May 12, 1970 A. A. FLICK 3,511,425

DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

Filed Jan. 8, 1968 5 Sheets-Sheet 1

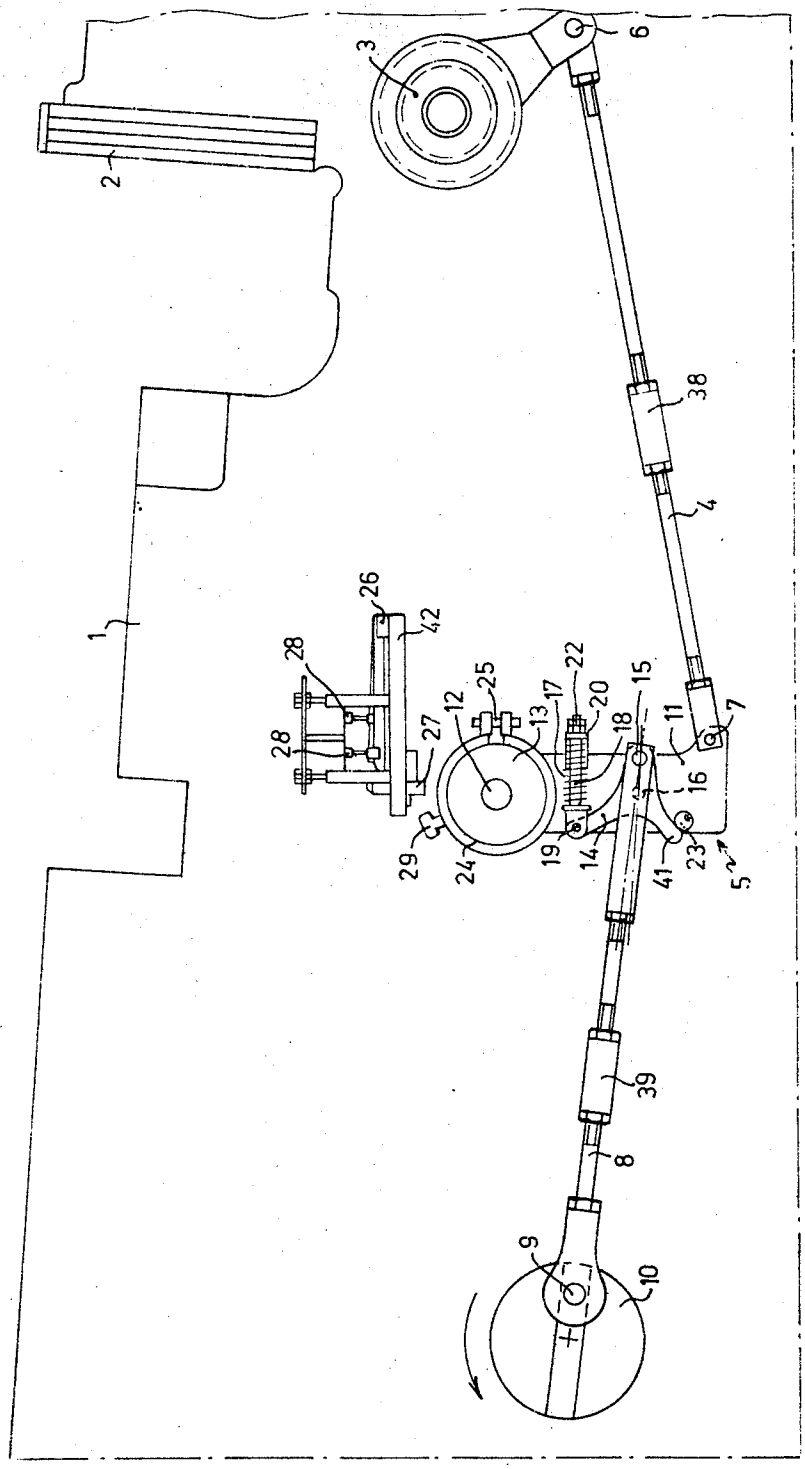

FIG. 1

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DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

Filed Jan. 8, 1968 5 Sheets-Sheet 2

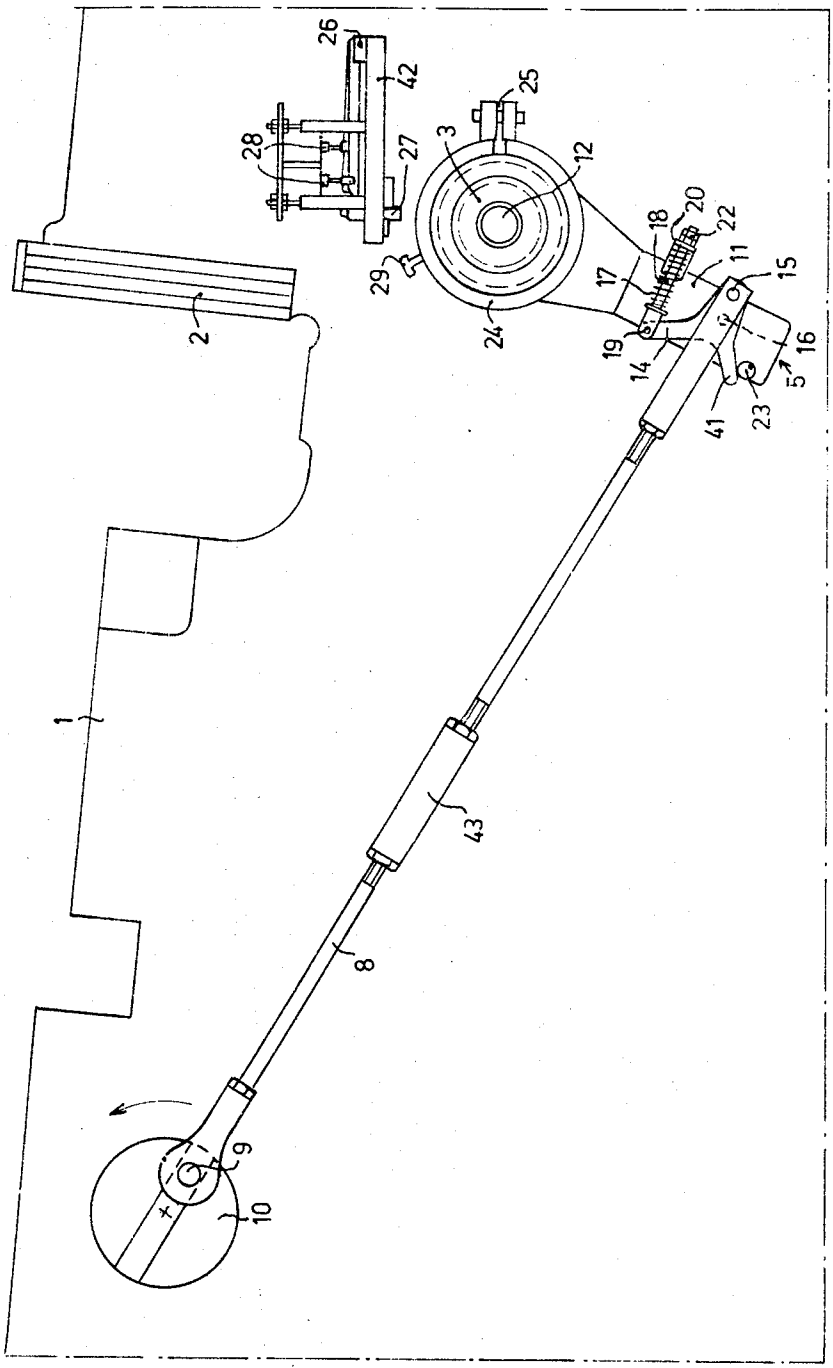

FIG. 2

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DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

Filed Jan. 8, 1968 5 Sheets-Sheet 3

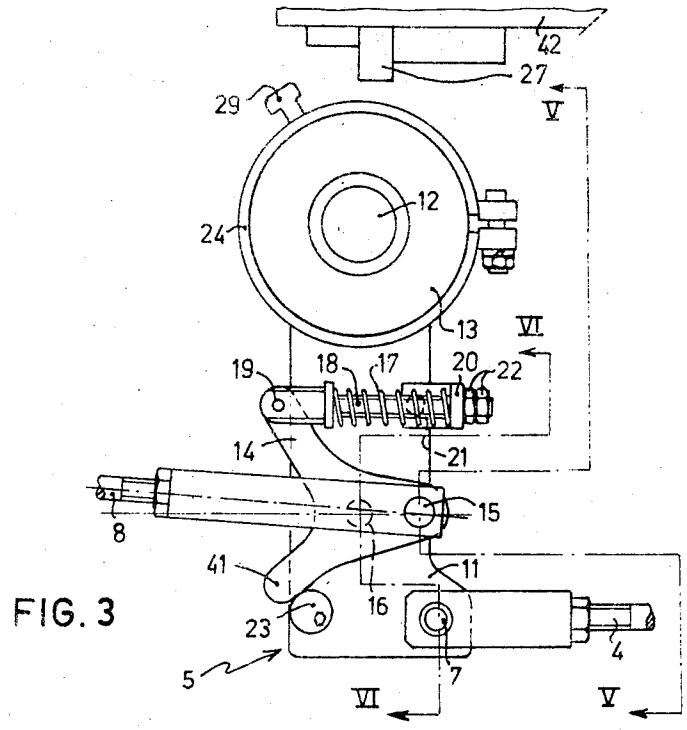

FIG. 3

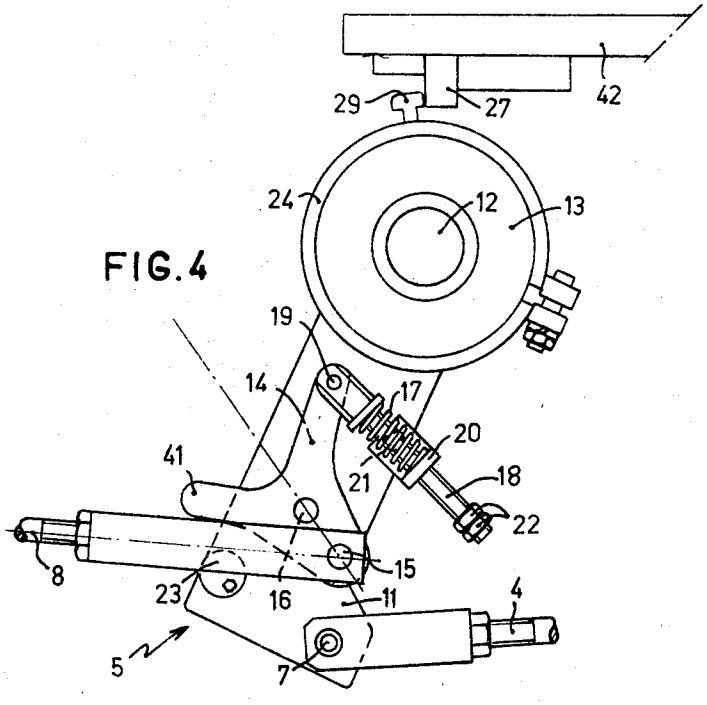

FIG. 4

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DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

Filed Jan. 8, 1968 5 Sheets-Sheet 4

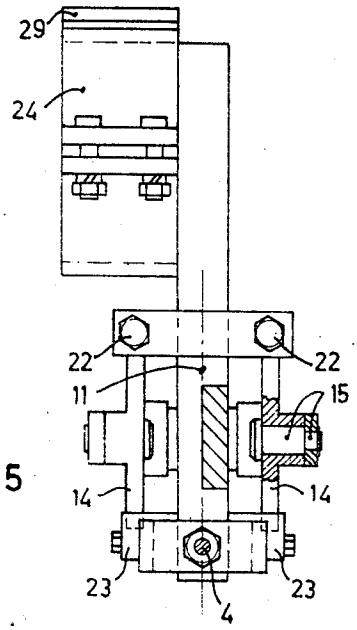

FIG.5

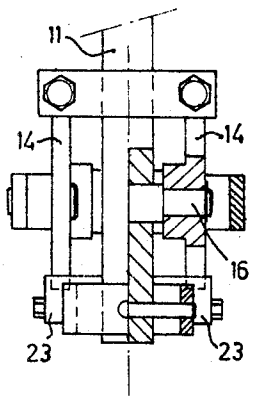

FIG.6

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DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

Filed Jan. 8, 1968 5 Sheets-Sheet 5

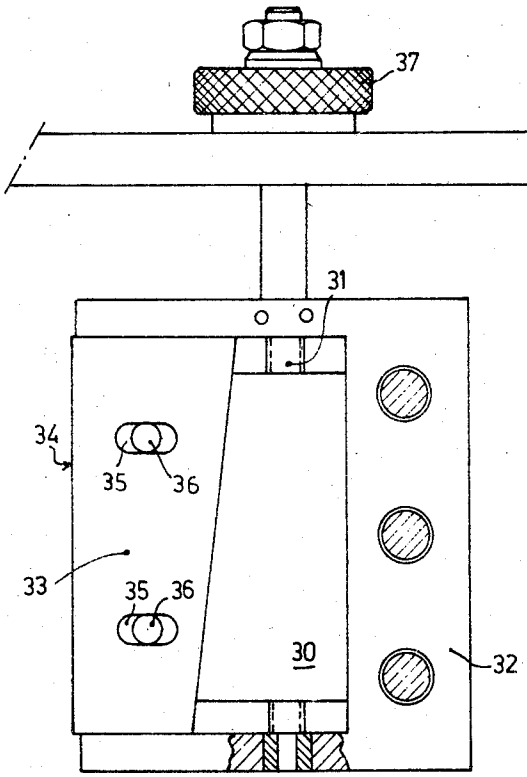

FIG. 7

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United States Patent Office

3,511,425

Patented May 12, 1970

3,511,425

DEVICE FOR CORRECTING THE STEPWISE SUPPLY OF STRIP MATERIAL

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Claims priority, application Netherlands, Jan. 6, 1967, 6700225
Int. Cl. B65h 17/18
U.S. Cl. 226—138 10 Claims

ABSTRACT OF THE DISCLOSURE

A device for correcting location of areas of printing in the stepwise supply of strip material for delivery to an operating machine wherein a correction mechanism has a part movable in relation to the machine frame and through rod connections to the strip supply and eccentric connection to the main drive of the machine, cooperating with abutment cams, a control apparatus determines correction of deviations from the theoretically correct locations of these areas.

This invention relates to a device for the correction of the stepwise supply of preferably preprinted, strip material to the operating station of an operating machine, such as a punch press.

Particularly, although not exclusively, the invention relates to a device which is to be used in a press for punching caps for bottles and other objects from metal strip in rolls, on which strip a repeating pattern has been printed. The drawbacks which occur when punching preprinted strip material and especially when punching metal strip in rolls on which strip a repeating pattern has been preprinted for the manufacture of caps for bottles, lids and other objects, in the first place consist of either a very low production, i.e. a slight number of strokes per minute of the press in question, or, if a reasonable production is obtained by a limited increase of the number of strokes per minute of the press, of the impossibility to achieve and exact, correcting control of the supply of the material. In the latter case, consequently, there is not a question anymore of an exact punching of the correct printed areas of the strip.

The invention provides a device which is enabled not only to control the supply in such a manner that the areas to be punched arrive in the correct place for operation, but the device is also capable of operating accurately and efficaceously at high speeds of the press. Thus, the machine operates accurately and reliably at speeds of the press of 300 working strokes per minute.

The purpose of the invention is moreover, a universal device, which not only can be incorporated with the design of a press and built in during the construction but can be built in into substantially each existing press.

For this purpose the device is constructed in such a manner that application difficulties in existing types of presses, which difficulties could be caused by the constructive embodiment of the various kinds of presses, e.g. by intersecting shafts of main drive and supply mechanism, are avoided.

For this purpose the invention relates to a device for the correction of the stepwise supply of preferably preprinted strip material to the operation station of an operating machine, such as a punch press, in such a way that certain areas of the strip arrive in a correct position at the operating station where an operation on only these certain areas of the strip is to be effected, which device, inter alia, is provided with a correction mechanism having a part which is movably supported in respect of the machine frame and is provided with an abutment face and is connected on the one hand, with the strip feed mechanism of the machine and, on the other hand, by a rod connection, with a movement mechanism derived from the main drive of the machine, e.g. an eccentric, the device also being provided with a plurality of abutment cams or the like for the cooperation with the abutment face of the movable part, which abutment cams are coupled with a control apparatus which is responsive to a detection apparatus for locating—in dependency of inter alia, deviations between the real locations and the theoretically correct locations of the said areas on the strip—each time in the path of movement of the movable part the abutment face of that abutment cam which determines the desired value of the magnitude of the displacement movement of this part and of the strip feed, while the rod connection is pivotally connected with the movably supported part by means of a tipping mechanism which tips when the movement of the movably supported part is blocked and which admits an uninterrupted continuous movement of the drive of the machine, the movably supported part being a rotatable oscillating piece carrying the tipping mechanism and bearing on a supporting shaft or the like member which is attached to the machine.

The constructive embodiment of the detection apparatus, the strip feed mechanism and of the control apparatus is no characterizing feature of the present invention. In the preferred embodiments of the device according to the invention to be described herebelow the control apparatus comprises electrically operated lifting magnets acting on the abutment cams, while the strip feed mechanism operates with a free travel coupling.

A preferred embodiment of the device according to the invention is characterized in that the rotatable oscillating piece is provided with a preferably cylindrical portion located around the supporting shaft, to which portion at least one adjustable and fastenable abutment for cooperating with the respective abutment cams is attached, and further is provided with a projecting portion onto which or to which the tipping mechanism is secured.

The above and other characterizing features of the device according to the invention, as well as the operation of the device, will be described and elucidated with reference to the drawings representing two preferred embodiments of the device according to the invention.

FIG. 1 is a diagrammatic side view of a first embodiment of the device, couple to the strip feed mechanism and to the main drive shaft of the machine.

FIG. 2 is a diagrammatic side view of a second embodiment of the device, coupled on the one hand, by means of a rod connection to the main drive shaft of the machine, and, on the other hand, coupled directly to the strip feed mechanism.

FIGS. 3 and 4 display on an enlarged scale a side view of the correction mechanism, with the tipping mechanism in the initial position and in the tipped position, respectively.

FIG. 5 is a detail of FIG. 3, partially in front view and partially in section on line V—V in FIG. 3.

FIG. 6 is a detail of FIG. 3, partially in front view and partially in section on line VI—VI in FIG. 3.

FIG. 7 displays a mechanism which can be applied to both embodiments of the device and serves to enable a simultaneous displacement of the basic contact face of the abutment cams.

Reference number 1 diagrammatically indicates a punching machine with a guide path 2 for a strip of metal foil, from which, e.g. caps for bottles are to be punched and on which a repeating printed pattern is located. The

strip feed mechanism which operates with a free travel coupling is indicated by 3. In the embodiment according to FIG. 1 the free-travel coupling is connected with the correcting mechanism 5 by means of a straight rod 4 which can be longitudinally adjusted. This rod 4 has a pivot connection 6 with the feed mechanism, 3, and a pivot connection 7 with the correction mechanism 5. In the embodiment according to FIG. 2 the rod 4 is missing which will be further explained herebelow.

In both embodiments the correction mechanism 5 is directly connected with the adjustable eccentric 10 on the main drive shaft of the machine by means of an adjustable tie rod 8, via the eccentric pin 9. The step by step displacements (feed) of the metal strip on the guide path 2 are caused by the feed mechanism, and via the correction mechanism, are derived from the main drive shaft, the correction mechanism taking care, that deviations, which could exist between the real locations and the theoretical pitch of the preprinted areas to be punched out of the metal strip, are automatically compensated during the feed stroke, preceding the working stroke in question of the machine by increasing or reducing the feed without stagnation in the uninterrupted continuous movement of the main drive of the machine. This may be done by cooperation of the correction mechanism with the detection apparatus (not shown) which scans indications located on the strip at regular distances in such a way that pulses caused by said indications are transferred to the correction mechanism, which in agreement therewith, controls the feed of the strip.

The correction mechanism comprises an oscillating piece 11 which in its plane is rotatably supported on a supporting shaft 12. In the embodiment according to FIG. 1 the shaft 12 is located in a suitable place of the machine and extends through a central bore, present in a cylindrical portion 13 rotatable about the shaft 12, which portion 13 forms a part of the oscillating piece 11. In the embodiment according to FIG. 2 the bore in the oscillating piece is effected in such a maner that it can be mounted on the freetravel coupling which, in its turn, is mounted on the shaft of the strip feed mechanism.

The tie rod 8 is connected with the oscillating piece 11 by the intermediary of a tilting piece 14. This has a pivot connection 15 with the end of the tie rod 8. Furthermore, the tilting piece has a pivot connection 16 with the oscillating piece 11. The tilting piece 14 has more or less the shape of a triangle, having an upwardly directed finger and a downwardly directed finger 41.

The pivoting system formed by the tie rod 8 and the tilting piece 14 is under the action of a compression spring 17 which is guided onto a rod 18 which, on the one hand, has a pivot connection 19 with the upper finger of the tilting piece 14 and, on the other hand, is axially shiftably guided in a guide piece 20 which is pivotally mounted on the oscillating piece 11 by means of a journal pin 21 (indicated in dotted lines in FIGS. 3 and 4). Adjustable safety nuts 22 enable an adjustment of the active length of the rod 18 and thereby of the accurate adjustment of the position of the pivot 15.

The entire system may be double (see FIGS. 5 and 6), which means that the parts which are visible at the front of the oscillating piece 11 may also be present at the rear.

In FIG. 1 the lower finger 41 of the tilting piece 14 may be supported on the peripheral abutment face of an eccentric 23 which is adjustably mounted on the oscillating piece 11. This abutment eccentric 23 safeguards the tilting piece 14 against running away to the wrong side, e.g., in case of a breaking of the strip 17 or rod 18. This undesired movement would have the result that the tipping mechanism could not tip and that the mechanism would be damaged. Moreover, a loosening by vibration, if any, of the adjustable safety nuts cannot cause damage. The cylindrical portion 13 of the oscillating piece 11 carries a clamping strap 24 on its periphery, which strap can be rotated in a peripheral direction in respect to the portion 13 and can be fixed in any adjusted position by means of the clamping connection 25. At the outer periphery the clamping strap has an abutment 29 for cooperation with the respective abutment cams 27.

On a frame 42 levers (e.g. three) are located beside each other. These levels are pivotally supported at their corresponding one end 26. At their other ends they each have a projection engaging below a transverse pin near an abutment cam 27. Consequently, the abutment cams 27, lying beside each other, each by means of its own transverse pin rests on the projection of the respective levers. The abutment cams are vertically shiftably guided in the frame. Adjacent its projection each lever is coupled with a lifting magnet 28. These lifting magnets belong to the control apparatus, which is responsive to signals of the detection apparatus. By way of the lifting magnets the abutment cams can be lifted independently of each other, with the purpose to have their abutment faces act as a limiting abutment for the oscillating piece 11 which passes through an arc of a circle when rotating about the supporting shaft. The movement of the oscillating piece 11 is terminated when the abutment 29 on the oscillating piece contacts one of the abutment cams.

The abutment cam faces turned toward the abutment 29 are staggered in respect to each other in the sense that, seen in a direction transverse to the oscillating plane of the oscillating piece, the abutment faces are not aligned, but are staggered in respect to each other.

For the rest the control apparatus is so arranged that each time the abutment face which determines the arcuate path of displacement of the oscillating piece has a value for the correction to be effected, it is in the path of movement of the abutment 29.

The tipping mechanism which in fact consists of the parts 14–23 and 41 ensures that, no matter against which abutment cam the abutment 29 abuts, the movement of the eccentric 10 and the tie rod 8 can continue uninterruptedly according to the fixed path of said tie rod. As appears from FIG. 3, the center of the pivot pin 16 initially lies below the center line of the tie rod 8. The force which is exerted by the rod 8 and on pivot 15 acts on the tilting piece 14, to cause in said position that the tilting piece 14 wants to turn to the left around its pivot 16, in which movement it is limited, however, by the rod 18 which in the pivot 19 is connected with the tilting piece 14 and by means of the bolts 22, bearing on the supporting face 20, has a certain adjusted active length. The eccentric 23 forms a safety abutment which is capable of absorbing the momentary couple and to take over the function of the rod 18 in case during the rotating movement to the left the outmost limit of the tilting piece would fall off due to, e.g. a breaking of the rod 18. During the operating stroke of the device the oscillating piece 11 rotates to the right, about the supporting shaft 12 (see FIG. 4) and the eccentric 10 turns to the left, as a result of which the pivots 15 and 16 displace themselves each along an arc of a circle, the pivot 16 gradually coming higher than the pivot 15 and finally arriving above the longitudinal axis of the tie rod 8 and, consequently, at the same side of the axis as the pivot pin 19, the said position being represented in FIG. 4. The pressure spring 17 prevents that under the influence of the tension force the tilting piece 14 tips as long as the abutment 29 has not yet contacted the abutment face of an abutment cam situated in its path of movement. If this has happened, the tension force in the tie rod 8 surmounts the pressure force of the spring 17 and the tilting piece is drawn further, so that the movement of main drive shaft and eccentric 10 can continue uninterruptedly. The purpose of the compression spring, consequently, is to avoid the premature tipping movements of the tilting piece in case of an unstable tipping condition which is necessary to enable the tipping movement in case of cooperation of the abutment 29 with the mutually spaced respective abutment faces of the abutment cams.

During the return movement the expanding spring **17** cooperates in the return movement of the tilting piece to its normal initial position which is determined by the length of the rod **18** which is adjusted by way of the adjustable safety nuts **22**. This initial position, as already discussed, is safeguarded by the adjustment of the abutment **23**.

In the embodiment according to FIG. 1 the supporting shaft **12** is firmly attached to a suitably selected spot of the machine, which spot is situated between the eccentric and the strip feed mechanism. This embodiment is particularly favourable for machines e.g. presses, in which the drive and the strip feed mechanism are arranged in a difficult way for coupling in such a manner, e.g. with intersecting shafts.

In FIG. 2, on the contrary, the correction mechanism is mounted on the shaft of the strip feed mechanism. The central bore in the cylindrical portion **13** of the oscillating piece is carried out in such a manner that it can be mounted on a free travel coupling of the strip feed mechanism **3**, said coupling being mounted on the shaft of the strip feed mechanism, the angular rotation of which is to be corrected. Due to this simple embodiment the application of the connecting rod **4** in FIG. 4 can be omitted.

Here the tie rod **8** directly connects the eccentric **10** with the correction mechanism **5**. In both embodiments care should be taken that the abutment cams are capable of displacing themselves in a substantially vertical direction upwards and downwards in order that they can fall down from the lifting magnet under the influence of their own weight. By adjusting the rod **18** of the compression spring **17** by means of the safety nuts **22**, and consequently, by adjusting the tilting piece **13**, inter alia the moment of tipping of the tilting piece now can be determined in accordance with the prevailing circumstances. Since the invention allows the adjustment of substantially any desired tipping point of the correction mechanism, the device can operate with a variable adjustment of the eccentric **10**.

The variations of the basic stroke length are determined by the respective abutment cams **27**. The basic stroke length is adjusted by adjustment of the abutment **29** by means of the clamping strap **24** which can be displaced and fixed around the cylindrical portion **13** of the oscillating piece **11**. The clamping strap is relaxed by loosening the connection **25**. The machine is manually turned until the abutment **29** arrives against the desired zero position, whereupon the clamping strap is fastened again.

The invention also comprises a regulating mechanism (represented in FIG. 7) for displacing the contact face of all commanded abutment cams **27** delimiting the stroke of the oscillating piece **11**. It, namely, has appeared in practice that the regulation can become one-sided in case of circumstances which vary in only a very slight degree. It is meant by this that one and the same correction, either positive or negative, is effected during a longer period. By the displacement of the basic contact face of the correcting abutment cams this one-sided control or correction can be eliminated. As appears from FIG. 7, the mechanism comprises an adjustable wedge **30** which is shiftably guided on a screw rod **31** in a frame portion **32** and acts on a pressure block **33** which is also shiftable in the frame portion **32** in a direction perpendicular to the direction of displacement of the wedge **30**. The outer face **34** of the pressure block **33** acts on the abutment cams **27** and shifts them. The shifting of the pressure block **33** is possible due to oblong slots **35** and pins **36**. The wedge **30** can be manually adjusted by way of an adjusting knob **37**. Also an automatic control is conceivable.

With this mechanism it is also possible, when adjusting a new product, consequently, when the total working stroke of the machine should be adjusted to effect a final fine regulation.

As appears from FIG. 1 an adjusting means **38** is incorporated in the connecting rod **4**, and an adjusting means **39** is incorporated in the tie rod **8**. By way of these adjusting means, here being a turn buckle, the length of the rods can be altered. With inter alia, the adjusting means **39** the position of the oscillating piece **11** in respect of the abutment cams **27** is determined, whereas the adjusting means **38** in FIG. 1 determines the magnitude of the feed of the strip. In the embodiment according to FIG. 2 only the rod **8** is provided with an adjusting means **43** which partially takes over the functions of both adjusting means **38** and **39** in FIG. 1.

With the device according to the invention substantially any type and embodiment of presses for an intermittent treatment of strip material, certain areas of which should be exactly arranged at the operation station, can be given an exactly controllable stepwise supply of material at the operation station. For that purpose the device according to the invention can be built in immediately when building the press, but can also be applied with existing presses. Applications of the invention are, inter alia, manufacture of crown caps, tins for preservatives, lids, etc. However, the invention is not restricted to the application of the device according to the invention to presses but can be applied also for the control of the step by step supply of other kinds of operating machines for operating or processing strip material.

What is claimed is:

1. A device for correcting the stepwise supply of preferably preprinted, strip material to the operation station of an operating machine, in such a way that certain areas of the strip arrive in a correct position at the operation station, where an operation on only these certain areas of the strip is to be effected, which device is provided with a correction mechanism which has a part which is movably supported in respect of the machine frame and is provided with an abutment face and is connected, on the one hand, with the strip feed mechanism of the machine and, on the other hand, by a rod connection, with a movement mechanism derived from the main drive of the machine, the device also being provided with a plurality of abutment cams for the cooperation with the abutment face of the movable portion, which abutment cams are coupled with a control apparatus for locating each time in the path of movement of the movably supported part the abutment face of that abutment cam which determines the desired value of the magnitude of the displacement movement of this part, and therewith, the feed of the strip, while the rod connection is pivotally connected with the movably supported part by means of a tipping mechanism which tips when the movement of the movably supported part is blocked and which allows an uninterrupted continuous movement of the drive of the machine, the movably supported part being a rotatable oscillating piece carrying the tipping mechanism and bearing on a supporting shaft which is attached to the machine.

2. A device according to claim **1**, characterized in that the rotatable oscillating piece (**11**) is provided with a cylindrical, portion (**13**) located around the supporting shaft (**12**) to which portion at least one adjustable and fastenable abutment (**29**) for cooperation with the respective abutment cams is attached, and further provided with a projecting part to which the tipping mechanism is secured.

3. A device according to claim **2**, characterized by an adjusting mechanism which can be manually or automatically operated and by means of which the contact face of all abutment cams (**27**) and the position of the abutment (**29**) with respect to the oscillating piece (**11**) can be displaced.

4. A device in accordance with claim **3** including mechanism for adjusting the contact face of all abutment cams, characterized in that the mechanism is provided with an adjustable wedge (**30**) shiftably mounted on a screw rod (**31**) in a frame part (**32**), which wedge

during its displacement shifts a pressure block (33) in a direction which is perpendicular to the direction of displacement of the wedge, which pressure block (33) has a free outer face (34) forming the contact face of the abutment cams.

5. A device according to claim 1, characterized in that the rod connection is formed by a rod (8) adjustable in length, which rod at the one side is directly connected with an eccentric (10) and at its other end a pivot (15) is connected to one end of a tilting piece (14) belonging to the tipping mechanism which piece is rotatably connected with the oscillating piece in a pivot (16) situated between the said one end of the rod and the said pivot (15).

6. A device according to claim 5, characterized in that the tilting piece (14) at a second and (19) is pivotally connected with adjusting means (17–22) for the adjustment of the position of the tilting piece in respect of the oscillating piece, said adjusting means, on the other hand, being connected with the oscillating piece.

7. A device according to claim 6, characterized in that the means (17–22) at least consist of a guide piece (20) which has a pivot connection (21) with the oscillating piece (11), a rod (18) being axially shiftably guided in the guide pieces which rod at one end (19) being pivotally connected with the second end of the tilting piece (14) and at its other end being provided with adjustable fastening means (22) supported on the guide piece (20), a compression spring (17) being located between the guide

piece and the end of the rod connected with the tilting piece.

8. A device according to claim 5, characterized in that the tilting piece (14) has a part (41) capable of cooperating with an adjustable mount which also determines the outermost position of the tilting piece in the not-tipped condition.

9. A device according to claim 1, characterized in that the shaft of the strip feed mechanism (3) also forms the supporting shaft (12) for the oscillating piece (11), with intermediary of a freetravel coupling.

10. A device according to claim 1, characterized in that the oscillating piece is supported on said separate supporting shaft (12) located on the operating machine exclusively for said purpose, the projecting part of the oscillating piece being pivotally connected (6, 7) with the strip feed mechanism (3) by means of a rod connection (4) which is adjustable in length.

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U.S. Cl. X.R.

226—142