

Stamping press arrangement

Technical field

5 The present invention relates to a stamping press arrangement as well as to a use of the stamping press arrangement according to the preambles of the independent claims.

10 Prior art

A variety of components are manufactured by stamping presses in a particularly economic way and in large numbers.

15 A special field is the manufacturing of container lids with a push-in or a pull-off tab which can be opened without tools, also called EOE (Easy Open Can Ends) by the industry, for which manufacturing pre-fabricated metal sheet lids are provided in the stamping
20 press, with different profiles, with a carving for the opening position as well as with a separately supplied push-in or a pull-off tab.

US 4, 166, 424 discloses a stamping press for manufacturing EOE's, for which the prefabricated sheet
25 metal lids are guided in two parallel rows through a bottom press part where they are stepwise reshaped, provided with a carving and provided subsequently with a pull-off tab. A top press part is located directly above the bottom press part, through which a metal strip is
30 guided and during this time reformed stepwise as strip carrying serially one after the other the pull-off tabs to be attached to the lids in the bottom press part. This strip is inserted into the bottom press part in a 180° arc in its transport direction in a reverse way and then
35 perpendicular to the transport direction of the lids, where the pull-off tabs carried by it are separated from the strip and riveted with the lids. In case of the

bottom press part, the bottom tool half is moved and works against the fixed top tool half while in case of the top press part the top tool half is moved and works against the fixed bottom tool part. The moved tool halves
5 of the bottom and top press part are connected to one another via pull rods and are moved together up and down via a crank drive, such that the bottom press part acts during the upward movement and the top press part acts during the downward movement. This stamping press has the
10 disadvantage that it is structurally weak and therefore only provides low precision as well as allows only comparatively slow stroke speeds. Additionally, the top press part, which produces the pull-off tabs, has mandatorily the same stroke like the bottom press part,
15 which processes the lids, such that the influencing possibilities for optimizing the entire process are considerably restricted.

DE 36 27 179 A1 discloses a stamping press for manufacturing EOE's, in case of which the
20 prefabricated sheet metal lids are guided in two parallel rows in longitudinal direction of the press through a first press half, where they are stepwise reshaped, provided with a carving and provided subsequently with a pull-off tab. The pull-off tabs are produced in the
25 second press half and are attached to the lids in in the first press half. The lids are processed in the first press half with two press rams penetrating one another, which work downward against a press table which is solidary with the second press half. The second press
30 half has an own press ram for manufacturing the pull-off tabs, which also works downward against the press table. All three press rams are driven by a common crank drive. This stamping press has the disadvantage that it has a complicated construction with three different press rams
35 and that it is also structurally weak, such that also in this case it allows only a low precision as well as only comparatively slow stroke speeds. A particular

disadvantage of this construction is additionally that deformations of the one press half due to stamping force and/or temperature have a strong influence on the respective other press half.

5 EP 0 281 777 A1 discloses a stamping press for manufacturing EOE's, in case of which the prefabricated sheet metal lids are guided in three parallel rows in longitudinal direction of the press through a first press, where they are stepwise reshaped,
10 provided with a carving and provided subsequently with a pull-off tab. The pull-off tabs are produced in a second press which is synchronized with the first press and has a transport direction which is perpendicular to the transport direction of the first press, wherein the pull-
15 off tabs are subsequently supplied directly to the first press and are attached to the lids there. This stamping press avoids some of the disadvantages of the stamping presses mentioned above, it has however still the disadvantage that the press ram of the first press is
20 relatively big and accordingly massive, which leads to enormous component stress and a high energy consumption in case of high stroke speeds or significantly limits the potential for increasing the stroke speeds and consequently for increasing the productivity of the
25 press, respectively. Additionally, due to the use of a common tool for three shell rows the problem results that the first press has to be operated with an enormous press load in order to ensure a precise carving depth for all three shell rows, thus requiring much energy and being
30 prone to wear.

 The publications WO 2014/144119 A1 and WO 2014/144284 A1 disclose a stamping press for manufacturing EOE's, in case of which the prefabricated sheet metal lids are stepwise reshaped in three parallel
35 stamping press units with one row each, are provided with a carving and provided subsequently with a push-in or pull-off tab, respectively. In a further stamping press

unit with a transport direction which runs perpendicularly to the transport direction of the three other press units, the push-in or pull-off tab, respectively, are manufactured of a sheet metal strip and subsequently supplied directly to the three mentioned press units, where they are attached to the lids. The press ram of the stamping press units work each downward against a machine table under which crank shafts, each running through the press units in transport direction of the lids, and connecting rods for transforming the rotational movement of the crank shaft in the up and down movement of the press ram, are arranged. The crank shafts of the four stamping press units are coupled to the main press drive via four angular gears and frictions arranged in between. This stamping press partially avoids the disadvantages of the above mentioned stamping press, however it has the disadvantage that it is constructed in a very complex way and has many wear-prone and energy consuming components, therefore having a negative influence on its energy efficiency, its life, its maintenance intensity and last but not least also on the attainable stroke speeds.

Disclosure of the invention

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It is therefore the objective to provide a technical solution which doesn't have the above mentioned disadvantages of the prior art or at least partially avoids them.

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This objective is reached by the stamping press arrangement according to the independent claims.

According to them, a first aspect of the invention relates to a stamping press arrangement with a plurality of stamping press units, preferably for manufacturing container lids with push-in or pull-off tabs which can be opened without tools.

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The arrangement comprises at least two adjacent first stamping press units according to the claims, preferably with identical construction and size, each of which has a press ram for receiving and moving a first tool part which works against a receiving plate for receiving a corresponding second tool part. These first stamping press units are oriented with respect to one another in such a way that they have working directions extending parallel to each other and preferably have work planes located in a common plane.

Furthermore, the arrangement comprises at least a second stamping press unit according to the claims, having a press ram for receiving and moving a first tool part which works against a receiving plate for receiving a corresponding second tool part.

The working direction of this second stamping press unit extends perpendicularly to the working directions of the first stamping press units, in such a way that material pieces or material strips processed in a working space of the second stamping press unit can be guided in direct extension of the working direction of the second stamping press unit into working regions of the first stamping press units for further processing in the first stamping press units with material pieces or material strips supplied in working direction of the first stamping press units to the first stamping press units. For this, the work plane of the second stamping press unit is preferably located in a same plane with the work planes of the first stamping press units.

The first stamping press units have each a crankshaft portion or eccentric shaft portion, which is rotatable about a first rotation axis according to the claims, and which serves in interaction with at least an attributed connecting rod to generate a travel movement of the press ram of the respective stamping press unit for processing the material pieces and/or the material strips in the first stamping press units. The crankshaft

portion or eccentric shaft portion of the first stamping
press units are driven via a common driving unit, wherein
their rotation axes are identical. They are connected or
coupled to one another in such a way that they are
5 rotated forcibly together with the same number of
rotations.

The second stamping press unit also has a
crankshaft portion or eccentric shaft portion which is
rotatable with a driving unit about a second rotation
10 axis according to the claims and which serves in
interaction with at least an attributed connecting rod to
generate a travel movement of the press ram of the second
stamping press unit for processing the material pieces
and/or the material strips in the second stamping press
15 unit. The crankshaft portion or eccentric shaft portion
of the second stamping press unit is coupled to the
crankshaft portion or eccentric shaft portion of the
first stamping press units in such a way, particularly by
a rotational positive fit in both rotation directions,
20 that its crankshaft portion or eccentric shaft portion is
rotatable forcibly synchronously with the crankshaft
portion or eccentric shaft portion of the first stamping
press units, preferably with the same number of
rotations.

25 In other words, the invention relates to a
stamping press arrangement with multiple stamping press
units arranged in an adjacent way, which have work
directions running mutually parallel in a common plane,
and with a second stamping press unit, the work direction
30 of which is perpendicular to the work directions of the
first stamping press units, such that material processed
in this stamping press unit can be guided in direct
extension of its work direction into work areas of the
first stamping press units. The stamping press units have
35 each a crankshaft portion or eccentric shaft portion, by
means of which the stroke movement of the respective
press ram is effected via a connecting rod. The

crankshaft portions or eccentric shaft portions of the first stamping press units are driven forcibly together with the same number of rotations by a common driving unit and they have a common rotation axis. The crankshaft
5 portion or eccentric shaft portion of the second stamping press unit is coupled to the crankshaft portions or eccentric shaft portions of the first stamping press units in such a way that it rotates forcibly synchronously with the latter.

10 The invention makes it possible to provide in an inexpensive way highly precise and fast stamping press arrangements for the economic large series production of low-tolerance multiple-part stamping and punching products, e.g. container lids with push-in or pull-off
15 tabs (EOEs), which can be opened without tools.

Preferably, the rotation axis of the crankshaft portion or eccentric shaft portion of the second stamping press unit is parallel to the rotation axis of the crankshaft portions or eccentric shaft
20 portions of the second stamping press units. It is particularly preferred that these rotation axes are identical. In this way, a simple and loss-free or low-loss, respectively, rotational coupling of the crankshaft portions or eccentric shaft portions is possible, e.g. by
25 their rigid mutual connection or by their coupling via a positive fit coupling.

It is further advantageous that the first stamping press units have each a separate crankshaft portion or eccentric shaft portion and the crankshaft
30 portions or eccentric shaft portions of the first stamping press units are coupled to one another by a rotational positive fit in both rotation directions, preferably such that they are radially and axially shiftable with respect to one another, wherein this is
35 advantageously done by means of one or more Oldham-couplings.

It is also advantageous that the second stamping press unit has a separate crankshaft portion or eccentric shaft portion which is coupled to the crankshaft portion or eccentric shaft portion of one of the first stamping press units in the way described above.

Such an embodiment of the stamping press units make it possible to rule out a transfer of temperature-dependent and stamping-force-dependent deformation forces between the stamping press units via their crankshaft portion or eccentric shaft portion.

In a further preferred embodiment of the stamping press arrangement, each one of the first stamping press units has an own receiving plate which is separate from the other stamping press units. In this way it is possible to mechanically decouple from one another to a large extent the structures of the stamping press units in order to avoid a transfer of temperature-dependent and stamping-force-dependent deformation forces between its structures.

In another preferred embodiment, the receiving plates of the first stamping press unit are formed together, which allows a considerable cost advantage in case certain compromises in terms of precision have to be accepted.

Advantageously, the press rams of the stamping press units work each from the top against a receiving plate arranged below. Such concepts have the advantage that the material pieces or material strips to be processed lie on the bottom, fixed tool half due to the gravitational force, thereby simplifying material handling for many applications in contrast to other concepts.

If the crankshaft portions or eccentric shaft portions are each arranged above the press ram, which is preferred, the advantage results that particularly precise stamping press units are possible, because a

minimization of the stamping-force-dependent bending of the press ram can be reached by a central force introduction into the press ram, and the actual press ram drive can be formed by very short and rigid components, thereby additionally leading to advantages with respect to the inert masses and thereby with respect to the feasible stamping frequencies.

In yet a further preferred embodiment of the stamping press arrangement according to the invention, it has multiple, preferably three or four first stamping press units according to the claims, arranged in an adjacent way, which are coupled to one another in a common self-carrying structure, preferably each one in sections of the stamping press units which are not charged by stamping forces. "Sections of the stamping press units which are not charged by stamping forces" are provided by components or component portions which do not experience dimension changes or deformation, respectively, due to the stamping force, in operation as intended. In this way, the individual stamping press units can be positioned in a precise way with respect to one another and they can be coupled to one another as a fixed unit. For the preferred case that the stamping press units are coupled to one another in an area which is substantially not charged by the stamping forces, the further advantage results that practically no deformations due to the stamping forces are transferred between the stamping press units.

In this context it is preferred that the two outer ones of the first stamping press units, which are coupled to one another in a common structure, are each coupled to a supporting structure via which the structure formed by the first stamping press units is supported on the floor. The connection with the supporting structure is preferably implemented in an area of the stamping press units, which is not charged by the stamping forces.

In this way it is possible to fix the height of the working planes of the stamping press units via the supporting structure and to use stamping press units in case of which the receiving plate is supported by a hanging supporting structure.

Advantageously, in case of this preferred embodiment of the stamping press arrangement, at least one of the supporting structures carries a second stamping press unit according to the claims on its side facing away from the mutually coupled first stamping press units. In this way, the at least one second stamping press unit can be positioned precisely with respect to the first stamping press units and it can be connected to them, thus forming a fixed unit. This also makes it possible to set the height of the working plane of the second stamping press unit via the supporting structure or to adjust it to the height of the working planes of the first stamping press units, respectively. Furthermore, in this way it is possible to use a second stamping press unit according to the claims, in case of which the receiving plate is carried by a hanging supporting structure.

A preferred configuration of this embodiment of the stamping press arrangement according to the invention has two groups of first stamping press units, preferably two groups of each three first stamping press units. These groups of first stamping press units are coupled to one another to a first common self-supporting structure (first group of first stamping press units), preferably each in an area of the respective stamping press units, which is substantially not charged by the stamping forces, and to a second common self-supporting structure (second group of first stamping press units). The first structure and the second structure are coupled to one another at their ends facing one another via a first supporting structure arranged between them, via which these two structures are each supported on the

floor with this first end. At its other second end, the structures are each coupled to a further supporting structure, with the first stamping press unit arranged at this second end, via which the respective structure is supported on the floor at its second end. At least one of these further supporting structures carries a second stamping press unit according to the claims on its side which is opposed to the respective first or second structure, respectively, of mutually connected first stamping press units. Very large volumes can be produced with such "tandem arrangement", wherein this configuration allows a simple supplying and discharging of material and products.

In order to keep wear and energy losses of the stamping press arrangement according to the invention as low as possible, it is further preferred that the driving unit for the first stamping press units according to the claims or the common driving unit for the first and second stamping press units, respectively, has no gears between its flywheel and the crankshaft portions or eccentric shaft portions.

It is further preferred that each one of the first stamping press units according to the claims has an own supply device for supplying individual material pieces into a working area of the respective stamping press unit, preferably a conveyor belt with holes for supplying metal blanks, e.g. metal can shell blanks. Such stamping press arrangements are particularly suitable for manufacturing container lids with press-in or pull tabs (EOEs) which can be opened without tools.

Advantageously, these supply devices are driven via the driving unit for the stamping press units, resulting in the simple implementation of a synchronous drive and in that additional drives are obsolete.

Preferably, no separable clutches are present between the supply devices and the driving unit, such

that a forcibly synchronous coupling of the supply devices is present.

If the supply devices are integrated into the receiving plates of the first stamping press units
5 according to the claims, which is preferred, they can be provided in a particularly space saving way.

In order to design the system concept of the stamping press arrangement according to the invention as robust and failsafe as possible and to reduce the effort
10 with respect to technical implementation to a minimum, it is further advantageous that the stamping press arrangement only has precisely one flywheel, precisely one friction and precisely one brake in the drive train for the stamping press units.

15 In a further preferred embodiment of the stamping press arrangement, the first stamping press units and/or the at least one second stamping press unit have each precisely one connecting rod, by means of which the stamping force is introduced centrally into the
20 respective press ram. This way of construction is advantageous particularly in case of short press rams, seen in transport direction, or in case of substantially central press ram load, respectively, because it has a simple and inexpensive drive mechanism with few moving
25 parts.

In a further preferred embodiment of the stamping press arrangement, the first stamping press units and/or the at least one second stamping press unit have each two connecting rods, by means of which the
30 stamping force is introduced symmetrically into the respective press ram. This way of construction is advantageous particularly in case of relatively long press rams, seen in transport direction, or in case of relatively asymmetric press ram load, respectively,
35 because it increases the tilt resistance of the press ram.

It is further advantageous that each one of the stamping press units of the stamping press arrangement has an own mass compensation device. In this way, the dynamic forces acting towards the outside can be diminished or eliminated, respectively.

It is also advantageous that each one of the stamping press units of the stamping press arrangement is adjustable independently from the other stamping press units with respect to press ram stroke and/or closing height. In this way, the stamping press arrangement according to the invention provides a maximum of production flexibility and production precision.

A second aspect of the invention relates to the use of the stamping press arrangement according to the first aspect of the invention for manufacturing metal can lids with a push-in or a pull-off tab. The advantages of the invention are particularly evident in case of such use of the stamping press arrangement.

Short description of the drawings

In the following the prior art and embodiments of the invention will be further explained by means of the figures. Thereby it is shown in:

Fig. 1 a front view of a first stamping press arrangement according to the invention;

Fig. 2 a side view of the first stamping press arrangement from the direction S of Fig. 1;

Fig. 3 a horizontal section through the first stamping press arrangement along the line X-X of Fig. 1;

Fig. 4 a partial vertical section through the first stamping press arrangement along the line X-Y of Fig. 2;

Fig. 5 a vertical section through the first stamping press arrangement along the line Z-Z of Fig. 4;

Fig. 6 a view like in Fig. 5 of a variant of the first stamping press arrangement; and

Fig. 7 a front view of a second stamping press arrangement according to the invention.

Ways of carrying out the invention

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Fig. 1 and 2 show a first stamping press arrangement for manufacturing metal container lids with a push-in or a pull-off tab and which can be opened without tools, once in a front view (Fig. 1) and once in a side view with viewing direction S from the left (Fig. 2).

As can be seen by viewing together with Fig. 3 and 4, which show a horizontal section along the line X-X of Fig. 1 (Fig. 3) and a partial vertical section along the line Y-Y of Fig. 2 (Fig. 4) through the press arrangement, the latter comprises three adjacent stamping presses 4a, 4b, 4c (three first stamping press units according to the invention), in the following called "conversion-presses", by means of which prefabricated metal sheet lids are provided with different profiles, with a carving for the opening location as well as with an additionally supplied push-in or pull-off tab, respectively. The three conversion presses 4a, 4b, 4c are coupled to one another as common self-supporting structure 4a-4c. The two outer conversion presses 4a, 4c of this structure 4a-4c are each coupled to a supporting structure 9, 11; 10, 11, via which the structure 4a-4c formed by the three conversion presses 4a, 4b, 4c is supported on the floor.

The left supporting structure 9, 11 consists of a drive housing 9 and a supporting pillar 11, and the right supporting structure 10, 11 consists of a supporting section 10 and a supporting pillar 11. Said supporting structure 10, 11 carries a further stamping press 8 (second stamping press unit according to the claims) on its side which is opposed to the conversion presses 4a, 4b, 4c, by means of which the push-in or the pull-off tabs, respectively, are manufactured from a

strip material 22. In the following, this press 8 is called "tab press".

The three conversion presses 4a, 4b, 4c are oriented with respect to one another in such a way that they have mutually parallel working directions B and their working planes are in a same plane.

The tab press 8 is oriented with respect to the conversion press 4a, 4b, 4c in such a way that its working direction A runs perpendicular to the working directions B of the conversion presses 4a, 4b, 4c and its working plane lies in the same plane, where also the working planes of the conversion presses 4a, 4b, 4c are located. The working direction A of the tab press 8 intersects with the working directions B of the conversion presses 4a, 4b, 4c in the working direction of the conversion presses 4a, 4b, 4c. The push-in or the pull-off tabs, respectively, formed in the working area of the tab press 8 by stamping and reshaping on a material strip 22, are guided with the material strip 22 in direct extension of the working direction A of the tab press 8 in the working areas of the conversion presses 4a, 4b, 4c, where each of them is detached from the material strip with the respective conversion press 4a, 4b, 4c and are riveted with the metal lids passing through the respective conversion press 4a, 4b, 4c in its working direction B. The transport of the material strip 22 in the working direction A of the tab press 8 through the presses 4a, 4b, 4c is done by means of an advancing device 23a at the input of the tab press 8 and a pulling device 23b at the output of the last conversion press, as seen in this direction A.

As it results particularly from Fig. 3 and 4 as seen together with Fig. 5, which shows a vertical section through the stamping press arrangement along the line Z-Z of Fig. 4, the conversion presses 4a, 4b, 4c comprise each a press ram 1a, 1b, 1c for receiving the moved top conversion tool half (not shown), which work

from above against a receiving plate 2a, 3a; 2b 3b; 2c, 3c, which is separate from the other presses, for receiving the attributed fixed bottom conversion tool half (not shown). The press rams 1a, 1b, 1c are each
5 guided as vertical shifting via four press ram guides 12.

In the same way, the tab press 8 comprises a press ram 5 for receiving the moved top tab tool half (not shown), which works from above against a receiving plate 6, 7 for receiving the attributed fixed bottom tab
10 tool half (not shown). The press ram 5 is also guided as vertical shifting via four press ram guides 21.

The conversion presses 4a, 4b, 4c have each separately formed crank shafts 28a, 28b, 28c (crankshaft portions or eccentric shaft portions according to the
15 claims), each of them being arranged above the respective press ram 1a, 1b, 1c and being coupled to the press ram 1a, 1b, 1c of the respective conversion press 4a, 4b, 4c via a single attributed connecting rod 29a, 29b, 29c, for generating the stroke of the press ram 1a, 1b, 1c of this
20 press. The stamping force is introduced into the press ram 1a, 1b, 1c with the connecting rod 29a, 29b, 29c, in each case centrally via a height-adjustable thrust bearing 39.

The tab press 8 also has a crank shaft 30
25 (crankshaft portion or eccentric shaft portion according to the claims), which is arranged above its press ram 5 and coupled to the press ram 5 via two connecting rods 31a, 31b, for generating the stroke of the press ram 5 of this press 8. The stamping force is introduced into the
30 press ram 5 with the two connecting rods 31a, 31b, symmetrically via two height-adjustable thrust bearings 39.

The rotation axis R2 of the crank shaft 30 of the tab press 8 and the rotation axis R1 of the crank
35 shafts 28a, 28b, 28c of the conversion presses 4a, 4b, 4c are identical. The cranks shafts 28a, 28b, 28c, 30 have a rotational positive fit in both rotation directions and

are coupled to one another radially and mutually shiftable by means of Oldham-couplings 32. They are driven via a common driving unit comprising an outer main drive motor 24, a friction arrangement and a brake arrangement 34, 35 with a flywheel 33, arranged inside the drive housing 9, as well as a belt drive 25, 26 arranged at the drive housing 9 below a protecting cover 27. No gears are arranged between the flywheel 33 and the crank shafts 28a, 28b, 28c, 30 of the presses 4a, 4b, 4c, 8.

As particularly visible in Fig. 3, each conversion press 4a, 4b, 4c has an own supplying device 13, 14, 15, integrated in its receiving plate, for supplying the metal shell blanks to their working area, each comprising a transfer system 13 and a transport band 15 with holes 16 for receiving the shell blanks. The transport band 15 extends between two deflection pulleys 14 through the respective conversion press 4a, 4b, 4c. The deflections pulleys 14 at the output of the conversion presses 4a, 4b, 4c are each carried by an axle 17, which is fixedly, with respect to rotation, connected to the respective deflection pulley 14 and which is supported via two bearing blocks 18 in a rotatable way on the structure of the respective conversion press 4a, 4b, 4c. These axles 17 of the three conversion presses 4a, 4b, 4c are coupled to one another via two intermediary axles 19 in a rotational positive fitting way in both rotation directions and they are driven by a stepping gear 20 which is coupled to the crank shafts 28a, 28b, 28c, 30 of the presses 4a, 4b, 4c, 8 in a synchronous way with respect to rotation by means of two angle gears 20a, 20c and a joint shaft 20b. No separable clutchess are present between the supplying devices 13, 14, 15, 16 and the driving unit 24, 25, 26, 33, 34.

As it is further evident, each of the presses 4a, 4b, 4c, 8 has a compensation mass 36a, 36b, 36c, 37 which is moved up and down by means of further connecting

rods arranged on the respective crank shaft 28a, 28b, 28c, 30 in an opposite direction to the respective press ram 1a, 1b, 1c, 5, in order to reduce or eliminate, respectively, dynamic forces acting to the outside.

5 Fig. 6 shows a variant of the stamping press arrangement in a vertical section along the line Z-Z of Fig. 4. As can be seen, in case of the conversion presses 4a, 4b, 4c of this variant, the respective connecting rod 29a, 29b, 29c is coupled to the press ram 1a, 1b, 1c of
10 the respective conversion press 4a, 4b, 4c via a lever mechanism, wherein the force introduction is done symmetrically via two pressure tongues 38.

 Fig. 7 shows a front view of a second stamping press arrangement according to the invention. It
15 differs from the above mentioned first stamping press arrangement according to the invention only in that it comprises six adjacent conversion presses 4d, 4e, 4f; 4g, 4h, 4i (six first stamping press units according to the claims), by means of which prefabricated sheet metal
20 shells are provided with different profiles, with a carving for the opening location as well as with a supplied push-in or pull-off tab, respectively.

 These six conversion presses 4d, 4e, 4f, 4g, 4h, 4i form two groups of each three conversion presses 4d, 4e, 4f; 4g, 4h, 4i, of which the first group 4d, 4e, 4f forms a first common self-supporting structure 4d-4f and the second group 4g, 4h, 4i forms a second common self-supporting structure 4g-4i. The first structure 4d-4f and the second structure 4g-4i are connected to one
30 another via a middle supporting structure 10a, 11a (first supporting structure according to the claims) arranged between them, which consists of a supporting portion 10 and a supporting pillar 11, and they are supported on the floor by means of this supporting structure 10, 11.

35 The first structure 4d-4f is connected at its left end with its outer conversion press 4d to a further supporting structure consisting of a drive housing 9 and

a supporting pillar 11 and it is supported on the floor via this supporting structure 9, 11.

The second structure 4g-4i is connected at its right end with its outer conversion press 4i to a further supporting structure consisting of a supporting portion 10 and a supporting pillar 11 and it is supported on the floor via this supporting structure 10, 11. This supporting structure 10, 11 supports on its side which faces away from the conversion presses 4g, 4h, 4i a tab press 8 (second stamping press unit according to the claims), by means of which the push-in or pull-off tabs, respectively, are produced of a material strip.

The rest of the construction of this second stamping press arrangement according to the invention is identical to the one of the first stamping press arrangement.

While preferred embodiments of the invention are described in the present patent application, it is clearly noted that the invention is not limited to these embodiments but can also be carried out in different ways within the scope of the following claims.

Claims

1. Stamping press arrangement comprising at least two adjacent first stamping press units (4a-4c; 4d-4i), each of which has a press ram (1a, 1b, 1c) for receiving a first tool part, which works against a receiving plate (2a, 3a; 2b, 3b; 2c, 3c) for receiving a corresponding second tool part, wherein the first stamping press units (4a-4c; 4d-4i) have working directions (B) extending parallel to each other in a common plane, and comprising at least a second stamping press unit (8) having a press ram (5) for receiving a first tool part which works against a receiving plate (6, 7) for receiving a corresponding second tool part, wherein the working direction (A) of the at least one second stamping press unit (8) extends perpendicularly to the working directions (B) of the first stamping press units (4a-4c; 4d-4i), in such a way that material pieces or material strips processed in a working space of the second stamping press unit (8) can be guided in direct extension of the working direction (A) of the second stamping press unit (8) into working regions of the first stamping press units (4a-4c; 4d-4i) for further processing in the first stamping press units (4a-4c; 4d-4i) with material pieces or material strips supplied in working direction (B) of the first stamping press units (4a-4c; 4d-4i) to the first stamping press units, wherein the at least two first stamping press units (4a-4c; 4d-4i) are driven via a common driving unit (24, 25, 26), wherein each of the respective first stamping press units (4a-4c; 4d-4i) has a crankshaft portion or eccentric shaft portion (28a, 28b, 28c), which is rotatable about a first rotation axis (R1) by the driving unit (24, 25, 26) in order to generate a travel movement of the press ram (1a, 1b, 1c) of the respective stamping press unit (4a-4c; 4d-4i), in interaction with at least one connecting rod (29a, 29b, 29c) of the

respective first stamping press unit (4a-4c; 4d-4i), for processing the material pieces and/or the material strips in the first stamping press units (4a-4c; 4d-4i), wherein the rotation axes (R1) of the crankshaft portions or eccentric shaft portions (28a, 28b, 28c) of the first stamping press units (4a-4c; 4d-4i) are identical and wherein the crankshaft portions or eccentric shaft portions (28a, 28b, 28c) of the first stamping press units (4a-4c; 4d-4i) are connected or coupled to one another in such a way that they are rotated forcibly together with the same number of rotations,

wherein the at least one second stamping press unit (8) has a crankshaft portion or eccentric shaft portion (30) which is rotatable about a second rotation axis (R2) by a driving unit (24, 25, 26, 33, 34), for generating in interaction with at least one connecting rod (31a, 31b) of the at least one second stamping press unit (8) a travel movement of the press ram (5) of the at least one second stamping press unit (8) for processing the material pieces or material strips in the second stamping press unit (8),

wherein the crankshaft portion or eccentric shaft portion (30) of the at least one second stamping press unit (8) is coupled to the crankshaft portions or eccentric shaft portions (28a, 28b, 28c) of the first stamping press units (4a-4c; 4d-4i) in such a way, particularly by a rotational positive fit in both rotation directions, that it is rotatable forcibly synchronously with the crankshaft portions or eccentric shaft portions (28a, 28b, 28c) of the first stamping press units (4a-4c; 4d-4i), particularly with the same number of rotations,

wherein multiple, particularly three or four, first stamping press units (4a-4c; 4d-4f; 4g-4i) arranged in an adjacent way are coupled to one another to form a common structure (4a-4c; 4d-4f; 4g-4i),

wherein the two outer ones of these first stamping press units (4a, 4c; 4d, 4f; 4g, 4i) coupled to one another to form a common structure are each coupled to a supporting structure (9, 11; 10, 11; 10a, 11a), via
5 which the structure (4a-4c; 4d-4f; 4g-4i) formed by it is supported on the floor,

and wherein each one of the first stamping press units (4a-4c; 4d-4i) has an own receiving plate (2a, 3a; 2b, 3b; 2c, 3c) which is separate from the other
10 stamping press units, each of which is supported by a hanging supporting structure.

2. Stamping press arrangement according to claim 1, wherein at least one of the supporting
15 structures (10, 11), via which the structure (4a-4c; 4d-4f; 4g-4i) formed by the adjacent first stamping press units (4a-4c; 4d-4f; 4g-4i) is supported on the floor, carries on its side facing away from the mutually coupled first stamping press units (4a-4c; 4g-4i) the at least
20 one second stamping press unit (8).

3. Stamping press arrangement according to claim 1 and to claim 2, wherein two groups of first stamping press units (4d-4f; 4g-4i), particularly two
25 groups of each three first stamping press units (4d-4f; 4g-4i), are coupled to one another to a first common structure (4d-4f) and to a second common structure (4g-4i), wherein this first structure (4d-4f) and this second structure (4g-4i) are coupled to one another via a first
30 supporting structure (10a, 11a) arranged between them, via which the first structure (4d-4f) and the second structure (4g-4i) are supported on the floor, wherein each outer first stamping press unit (4d; 4i) of the respective first (4d-4f) or second structure (4g-4i),
35 respectively, is coupled to a further supporting structure (9, 11; 10, 11), via which it is supported on the floor, and wherein at least one of the further

supporting structures (9, 11; 10, 11) carries one of the second stamping press units (8) on its side facing away from the respective first (4d-4f) or second structure (4g-4i), respectively.

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4. Stamping press arrangement according to one of the preceding claims, wherein the second rotation axis (R2) is parallel to the first rotation axis (R1), and particularly wherein it is identical with it.

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5. Stamping press arrangement according to one of the preceding claims, wherein the first stamping press units (4a-4c; 4d-4i) have each a separate crankshaft portion or eccentric shaft portion (28a, 28b, 28c) and these crankshaft portions or eccentric shaft portions (28a, 28b, 28c) are coupled to one another by a rotational positive fit in both rotation directions, particularly in such a way that they are axially and radially shiftable with respect to one another, particularly by means of one or more Oldham couplings (32).

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6. Stamping press arrangement according to one of the preceding claims, wherein the at least one second stamping press unit (8) has a separate crankshaft portion or eccentric shaft portion (30) which is coupled to one crankshaft portion or eccentric shaft portion (28c) of one of the first stamping press units (4c; 4i) by a rotational positive fit in both rotation directions, particularly in such a way that the two crankshaft portions or eccentric shaft portions (28c, 30) are axially and radially shiftable with respect to one another, particularly by means of an Oldham coupling (32).

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7. Stamping press arrangement according to one of the preceding claims, wherein the press rams (1a,

1c, 1d, 5) of the stamping press units (4a-4c, 8; 4d-4i, 8) work each from the top against the receiving plates (2a, 3a; 2b, 3b; 2c, 3c; 6, 7).

5 8. Stamping press arrangement according to one of the preceding claims, wherein the crankshaft portions or eccentric shaft portions (28a, 28b, 28c, 30) are each arranged above the press rams (1a, 1b, 1c, 5).

10 9. Stamping press arrangement according to one of the preceding claims, wherein the driving unit (24, 25, 26) for the at least two first stamping press units (4a-4c; 4d-4i) has a flywheel (33) and no gears are arranged between the flywheel (33) and the crankshaft
15 portions or eccentric shaft portions (28a, 28b, 28c) of the at least two first stamping press units (4a-4c; 4d-4i).

 10. Stamping press arrangement according to
20 one of the preceding claims, wherein each one of the first stamping press units (4a-4c; 4d-4i) has a supply device (13, 14, 15) for supplying individual material pieces into a working area of the respective stamping press unit (4a-4c; 4d-4i), particularly a conveyor belt
25 (15) with holes (16) for supplying metal can shell blanks.

 11. Stamping press arrangement according to claim 10, wherein the supply devices (13, 14, 15) are
30 driven with the driving unit (24, 25, 26) for the at least two first stamping press units (4a-4c; 4d-4i).

 12. Stamping press arrangement according to claim 11, wherein no separable clutches are present
35 between the supply devices (13, 14, 15) and the driving unit (24, 25, 26).

13. Stamping press arrangement according to one of the claims 10 to 12, wherein the supply devices (13, 14, 15) are integrated into the receiving plates (2a, 3a; 2b, 3b; 2c, 3c) of the first stamping press units (4a-4c; 4d-4i).

14. Stamping press arrangement according to one of the preceding claims, wherein the stamping press arrangement in the drive train for the stamping press units (4a-4c, 8; 4d-4i, 8) has precisely one flywheel (33), precisely one friction (34) and precisely one brake (35).

15. Stamping press arrangement according to one of the preceding claims, wherein the first stamping press units (4a-4c; 4d-4i) in each case have precisely one connecting rod (29a, 29b, 29c), by means of which the stamping force is introduced centrally into the respective press ram (1a, 1b, 1c).

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16. Stamping press arrangement according to one of the preceding claims, wherein the at least one second stamping press unit (8) has two connecting rods (31a, 31b), by means of which the stamping force is introduced symmetrically into its press ram (5).

17. Stamping press arrangement according to one of the preceding claims, wherein each one of the stamping press units (4a-4c, 8; 4d-4i, 8) has an own mass compensation device (36a, 36b, 36c, 37) for diminishing or eliminating dynamic forces acting towards the outside.

18. Stamping press arrangement according to one of the preceding claims, wherein each one of the stamping press units (4a-4c, 8; 4d-4i, 8) is adjustable independently from the other stamping press units with respect to press ram stroke and/or closing height.

19. Use of the stamping press unit according to one of the preceding claims for manufacturing metal can ends with a push-in or a pull-off tab.