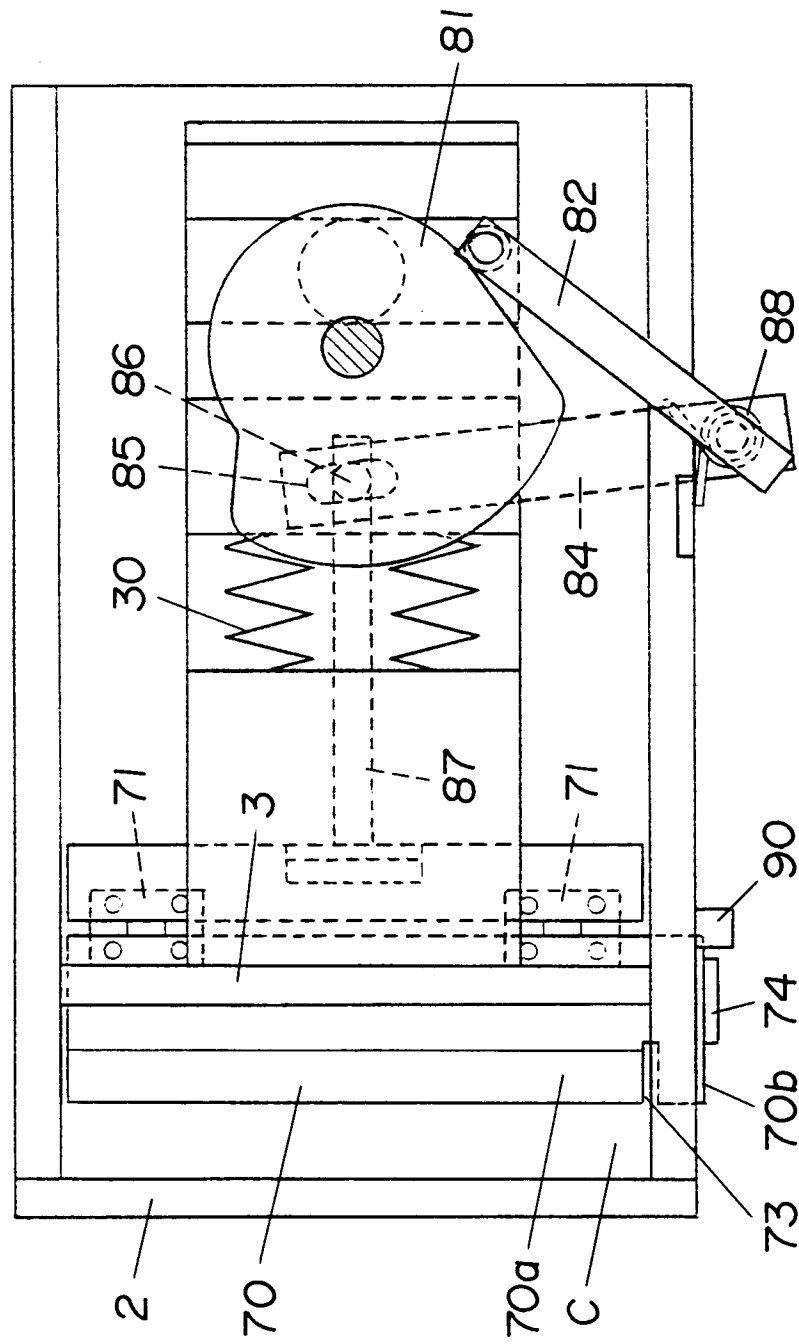


FIG. 3

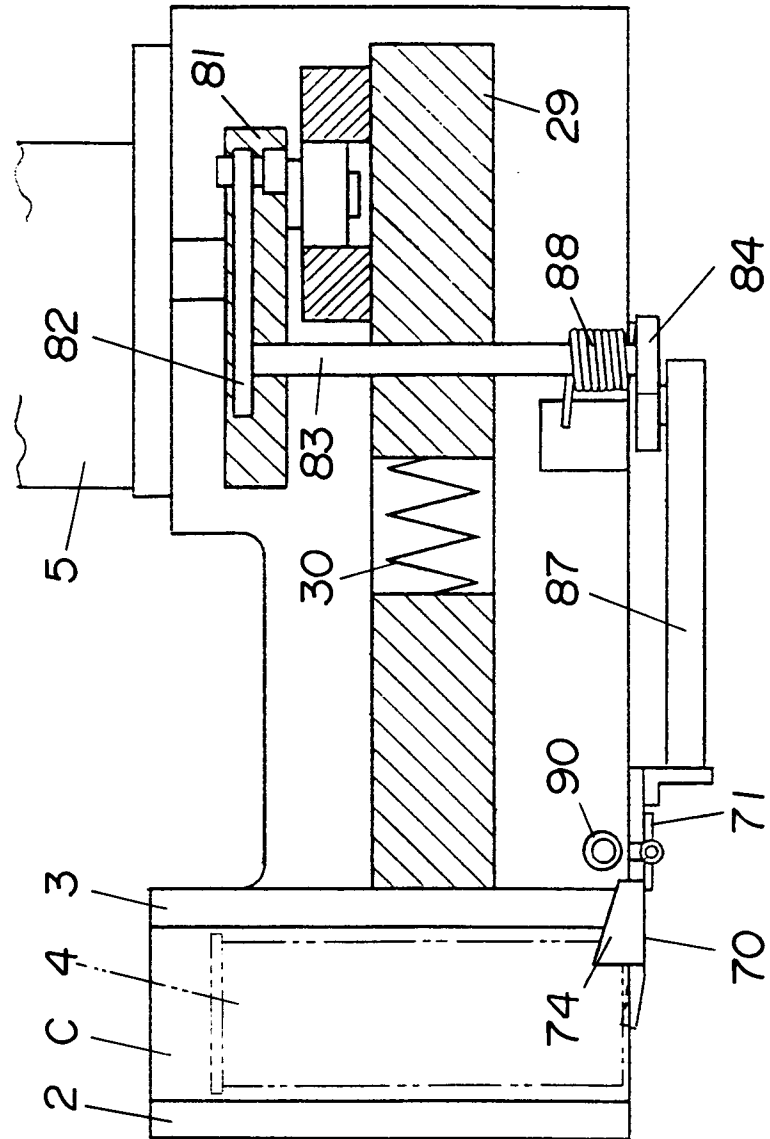


FIG. 5

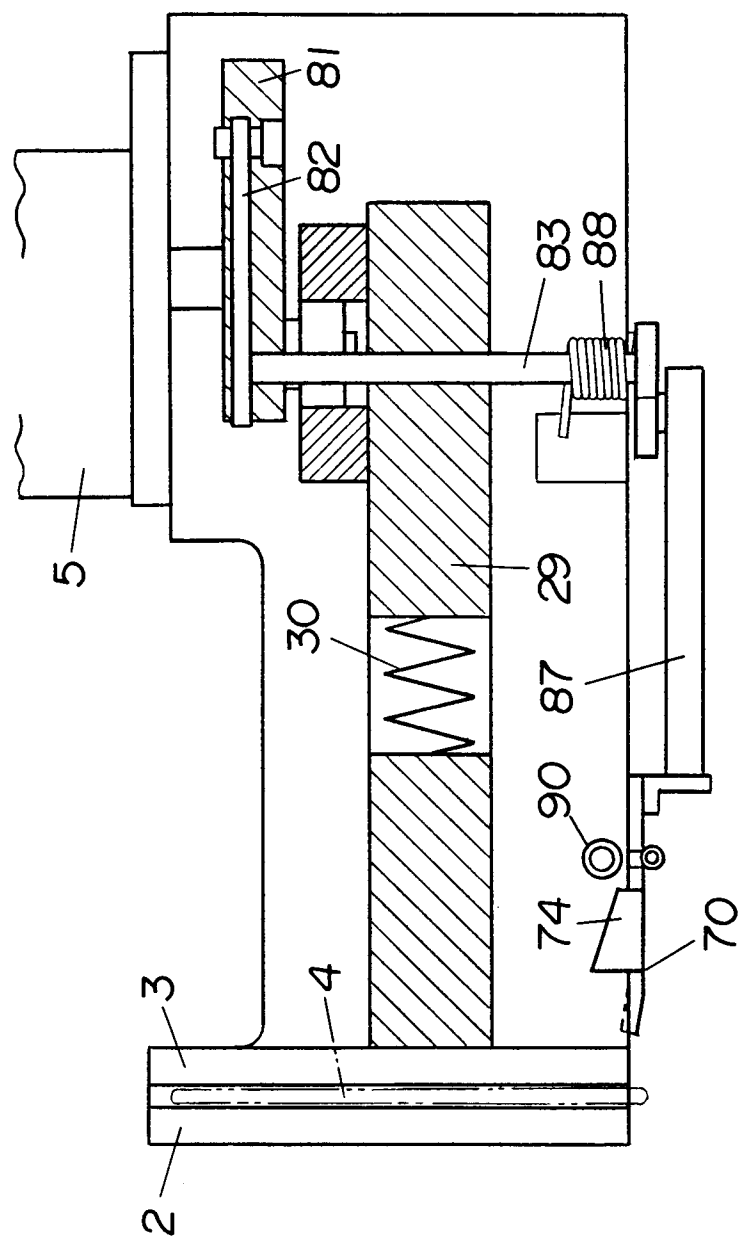


FIG. 6

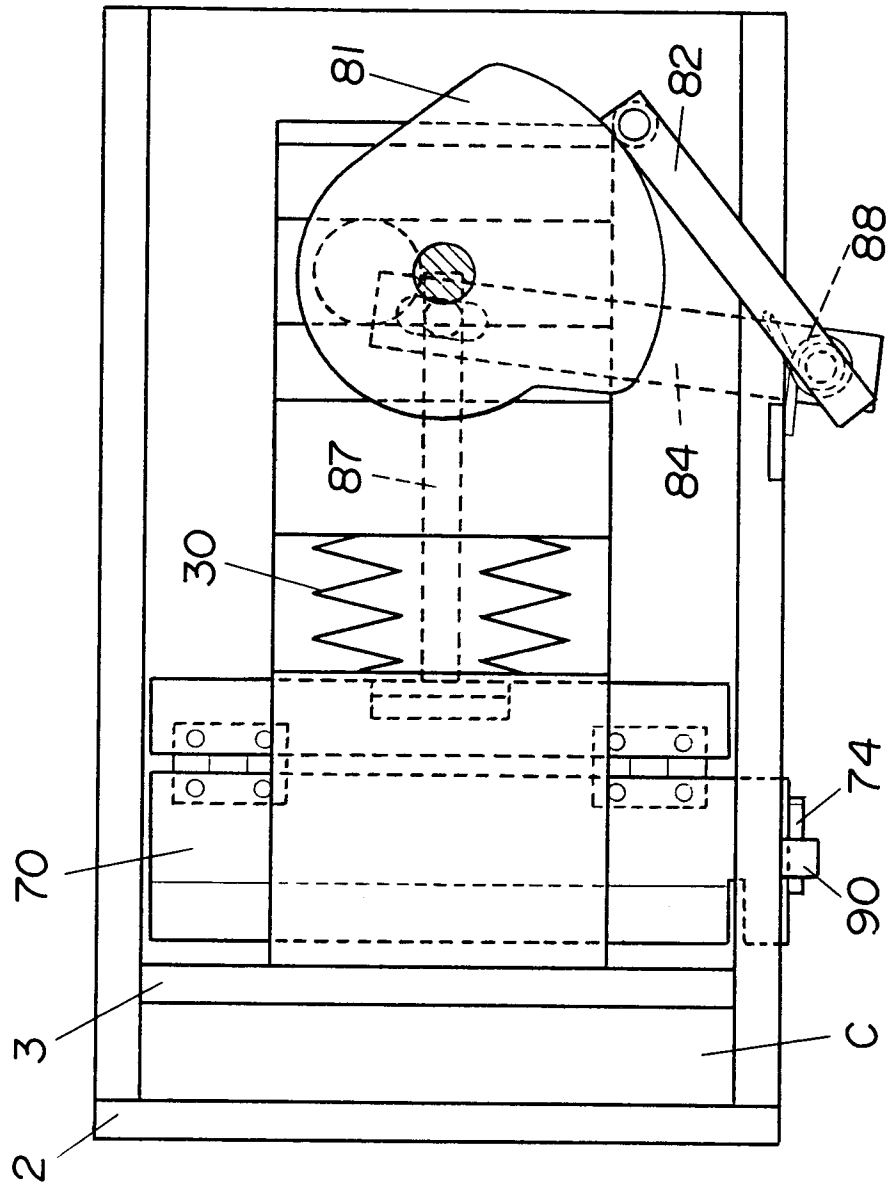


FIG. 7

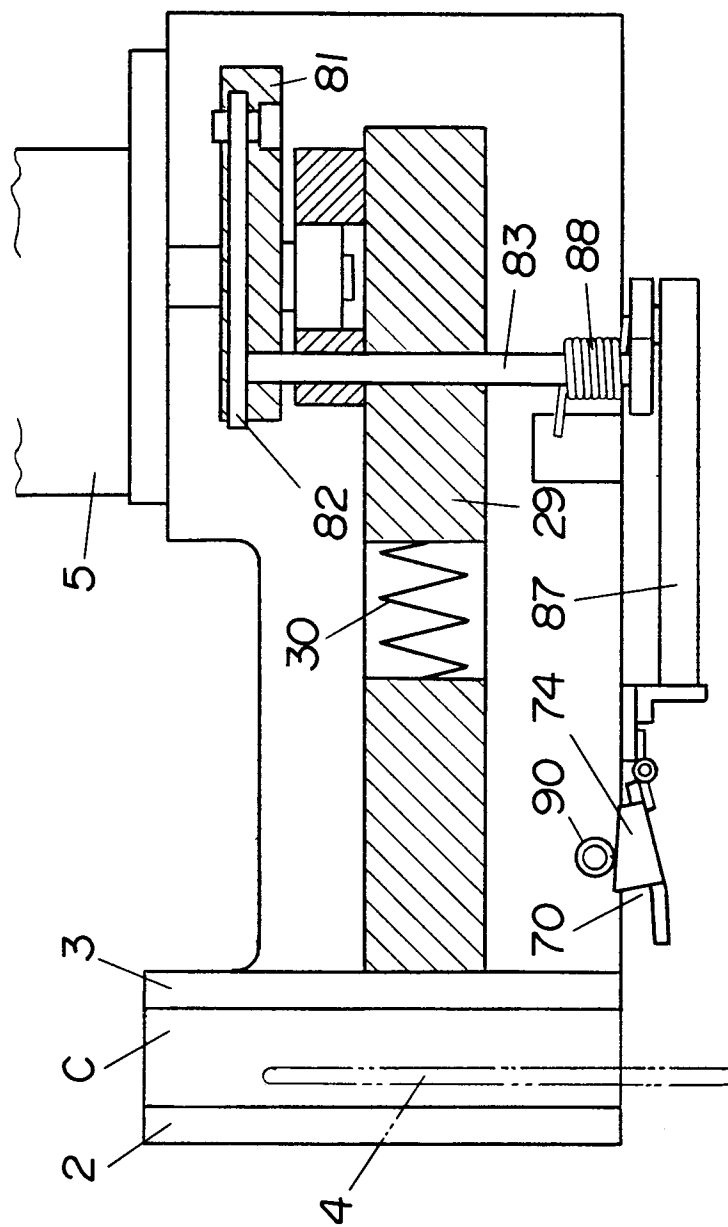


FIG. 8

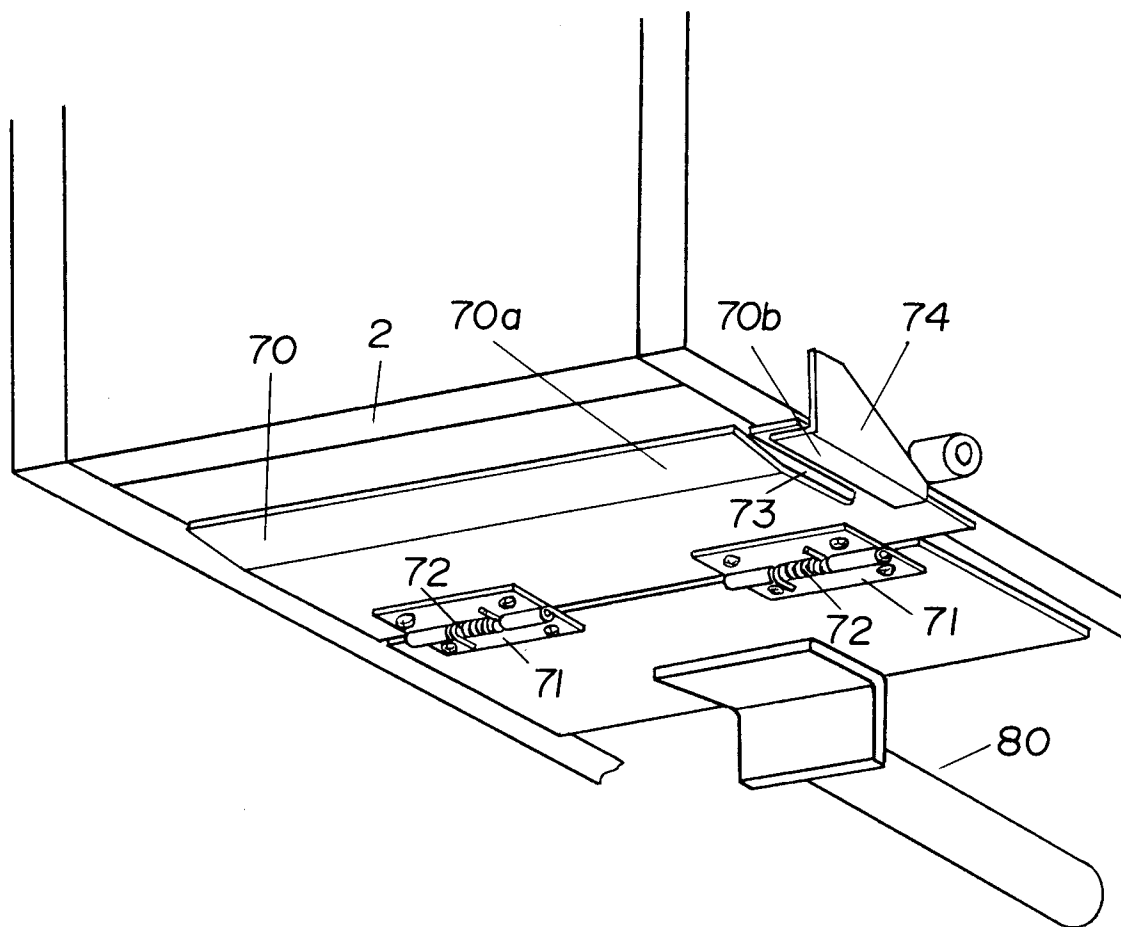


FIG.9

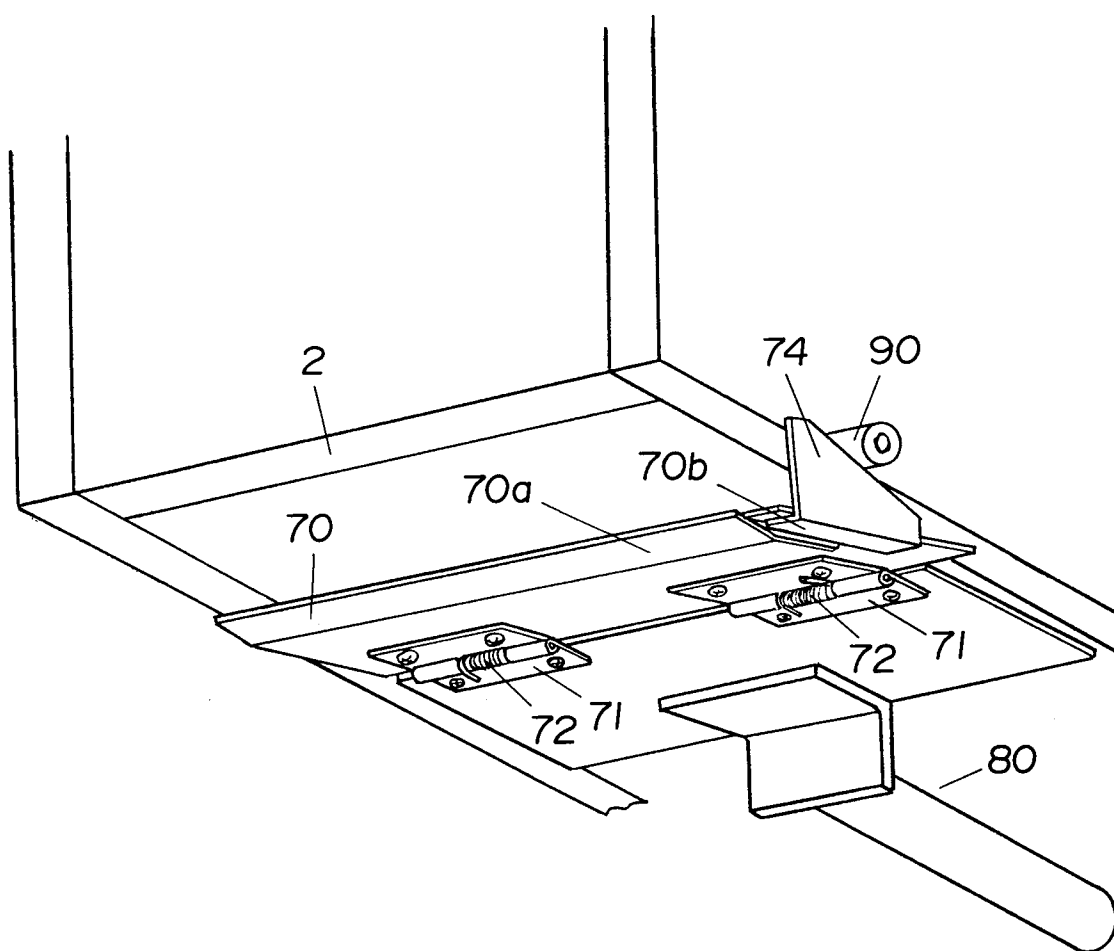


FIG.10

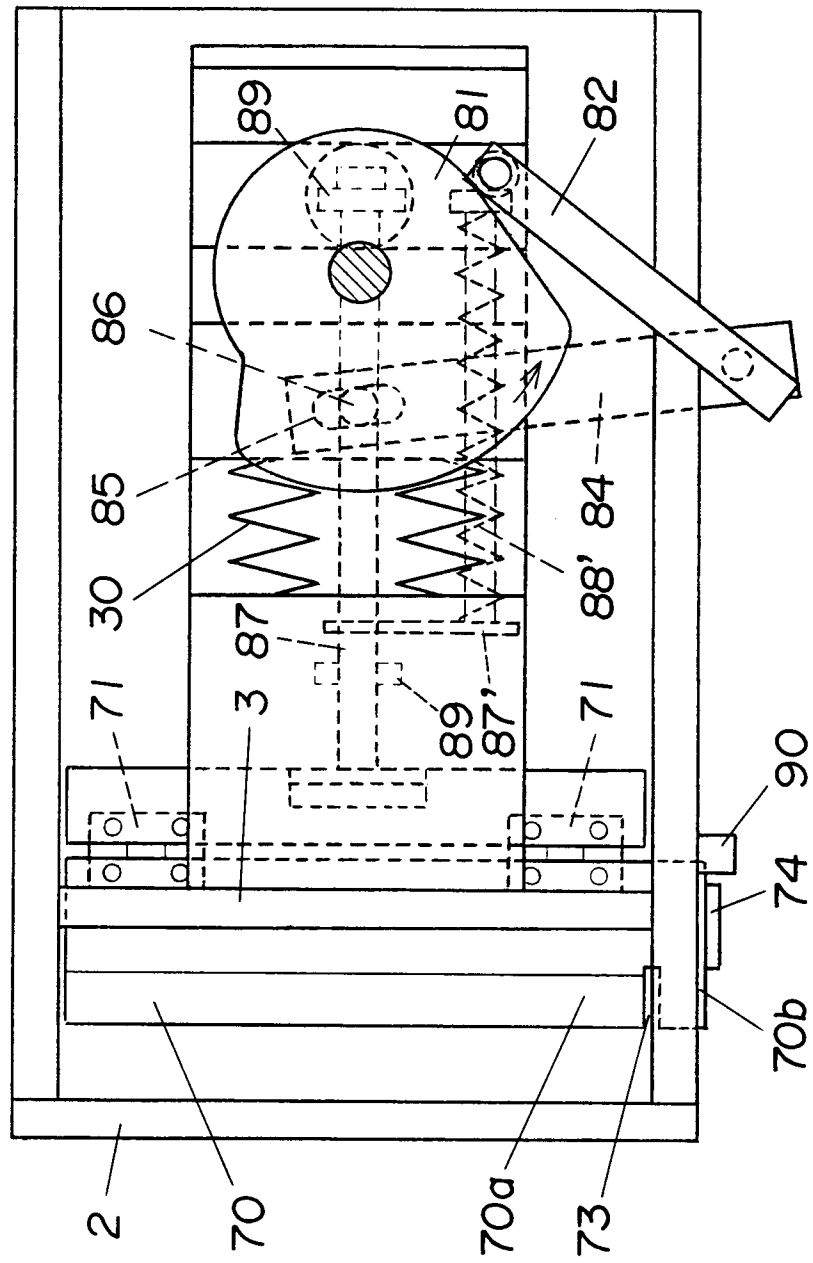


FIG. 11

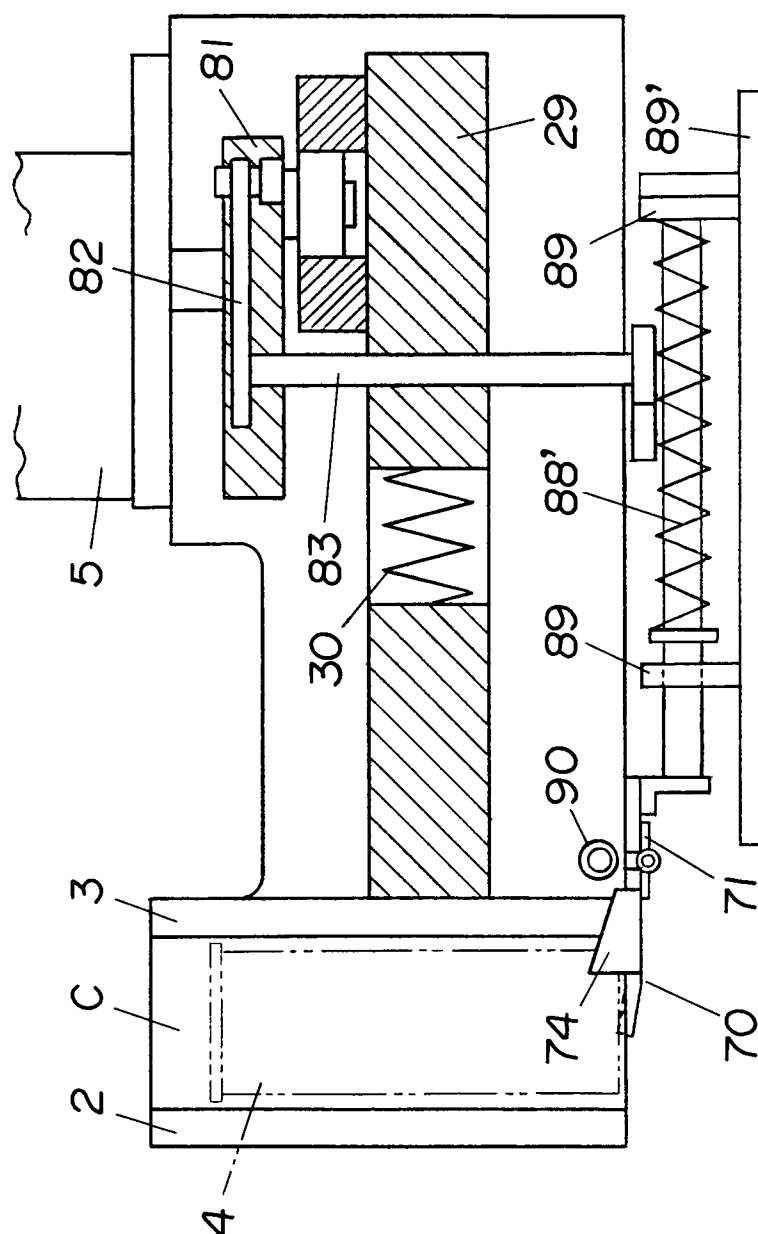


FIG.12

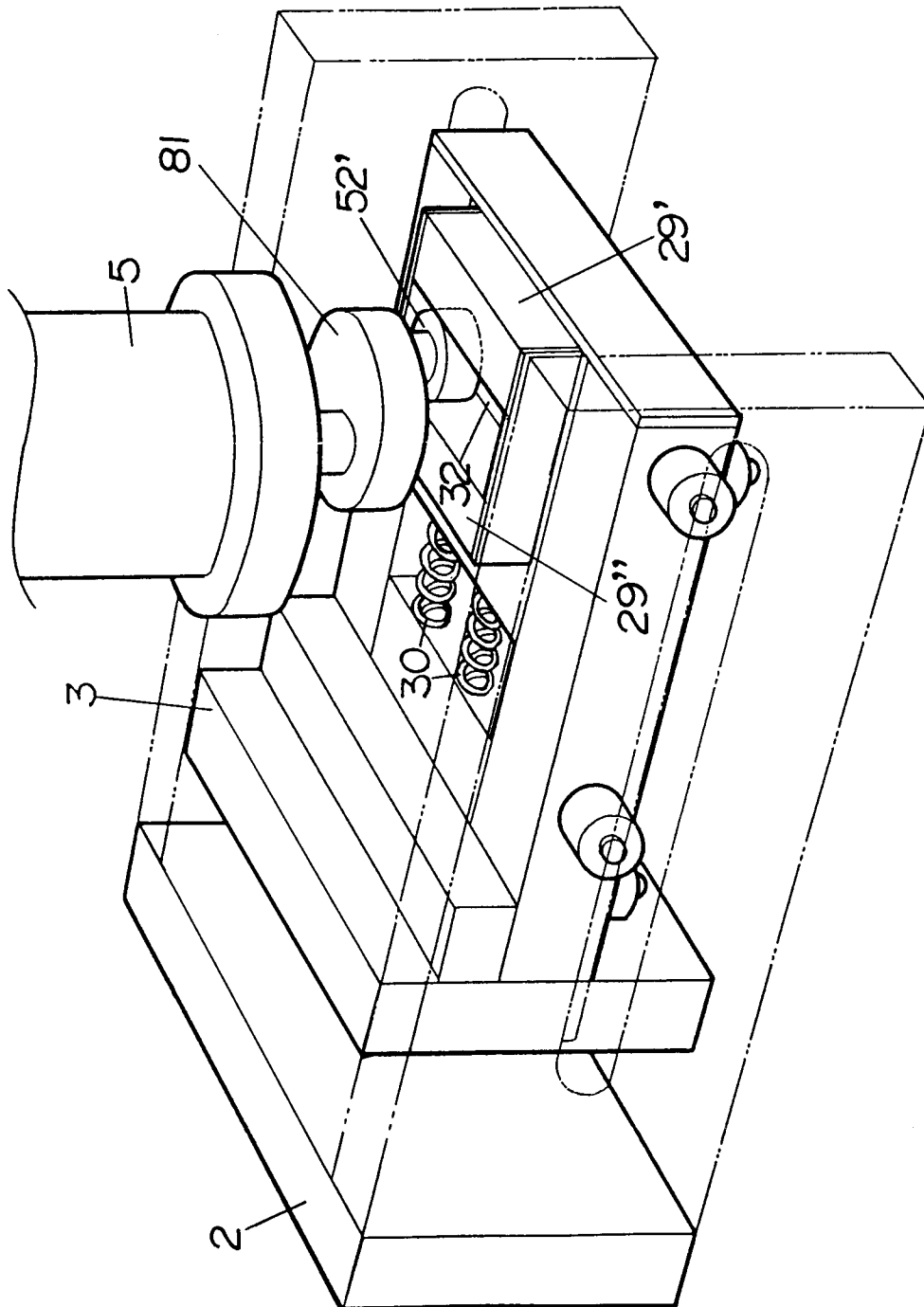


FIG. 13

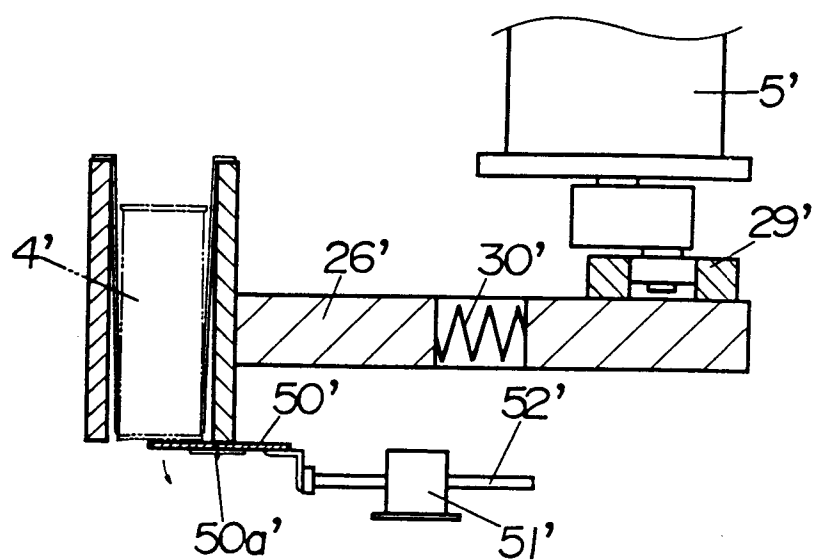


FIG.14

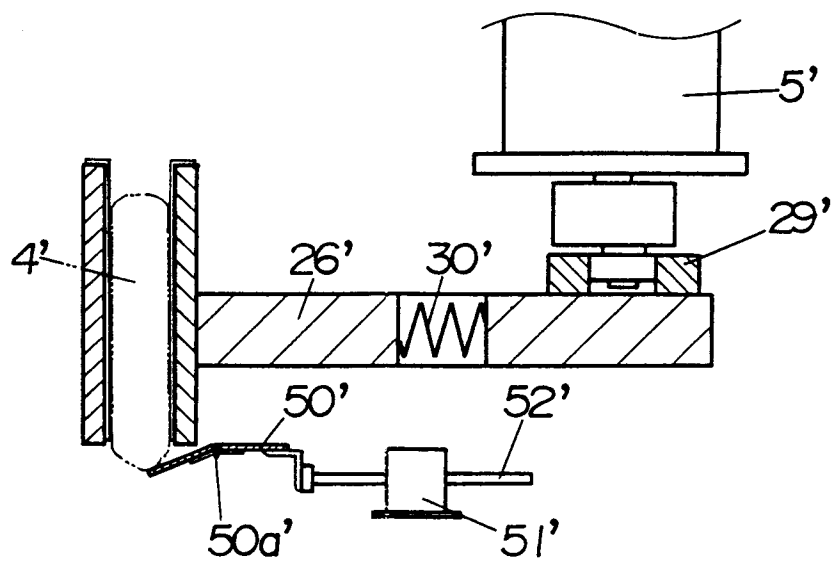


FIG.15

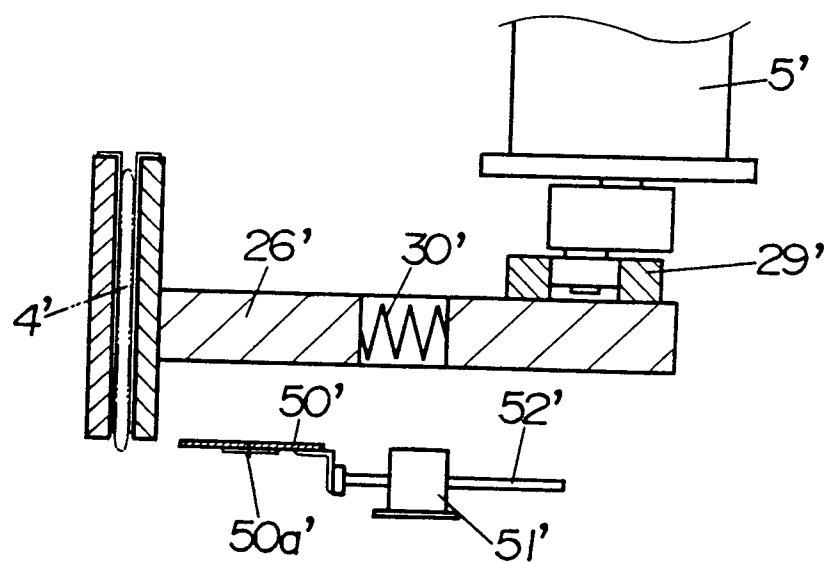


FIG.16

