

Description

The invention relates to a system of machining devices particularly for machining so-called lead frames, such as punching, cutting and bending. Such lead frames are intended for carrying chips. The intended processes to be performed on the lead frames are performed in a so-called cutting and bending machine. Such a cutting and bending machine needs to combine great accuracy with the highest possible machining speed. For machining the lead frames are carried by means of transporting means through the machine, placed on a machining station and subjected to a machining, whereafter the transporting means pick up the lead frames again and transport them to a following station. The entire process takes place automatically.

In older machines the machine tool is driven via pneumatic means in order to perform an active stroke. A pneumatic cylinder coupled to the tool carrier is employed for this purpose. Later machines were driven via hydraulic means since the forces generated therewith are greater than the forces obtained via pneumatic means. A complication in such a type of device is that a comparatively large stroke length is required since the transporting means require a free passage in order to be able to place the lead frame on a machining station and then pick it up again. It is furthermore desirable to be able to visually inspect the machining zone.

The hydraulic driving also has other different drawbacks. Firstly, the use of a hydraulic medium is not easily compatible with the clean environment in which the process must take place. In addition, the accuracy of the movement via hydraulic means is limited, since this movement is only guided by one guide, the hydraulic piston rod. In the past different steps have been taken to increase this accuracy, but the possibilities are limited. Should it be desired to further increase the speed, the hydraulic drive imposes limits, since the speed is limited among other reasons because the driving hydraulic medium has to surmount a dead point during a complete cycle of the active stroke. The result is that the transport of the lead frame can only be performed when it has been established that the stroke of the tool has ended at a predetermined position.

The invention has further for its object to obviate the above mentioned drawbacks. Particular objectives here must be a great stroke length, a high speed, a clean operating environment and great accuracy of the movement of the tool relative to the lead frame.

From JP-A-6165461 a cutting device as defined in the preamble of claim 1 is known.

Besides cutting the leads of a lead frame other operations should be machined, such as bending and punching. Thereto, according to the prior art, the lead frame should be taken out from such a machine and it should be placed in another machining device.

It is the object of the invention to provide an integrated system in which all the necessary operations are being carried out automatically in a controlled way.

This is achieved with the features as defined in claim

1.

By providing an integrated modular automatically operating system a economically suitable way of performing operations is obtained.

The modular construction furnishes great advantages, particularly in production. The machining devices can be separately produced and tested. They can then be assembled into a desired system. This provides a great degree of flexibility.

The member driving the tool carrier is preferably formed by an eccentric rotatably driven by a motor and situated in the main frame of the machining device.

A continuous movement is obtained by this method of driving, which allows a higher machining speed. Such a drive method is possible since the forces to be exerted for the machining are limited.

Coupled to the eccentric and connected to the tool carrier is an auxiliary frame, which is vertically guided in the main frame for performing relative to the main frame an active stroke performed between two end positions.

The end positions of the auxiliary frame are adjustable relative to the main frame. The option is therefore available of having the active stroke performed relative to the machining surface at a position where this is deemed desirable. The stroke depth can hereby be regulated. In addition, with a view to inspection, the working surface can be made entirely visually accessible as desired.

The setting of the end positions of the auxiliary frame preferably takes place by means of a shaft rotatable in the main frame and driven by a stepping motor, which shaft is coupled to the auxiliary frame over a screw connection. By using a stepping motor and a very fine screw thread connection a very accurate adjustment of the end positions of the auxiliary frame can be obtained.

The shaft is preferably a keyway shaft and is received for vertical movement in a belt pulley driven rotatably by the stepping motor.

For synchronously controlling the machining devices and the operation of the transport means the control device is coupled to sensors which detect the angle position of the eccentric in each of the machining devices. The system of machining devices is controlled on the basis of the information obtained under the control of software in the microprocessor incorporated in the control device.

The transport means for horizontal and vertical transport in the machining device are driven by a cam disc placed on the main shaft.

For driving of the transport means for horizontal transport the ridge disc is coupled over a fork-shaped member, which performs a linear movement when the cam disc rotates, to a pinion and a toothed rack, wherein the toothed rack, by means of a lever eccentrically connected to the toothed rack, provides a reciprocating movement of the transport means slidable along guide tracks.

For driving of the vertical transport the main shaft is coupled to cam discs disposed in parallel which drive operating members moving guide tracks for horizontal transport of a lead frame between end positions in vertical direction.

To avoid damage the system preferably contains a sensor connected to a release mechanism for a coupling between the drive motor and the main shaft for detecting an overload in the drive of the tool.

In order to ensure that after decoupling the device comes rapidly to a standstill, a brake coupled to the eccentric is energized at release of the coupling when an overload is detected.

For the transport between the machining devices the transport means consist of an endless belt with a feed end for receiving a lead frame passed on by the horizontal transport means of a preceding machining device and a discharge end for transferring a lead frame to the horizontal transport means of a following machining device, a stop for a lead frame placed above the endless belt, wherein the material of the endless belt has a friction coefficient such that, when the lead frame strikes against the stop, the belt slips relative to the lead frame.

The invention will be further elucidated with reference to the drawings.

In the drawings:

Fig. 1 shows a schematic perspective view of a system according to the invention,

Fig. 2 shows a perspective cut away view according to the line II-II in fig. 1,

Fig. 3 is a sectional view along the line III-III from fig. 2;

Fig. 4 shows a similar view to fig. 3, but in another of the end positions of the auxiliary frame, and

Fig. 5 shows a detail V from fig. 4.

Fig. 6 shows a perspective view of the horizontal drive and vertical drive of the transport means.

The system according to the invention comprises machining devices 1, 2, 3 accommodated in cabinet-like units 1, 2, 3, the operation of which devices is controlled and mutually synchronized from the control module 4. A microprocessor is incorporated in the control module 4. The control module 4 has a control panel 5 and a control unit in the form of a monitor 6.

The lead frame 7 for machining is transported by means of a transport means 8 which is movable over lengthwise guides 68 and 69 in a machining device. At the location of each machining device 1, 2, 3 is a machining station 11, 12, 13 respectively, where the various required processes, including punching, bending, cutting and the like, can be performed. Each machining device comprises at least a main frame 14 and an auxiliary frame 15 that is movable vertically relative to the main frame 14 with guide rods 40, 41, 42, 43 in bearings 16, 17. The main frame comprises transverse bearers 44, 45 which are connected at a distance by vertical walls

46, 47. The bearings 16, 17 are arranged in the transverse bearers 44 and 45 respectively.

The auxiliary frame 15 comprises a horizontally running, lower coupling member 48 connected to the guide rods 40, 41, 42, 43 and, arranged at a vertical distance therefrom, an upper coupling member 49 that is likewise fixedly connected to the guide rods 40, 41, 42, 43. The tool consists of a tool carrier 18 bearing a tool 19 and a work surface 38 co-acting therewith. Coupled to the upper coupling member 49 of the auxiliary frame 15 is a tool carrier 18 in which a desired tool 19 is placed. A shaft 20 which carries an eccentric 21 is received rotatably in protruding parts 50, 51, 52 on the transverse bearer 44 of the main frame 14. The shaft 20 is driven from the motor 22 via a transmission 23 and a belt pulley 24. The eccentric 21 is mounted in bearings 25, 26 of the protruding parts 50 and 51 respectively. The eccentric carries a spherical pivot 27 resting in an adapted bearing socket 28. With a rotation of the shaft 20 the eccentric, and therefore the auxiliary frame 15, moves between two end positions, one of which is drawn in fig. 3 and the other in fig. 4. These end positions respectively correspond to the open position of the machine tool 19 and the closed position thereof.

During the movement between both end positions a part 29 of the auxiliary frame 15 moves with the shaft 30 coupled thereto in a bearing 31 in the transverse bearer of the main frame. The coupling between the part of the shaft 30 and the auxiliary frame 15, in any case the flange shaped portion 32 thereof, runs via a screw thread connection 33 (fig. 5). Using the stepping motor 34 the belt pulley 36 can be rotated via the drive belt 35. Because the shaft 30 has a keyway 37 which co-acts with corresponding ribs on the inside of the bearing 31, the shaft 30 rotates with the belt pulley 36 therein carrying with it the part 29. Due to this rotation movement the part 32 of the auxiliary frame and the part 33 move in a lengthwise direction relative to one another so that the auxiliary frame 15 undergoes a vertical movement. Indicated with broken lines in fig. 5 is the position of the auxiliary frame relative to the part 29 in the situation according to fig. 3 and 4. In the present embodiment as according to fig. 5 the auxiliary frame 15 is moved in upward direction so that the work surface 38 is completely accessible. A subsequent active stroke of the eccentric 21 and therefore the auxiliary frame 15 will thus produce a higher lying end position of the machine tool 19 than in the position indicated in fig. 3 and 4. In the manner outlined in the foregoing, the depth of the active stroke can therefore be accurately controlled.

Fig. 6 shows the manner of transport into a machining device.

Placed on the main shaft 20 is a cam disc 60 which co-acts with a fork-shaped member 61 such that with a rotation movement of the cam disc 60 the fork-shaped member performs a linear reciprocating movement according to the arrows shown. The fork-shaped member 61 carries with it during the linear movement a cam 63 which engages on a worm gear 64 which is coupled

to a shaft 65. Due to the reciprocating movement of the worm wheel, coupled to cam 63, the worm gear 64 rotates, as does the shaft 65 therefore which is mounted in the frame. A lever 66 is eccentrically coupled to the shaft 65. At a rotation movement of the shaft 65, the lever performs a reciprocating movement between two end positions. The lever is coupled at the end with drive means 67 which move the transport means reciprocally along the guide track 69.

There is therefore a one-way coupling between the movement of the horizontal transport means and the rotation of the main shaft 20 so that complete synchronization with the movement of the tool of the machining device is ensured.

As can be seen, there is also a one-way coupling between the vertical transport of the lead frame in the machining device and the rotation of the main shaft 20. The main shaft 20 is coupled to the cam discs 73, 74 by an endless drive belt 70 which is trained over belt pulleys 71, 72. When the main shaft 20 rotates, the cam discs 73, 74 are driven. The cam discs 73, 74 rotating synchronously and in phase impart to the drive members 75, 76 a vertical movement between two end positions. The members 75, 76 are coupled to the respective guide tracks 68, 69 so that these likewise undergo a vertical movement.

Because both the horizontal and the vertical transport is derived from the main shaft 20 a complete synchronization between the mutual movements and the movement of the tool is ensured.

A releasing mechanism is arranged in the coupling 100 between the shaft of the driving belt pulley 24 and the main shaft 20. The coupling is connected via means (not drawn) to an overload sensor which measures the load of the drive of the tool. In the case of overloading as a result for example of incorrect placing of a lead frame, the release mechanism of the coupling 100, controlled by a signal from the sensor, is set into operation and therefore releases the shaft 20 from the drive shaft. A brake (not shown) of for instance pneumatic type also comes into operation which brings the main shaft and therefore the eccentric to a standstill within a very short period of time.

Finally, it is noted that for transport between the machining devices use is made of a buffer transporter 110. Such a buffer transporter 110 consists of an endless belt conveyor and a stop 111. During operation a lead frame is placed on the endless belt conveyor 110 by the horizontal transport means of a preceding machining device. The lead frame moves over the belt conveyor 110 until it meets the stop 111. After the lead frame has come to a standstill against the stop, the belt slips under the lead frame. The horizontal transport means of a following machining device take the lead frame at a suitable moment in time from the belt conveyor 110 and carry it to the machining location on the following machining device.

Claims

1. Apparatus comprising at least one machining device for punching the leads of a lead frame (7) comprising a main frame, a tool carrier carrying a tool and movable in a substantially vertical direction for performing an active punching stroke, a member driving the tool carrier and means (fig. 6) for transporting the lead frames in horizontal and vertical direction in the machining device characterized by machining devices (1, 2, 3), such as cutting and bending devices, placed in series with said punching device, transport means for transporting the lead frames (7) for machining along a transport path between successive machining devices (1, 2, 3), comprising an endless belt (110) with a feed end for receiving a lead frame passed on by the horizontal transport means of a preceding machining device and a discharge end for transferring a lead frame to the horizontal transport means of a following machining device, a stop (111) for a lead frame placed above the endless belt (110), wherein the material of the endless belt has a friction coefficient such that when the lead frame strikes against the stop (111) the belt slips relative to the lead frame and a control device (4) coupled to the machining devices for controlling and protecting the operation of the machining devices.
2. Apparatus as claimed in claim 1, characterized in that the member driving the tool carrier (18) is an eccentric rotatably driven by a motor, mounted in the main frame (14) of the machining device and coupled to the main shaft (20).
3. Apparatus as claimed in claims 1, 2, characterized in that an auxiliary frame (15) connected to the tool carrier (18) is coupled to the eccentric (21), which auxiliary frame (15) is guided vertically in the main frame (14) for performing relative to the main frame (14) an active stroke performed between two end positions.
4. Apparatus as claimed in claim 3, characterized in that the end positions of the auxiliary frame (15) are adjustable relative to the main frame (14).
5. Apparatus as claimed in claim 4, characterized in that the setting of the end positions of the auxiliary frame (15) take place by means of a shaft rotatable in the main frame (14) and driven by a stepping motor (34), which shaft is coupled to the auxiliary frame (15) over a screw thread connection (33).
6. Apparatus as claimed in claim 5, characterized in that the shaft is a keyway (37) shaft and is received for vertical movement in a belt pulley rotatably driven by the stepping motor (34).

to a shaft 65. Due to the reciprocating movement of the worm wheel, coupled to cam 63, the worm gear 64 rotates, as does the shaft 65 therefore which is mounted in the frame. A lever 66 is eccentrically coupled to the shaft 65. At a rotation movement of the shaft 65, the lever performs a reciprocating movement between two end positions. The lever is coupled at the end with drive means 67 which move the transport means reciprocally along the guide track 69.

There is therefore a one-way coupling between the movement of the horizontal transport means and the rotation of the main shaft 20 so that complete synchronization with the movement of the tool of the machining device is ensured.

As can be seen, there is also a one-way coupling between the vertical transport of the lead frame in the machining device and the rotation of the main shaft 20. The main shaft 20 is coupled to the cam discs 73, 74 by an endless drive belt 70 which is trained over belt pulleys 71, 72. When the main shaft 20 rotates, the cam discs 73, 74 are driven. The cam discs 73, 74 rotating synchronously and in phase impart to the drive members 75, 76 a vertical movement between two end positions. The members 75, 76 are coupled to the respective guide tracks 68, 69 so that these likewise undergo a vertical movement.

Because both the horizontal and the vertical transport is derived from the main shaft 20 a complete synchronization between the mutual movements and the movement of the tool is ensured.

A releasing mechanism is arranged in the coupling 100 between the shaft of the driving belt pulley 24 and the main shaft 20. The coupling is connected via means (not drawn) to an overload sensor which measures the load of the drive of the tool. In the case of overloading as a result for example of incorrect placing of a lead frame, the release mechanism of the coupling 100, controlled by a signal from the sensor, is set into operation and therefore releases the shaft 20 from the drive shaft. A brake (not shown) of for instance pneumatic type also comes into operation which brings the main shaft and therefore the eccentric to a standstill within a very short period of time.

Finally, it is noted that for transport between the machining devices use is made of a buffer transporter 110. Such a buffer transporter 110 consists of an endless belt conveyor and a stop 111. During operation a lead frame is placed on the endless belt conveyor 110 by the horizontal transport means of a preceding machining device. The lead frame moves over the belt conveyor 110 until it meets the stop 111. After the lead frame has come to a standstill against the stop, the belt slips under the lead frame. The horizontal transport means of a following machining device take the lead frame at a suitable moment in time from the belt conveyor 110 and carry it to the machining location on the following machining device.

Claims

1. Apparatus comprising at least one machining device for punching the leads of a lead frame (7) comprising a main frame, a tool carrier carrying a tool and movable in a substantially vertical direction for performing an active punching stroke, a member driving the tool carrier and means (fig. 6) for transporting the lead frames in horizontal and vertical direction in the machining device characterized by machining devices (1, 2, 3), such as cutting and bending devices, placed in series with said punching device, transport means for transporting the lead frames (7) for machining along a transport path between successive machining devices (1, 2, 3), comprising an endless belt (110) with a feed end for receiving a lead frame passed on by the horizontal transport means of a preceding machining device and a discharge end for transferring a lead frame to the horizontal transport means of a following machining device, a stop (111) for a lead frame placed above the endless belt (110), wherein the material of the endless belt has a friction coefficient such that when the lead frame strikes against the stop (111) the belt slips relative to the lead frame and a control device (4) coupled to the machining devices for controlling and protecting the operation of the machining devices.
2. Apparatus as claimed in claim 1, characterized in that the member driving the tool carrier (18) is an eccentric rotatably driven by a motor, mounted in the main frame (14) of the machining device and coupled to the main shaft (20).
3. Apparatus as claimed in claims 1, 2, characterized in that an auxiliary frame (15) connected to the tool carrier (18) is coupled to the eccentric (21), which auxiliary frame (15) is guided vertically in the main frame (14) for performing relative to the main frame (14) an active stroke performed between two end positions.
4. Apparatus as claimed in claim 3, characterized in that the end positions of the auxiliary frame (15) are adjustable relative to the main frame (14).
5. Apparatus as claimed in claim 4, characterized in that the setting of the end positions of the auxiliary frame (15) take place by means of a shaft rotatable in the main frame (14) and driven by a stepping motor (34), which shaft is coupled to the auxiliary frame (15) over a screw thread connection (33).
6. Apparatus as claimed in claim 5, characterized in that the shaft is a keyway (37) shaft and is received for vertical movement in a belt pulley rotatably driven by the stepping motor (34).



7. Apparatus as claimed in claims 1-6, characterized in that the control device is coupled to sensors detecting the angle position of the eccentric, the control device contains a microprocessor, and software is incorporated in the microprocessor to synchronize the operation of the transport means, the driving of the eccentric and the stepping motor (34) and to protect the operation of the system. 5
8. Apparatus as claimed in claim 2, characterized in that the transport means for the horizontal and vertical transport in the machining device are driven by a cam disc (60) placed on the main shaft (20). 10
9. Apparatus as claimed in claim 8, characterized in that for driving the transport means for the horizontal transport, the cam disc (60) is coupled over a fork-shaped member (61), which performs a linear movement when the cam disc (60) is rotated, to a pinion and toothed rack, and by means of a lever eccentrically connected thereto the toothed rack imparts a reciprocating movement to the transport means slidable along guide tracks (68, 69). 15 20
10. Apparatus as claimed in claim 8, characterized in that for driving of the vertical transport the main shaft is coupled to cam discs (73, 74) disposed in parallel which drive the operating members moving the guide tracks (68, 69) for the horizontal transport of a lead frame between end positions in vertical direction. 25 30
11. Apparatus as claimed in claims 1-10, characterized by a sensor connected to a release mechanism for a coupling (100) between the drive motor and the main shaft for detecting an overload in the drive of the tool. 35
12. Apparatus as claimed in claim 11, characterized in that when the coupling (100) is released when overload is detected, a brake coupled to the main shaft is energized. 40
13. Apparatus claimed in claim 12, characterized in that the brake is of the pneumatic type. 45

Patentansprüche

1. Gerät mit mindestens einer Bearbeitungsvorrichtung zum Stanzen der Führungen eines Führungsrahmens (7) mit einem Hauptrahmen, einem Werkzeugträger, der ein Werkzeug trägt und eine im wesentlichen vertikale Richtung zum Durchführen eines aktiven Stanzhubes bewegbar ist, einem Teil, das den Werkzeugträger antreibt, und Mittel (Fig. 6) zum Transportieren der Führungsrahmen in horizontaler und vertikaler Richtung in der Bearbeitungsvorrichtung, gekennzeichnet durch 50 55

Bearbeitungsvorrichtungen (1, 2, 3), wie Schneide- und Biegevorrichtungen, die in Reihe mit der Stanzvorrichtung angeordnet sind, Transportmittel zum Transportieren der Führungsrahmen (7) zum Bearbeiten entlang eines Transportweges zwischen aufeinanderfolgenden Bearbeitungsvorrichtungen (1, 2, 3) mit einem Endlosriemen (110) mit einem Zuführende zum Aufnehmen eines Führungsrahmens, der von den horizontalen Transportmitteln einer vorangehenden Bearbeitungsvorrichtung übergeben wird, und einem Ausgabeeende zum Übertragen des Führungsrahmens zu den horizontalen Transportmitteln einer folgenden Bearbeitungsvorrichtung, einem Anschlag (111) für einen Führungsrahmen, der oberhalb des Endlosriemens (110) angeordnet ist, wobei das Material des Endlosriemens einen solchen Reibungskoeffizienten aufweist, das, wenn der Führungsrahmen gegen den Anschlag stößt, der Riemen relativ zu dem Führungsrahmen durchschlupft, und eine Steuereinrichtung (4), die mit den Bearbeitungsvorrichtung zum Steuern und Schützen des Betriebes der Bearbeitungsvorrichtungen gekoppelt ist.

2. Gerät nach Anspruch 1, dadurch gekennzeichnet, daß das den Werkzeugträger (18) antreibende Teil ein Exzenter ist, der drehbar von einem Motor angetrieben wird, in dem Hauptrahmen (14) der Bearbeitungsvorrichtung angebracht ist und mit der Hauptwelle (20) gekoppelt ist.
3. Gerät nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein Hilfsrahmen (15), der mit dem Werkzeugträger (18) verbunden ist, mit dem Exzenter (21) gekoppelt ist, welcher Hilfsrahmen (15) vertikal in dem Hauptrahmen (14) zum Durchführen eines aktiven Hubes relativ zu dem Hauptrahmen (14), der zwischen zwei Endpositionen durchgeführt wird, geführt ist.
4. Gerät nach Anspruch 3, dadurch gekennzeichnet, daß die Endpositionen des Hilfsrahmens (15) relativ zu dem Hauptrahmen (14) einstellbar sind.
5. Gerät nach Anspruch 4, dadurch gekennzeichnet, daß das Einstellen der Endpositionen des Hilfsrahmens (15) mittels einer Welle stattfindet, die drehbar in dem Hauptrahmen (14) angeordnet ist und von einem Schrittmotor (34) angetrieben ist, welche Welle mit dem Hilfsrahmen (15) über eine Schraubengewindeverbindung (33) verbunden ist.
6. Gerät nach Anspruch 5, dadurch gekennzeichnet, daß die Welle eine Keilnutwelle ist und für eine vertikale Bewegung in einer Riemenscheibe aufgenommen ist, die drehbar von dem Schrittmotor (34) angetrieben ist.



7. Gerät nach Ansprüchen 1 bis 6, dadurch gekennzeichnet, daß die Steuereinrichtung (4) mit Sensoren gekoppelt ist, die die Winkelposition des Exzenters erfassen, die Steuereinrichtung (4) einen Mikroprozessor enthält und Software in den Mikroprozessor zum Synchronisieren des Betriebes der Transportmittel, des Antreibens des Exzenters und des Schrittmotors (34) und zum Schützen des Betriebes des Systemes eingesetzt ist. 5
8. Gerät nach Anspruch 2, dadurch gekennzeichnet, daß die Transportmittel für den horizontalen und vertikalen Transport in der Bearbeitungsvorrichtung durch eine Nockenscheibe (60) angetrieben werden, die auf der Hauptwelle (20) angeordnet ist. 10 15
9. Gerät nach Anspruch 8, dadurch gekennzeichnet, daß zum antreiben der Transportmittel für den horizontalen Transport die Nockenscheibe (60) über ein gabelförmiges Teil (61), das lineare Bewegung ausführt, wenn sich die Nockenscheibe (60) dreht, mit einem Ritzel und einer Zahnstange gekoppelt ist und die Zahnstange mittels eines exzentrisch damit verbundenen Hebels eine Hin- und Herbewegung auf die Transportmittel ausübt, die gleitend verschiebbar entlang von Führungsschienen (68, 69) vorgesehen sind. 20 25
10. Gerät nach Anspruch 8, dadurch gekennzeichnet, daß zum Antreiben des vertikalen Transportes die Hauptwelle mit Nockenscheiben (73, 74) gekoppelt ist, die parallel vorgesehen sind, die die Betriebsteile antreiben, die die Führungsschienen (68, 69) für den horizontalen Transport eines Führungsrahmens zwischen Endpositionen in der vertikalen Richtung bewegen. 30 35
11. Gerät nach Ansprüchen 1 bis 10, gekennzeichnet durch einen Sensor, der mit einem Freigabemechanismus für eine Kopplung (100) zwischen dem Antriebsmotor und der Hauptwelle verbunden ist, zum Erfassen einer Überlast des Antriebs des Werkzeuges. 40
12. Gerät nach Anspruch 11, dadurch gekennzeichnet, daß, wenn die Kopplung (100) freigegeben wird, wenn eine Überlast erfaßt wird, eine mit der Hauptwelle gekoppelte Bremse erregt wird. 45
13. Gerät nach Anspruch 12, dadurch gekennzeichnet, daß die Bremse vom pneumatischen Typ ist. 50

Revendications

1. Ensemble comprenant au moins un appareil d'usinage destiné au poinçonnage des fils de connexion d'un cadre (7) à fils de connexion, comprenant un châssis principal, un porte-outil qui porte un outil et qui est mobile en direction pratiquement verticale 55

pour effectuer une course active de poinçonnage, un organe entraînant le porte-outil, et un dispositif (figure 6) de transport des cadres à fils de connexion en directions horizontale et verticale dans l'appareil d'usinage, caractérisé par des appareils d'usinage (1, 2, 3) tels que des appareils de coupe et de cintrage, placés en série avec l'appareil de poinçonnage, un dispositif de transport des cadres (7) à fils de connexion afin qu'ils subissent un usinage, le long d'un trajet de transport entre des appareils successifs d'usinage (1, 2, 3), comprenant une courroie sans fin (110) ayant une extrémité d'alimentation destinée à la réception d'un cadre à fils de connexion transmis par le dispositif de transport horizontal d'un appareil précédent d'usinage et une extrémité d'évacuation destinée au transfert d'un cadre à fils de connexion au dispositif de transport horizontal d'un appareil suivant d'usinage, et un organe (111) d'arrêt d'un cadre à fils de connexion placé au-dessus de la courroie sans fin (110), le matériau de la courroie sans fin ayant un coefficient de frottement tel que, lorsque le cadre à fils de connexion vient frapper l'organe d'arrêt (111), la courroie glisse par rapport au cadre à fils de connexion, et un appareil de commande (4) couplé aux appareils d'usinage et destiné à commander et protéger le fonctionnement des appareils d'usinage.

2. Ensemble selon la revendication 1, caractérisé en ce que l'organe d'entraînement du porte-outil (18) est un excentrique entraîné en rotation par un moteur, monté dans le châssis principal (14) de l'appareil d'usinage et couplé à l'arbre principal (20).
3. Ensemble selon les revendications 1, 2, caractérisé en ce qu'un châssis auxiliaire (15) raccordé au porte-outil (18) est couplé à l'excentrique (21), et le châssis auxiliaire (15) est guidé verticalement dans le châssis principal (14) afin qu'il effectue une course active par rapport au châssis principal (14) entre deux positions d'extrémité.
4. Ensemble selon la revendication 3, caractérisé en ce que les positions d'extrémité du châssis auxiliaire (15) sont réglables par rapport au châssis principal (14).
5. Ensemble selon la revendication 4, caractérisé en ce que le réglage des positions d'extrémité du châssis auxiliaire (15) est réalisé à l'aide d'un arbre qui peut tourner dans le châssis principal (14) et qui est entraîné par un moteur pas à pas (34), cet arbre étant couplé au châssis auxiliaire (15) par un raccord à vis (33).
6. Ensemble selon la revendication 5, caractérisé en ce que l'arbre est un arbre à clavette (37) et est logé, afin qu'il se déplace verticalement, dans une poulie



de passage d'une courroie, entraînée en rotation par le moteur pas à pas (34).

7. Ensemble selon les revendications 1 à 6, caractérisé en ce que l'appareil de commande (4) est couplé à des capteurs qui détectent la position angulaire de l'excentrique, l'appareil de commande (4) contient un microprocesseur, et un logiciel est incorporé au microprocesseur afin qu'il synchronise le fonctionnement du dispositif de transport, l'entraînement de l'excentrique et le moteur pas à pas (34) et protège le fonctionnement de l'ensemble. 5 10
8. Ensemble selon la revendication 2, caractérisé en ce que le dispositif de transport horizontal et vertical dans l'appareil d'usinage est entraîné par un disque à came (60) placé sur l'arbre principal (20). 15
9. Ensemble selon la revendication 8, caractérisé en ce que, pour l'entraînement du dispositif de transport horizontal, le disque à came (60) est couplé, par un organe à fourche (61) qui effectue un mouvement linéaire lorsque le disque à came (60) tourne, à un pignon et une crémaillère, et celle-ci, à l'aide d'un levier qui lui est raccordé excentriquement, provoque un mouvement alternatif du dispositif de transport par coulissement le long de voies de guidage (68, 69). 20 25
10. Ensemble selon la revendication 8, caractérisé en ce que, pour l'entraînement en direction verticale, l'arbre principal est couplé à des disques à came (73, 74) disposés parallèlement et qui entraînent les organes de manoeuvre qui déplacent les voies de guidage (68, 69) de transport horizontal d'un cadre à fils de connexion entre des positions d'extrémité en direction verticale. 30 35
11. Ensemble selon les revendications 1 à 10, caractérisé par un capteur raccordé à un mécanisme de libération d'un accouplement (100) placé entre le moteur d'entraînement et l'arbre principal et destiné à détecter une surcharge lors de l'entraînement de l'outil. 40 45
12. Ensemble selon la revendication 11, caractérisé en ce que, lorsque l'accouplement (100) est libéré lors de la détection d'une surcharge, un frein couplé à l'arbre principal est commandé. 50
13. Ensemble selon la revendication 12, caractérisé en ce que le frein est de type pneumatique. 55

