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(73) Patenthaver: **M.E.P. Macchine Elettroniche Piegatrici S.p.A., Via Leonardo da Vinci, 20, 33010 Reana del Rojale (UD), Italien**

(72) Opfinder: **Del Fabro, Giorgio, Via Zanon, 18/10, 33100 Udine (UD), Italien**

(74) Fuldmægtig i Danmark: **Larsen & Birkeholm A/S Skandinavisk Patentbureau, Banegårdspladsen 1, 1570 København V, Danmark**

(54) Benævnelse: **Træk- og/eller udretningsenhed til aflange metalprodukter, såsom stænger, runde stykker eller metaltråd**

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EP-A- 0 446 648
EP-A- 0 689 884
WO-A-2007/141273
DE-A1- 4 442 483
DE-U1- 9 408 880

DESCRIPTION

FIELD OF THE INVENTION

[0001] The present invention concerns a drawing and/or straightening unit, applicable to feed to a work machine oblong metal products, such as bars, round pieces or metal wire, for example of the type used to make reinforcement for the building trade. In particular, the drawing and/or straightening unit according to the present invention is applied, preferentially, to machines that work simultaneously at least two bars, round pieces or metal wires at a time, feeding them in a substantially uniform, coordinated and simultaneous manner.

BACKGROUND OF THE INVENTION

[0002] Bending/shaping machines are known, also called stirrup machines, that are fed with oblong metal products, such as metal wire from a roll, iron round pieces, pre-sheared metal wire or bars, to make reinforcement stirrups for the building trade.

[0003] The machines are generally fed with two or more metal products at a time, in order to optimize the productivity of the machine.

[0004] Both metal products fed from a roll, and also pre-sheared bars, are generally obtained at the end of the hot rolling cycle and have on the outside a plurality of ribs, so as to improve the conditions under which they grip the concrete, during use.

[0005] Since the metal products are made by rolling, and also due to the presence of the ribs, the section of the metal products is not perfectly circular, and they have an oval section characterized by a bigger axis, in correspondence with the ribs, and a smaller axis staggered by about 90° from the bigger axis and smaller by a few millimeters.

[0006] It is also known that the work machines, generally at the head, have a drawing and/or straightening unit to feed the metal products to the operating stations of the machine.

[0007] The known drawing and/or straightening unit consists of a plurality of rollers opposite with respect to the axis of feed of the metal products, in order to draw them and/or stretch them.

[0008] Known drawing and/or straightening units normally comprise a driven roller provided with one or more circular throats, in which the metal products to be fed are disposed, and one or more contrasting rollers, opposite the driven roller with respect to the metal products.

[0009] The contrasting rollers are not constrained to each other, and each of them exerts a

determinate pressure in the direction of the driven roller, in correspondence with a relative circular throat.

[0010] The contrasting action is intended to ensure a sufficient friction between the metal product and the driven roller, limiting possible slipping of the metal product in the circular throats.

[0011] It is also known that the contrasting rollers can be selectively made to approach the driven roller, depending on the nominal diameter of the metal products being worked.

[0012] Moreover, known contrasting rollers are normally cushioned by means of respective elastic elements, for example cup springs, pre-loaded to absorb vibrations, or to compensate, with the pressure exerted, slight variations in the diameter of the metal products as they move.

[0013] The approach movement and the pre-loading of the elastic elements in the contrasting rollers are pre-defined and pre-adjusted, before the start of the steps to feed the metal product, depending on the sizes and type of metal product fed.

[0014] The document DE-A1-44 42 483 for example discloses a unit for feeding two or more oblong metal products to a machine for working said metal products, comprising first driven rollers 17a on which are able to be positioned longitudinally two or more metal products, and two or more second contrasting rollers 17b. Actuator means 21 are operationally associated with said second rollers. Each said actuator means 21 may be connected to one respective of said second contrasting rollers in order to move it linearly independently.

[0015] The document DE-G-94 08 880 discloses a device for simultaneously feeding a number of thin wires, wherein the device comprises contrasting rollers mounted on a swing arm driven by linear actuators.

[0016] During the normal feed of known metal products, in particular but not only when fed from a roll, the metal products tend to rotate on themselves, thus varying, during feed, their angular orientation with respect to their longitudinal axis.

[0017] This angular variation can lead to a limit condition in which a metal product is orientated with its bigger axis aligned between the driven roller and the respective contrasting roller, whereas another metal product is orientated with its smaller axis aligned between the two rollers, respectively driven roller and contrasting roller.

[0018] In order to guarantee drawing even in this limit condition, the adjustment of the approach movement and pre-loading of the elastic elements is often carried out empirically in an intermediate condition, presumably valid for both limit conditions of angular orientation of the metal products.

[0019] In practice, however, the metal product orientated on the smaller axis is not subjected

to sufficient contrast, and slips partly in the relative circular throat, whereas the metal product orientated on the bigger axis is over-contrasted.

[0020] The different contrasting action of the contrasting rollers on the individual metal products causes different speeds of feed of the metal products and the relative sliding thereof during feed. Consequently, errors occur in the feed to the operating stations of the machine, and there is a risk of loops forming and the metal products stretching.

[0021] In the state of the art, in fact, there is a frequent risk that stirrups may form that have different sizes and that do not correspond to the design data set.

[0022] Moreover, the excessive contrast on one of the metal products causes an increase in wear on the circular throats of the driven roller which, with time, lose their efficient guide function, for a correct feed of the metal products.

[0023] Purpose of the present invention is to achieve a drawing and/or straightening unit that allows to obviate the disadvantages of the state of the art in a simple and effective way, allowing a simultaneous and coordinated feed of several metal products at a time, substantially whatever the angular orientation of each of them.

[0024] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0025] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0026] In accordance with the above purpose, a drawing and/or straightening unit according to the present invention is applied to feed two or more oblong metal products, such as bars, round pieces or metal wire, to a machine for working said metal products.

[0027] The drawing and/or straightening unit according to the present invention comprises at least a first driven roller, and two or more a second contrasting rollers, opposite the first roller, with respect to the axis of feed of the metal products, so as to maintain the latter efficiently against the first roller, typically inside the circular throats during the feed steps.

[0028] The drawing and/or straightening unit also comprises actuator means, operationally associated with the second rollers, and able to move the latter in a selected and controlled manner with respect to the first roller.

[0029] According to the invention, the first roller has a drawing wheel provided with two or

more circular throats for feeding two or more metal products and the relative two or more second rollers are independent of each other in their movement toward the first roller.

[0030] In this solution, the actuator means can be associated independently with each of the second rollers, so that the latter can be disposed, and hence contrast, the relative metal products independently and in an optimum manner.

[0031] This guarantees that each metal product has the same conditions of contrast and feed, irrespective of its angular position and/or size, thus preventing the formation of loops and/or reciprocal slipping of the metal products fed at the same time.

[0032] Further according to the invention, the actuator means comprise at least a linear actuator for each of the two or more independent second rollers, in order to actuate both an initial approach to the first roller, and also a selective and controlled movement during the feed steps so as to compensate, substantially continuously, the progressive variations in size of the metal product.

[0033] According to a variant, particularly pertinent for the simultaneous drawing of two or more metal products, the actuator means comprise a first linear actuator, common for all the second rollers, in order to actuate the initial approach to the first roller, and a second linear actuator, for each second roller, to carry out independently the selective and controlled movement of the second rollers.

[0034] According to a variant, the actuator means comprise a screw member at least to determine the initial approach of the second roller/rollers to the first roller.

[0035] According to a variant, the actuator means comprise at least a drive member.

[0036] According to another variant, the actuator means is associated to at least an elastic member able to at least partly cushion the contrasting action of the second rollers on the relative metal product.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a front view of one embodiment of a drawing and/or straightening unit according to the present invention;
- fig. 2 shows a part section from I to I of fig. 1, in a first operating condition;
- fig. 3 shows the section from I to I of fig. 1 in a second operating condition;
- fig. 4 shows an enlarged detail of fig. 2;

- fig. 5 shows an enlarged detail of fig. 3.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF

EMBODIMENT

[0038] With reference to the attached drawings, a drawing and/or straightening unit 10 according to the present invention is applied advantageously, but not exclusively, to a bending/shaping machine, such as a stirrup machine, not shown, that is fed simultaneously with at least two metal wires or round pieces 11.

[0039] The drawing and/or straightening unit 10 according to the present invention comprises a drawing roller 12, driven, two external contrasting rollers 13, two internal contrasting rollers 15 and in this case a plurality of stretching rollers 16, disposed upstream and downstream of the contrasting rollers 13 and 15 with respect to the direction of feed F of the metal round pieces 11.

[0040] In particular, the drawing roller 12 comprises a single drawing wheel provided on the periphery with two circular throats, respectively external 17 and internal 19, both having a substantially V-shaped cross section and with sizes correlated to the nominal diameter of the metal round pieces 11 to be fed.

[0041] The stretching rollers 16 are of a substantially traditional type, and will not be described in detail here.

[0042] The contrasting rollers 13 and 15 are disposed on the opposite side from the drawing roller 12 with respect to the axis of feed F of the metal round pieces 11.

[0043] The contrasting rollers 13 and 15 are mounted on a mobile support 22, which is able to move together the contrasting rollers 13 and 15 toward the drawing roller 12, to reach a predetermined initial position, depending on the sizes of the metal round pieces 11.

[0044] The mobile support 22 is selectively movable by means of a screw transmission 23 commanded by a drive member, not shown.

[0045] According to a variant, the mobile support 22 is cushioned by elastic members, for example cup springs, to absorb the impacts on the contrasting rollers 13 and 15 caused by surface imperfections and/or vibrations of the metal round pieces 11.

[0046] In this case, the external contrasting rollers 13 are mounted on the mobile support 22

by means of a relative external slider 20, whereas the internal contrasting rollers 15 are mounted on the mobile support 22 by means of a relative internal slider 21.

[0047] The external slider 20 and the internal slider 21 are separate from each other and can slide independently one from the other.

[0048] In particular, each slider 20 and 21 is operationally associated with a relative linear actuator 25 and 26, mounted on the mobile support 22. Each linear actuator 25 and 26 moves the relative slider 20, 21 independently of the other and with respect to the mobile support 22.

[0049] The movement imparted by each linear actuator 25, 26 allows to compensate, substantially continuously and without pre-ordained constraints and with an extremely high level of precision and sensitivity, possible variations in the diameter of the metal round pieces 11 with respect to their nominal size, guaranteeing constant conditions of contrast and feed.

[0050] As can be seen, in particular by comparing figs. 4 and 5, when the two metal round pieces 11 are angularly oriented in a substantially analogous manner, the two contrasting rollers 13 and 15 are substantially at the same distance from the drawing roller 12.

[0051] On the contrary, when one of the two metal round pieces 11, in this case the one farthest to the left, is angularly oriented in a different way from the other, the difference in diameter, instead of being compensated by a super-pressure, is made up for by the downward movement of the internal contrasting roller 15.

[0052] This movement is actuated by the relative linear actuator 25, until the internal contrasting roller 15 is taken to the normal contrast pressure conditions against the metal round piece 11. The pressure conditions are substantially equivalent to the contrast pressure conditions applied by the external contrasting roller 13.

[0053] It is clear, however, that modifications and/or additions of parts may be made to the drawing and/or straightening unit 10 as described heretofore, without departing from the scope of the present invention.

[0054] For example, it comes within the field of the present invention to provide that instead of the two sliders 20 and 21, a mobile support 22 is provided, conformed so as to provide two mobile parts, independent of each other, and each supporting a relative contrasting roller 13 or 15.

[0055] In this solution, two independent screw transmissions 23 are provided, or other similar actuator member able to effect both the movement of bringing together both the contrasting rollers 13 and 15, and also the compensating movement of each contrasting roller 13 or 15, during feed, in order to allow a constant contrast pressure on the metal round pieces 11.

[0056] According to the invention, the activation of one or the other of the two linear actuators

25 and 26 is commanded by sensor members and/or pressure controllers of each linear actuator 25 and 26, so that it acts always at the same working pressure.

[0057] According to a variant, the two linear actuators 25 and 26 are selectively commanded by optical sensors to control the angular orientation of the metal round pieces 11.

[0058] According to another variant, instead of the linear actuators 25 and 26, motor means are provided, able to move the two contrasting rollers 13 and 15 independently, so as to constantly guarantee the same working pressure on the relative metal round pieces 11.

[0059] According to a variant, the present invention is applied to a traditional drawing unit without stretching rollers 16 and consisting substantially of one or more drawing rollers 12 and corresponding external 13 and internal 15 contrasting rollers.

[0060] According to a variant, each contrasting roller 13, 15 is mechanically associated with elastic members, to absorb possible vibrations or jumping due to the surface imperfections of the metal round pieces 11.

[0061] It also comes within the field of the present invention to provide two screw transmissions 23 able to determine a rough movement of approach of the contrasting rollers 13 and 15, and two linear actuators 25 and 26, able to define a precise movement of the contrasting rollers 13 and 15, so as to guarantee, constantly, that the same contrasting pressure is applied on the metal round pieces.

[0062] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of drawing and/or straightening unit for oblong metal products, such as bars, round pieces or metal wire, having the characteristics as set forth in the claims and hence all coming within the field of protection defined by the appended claims.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE4442483A1 [0014]

- DE9408880G [0015]

PATENTKRAV

1. Træk- og/eller udretningsenhed til samtidig fremføring af to eller flere aflange metalprodukter (11) til en maskine til bearbejdning af metalprodukterne (11), omfattende mindst en første drevet valse (12) med et trækhjul forsynet med to eller flere ringformede halse (17, 19), hvor der inde i hver især kan positioneres respektive metalprodukter, to eller flere andre kontrastvalser (13, 15), der er uafhængige af hinanden i bevægelse og ligger modsat den første drevne valse (12) i forhold til en fremføringsakse (F) for metalprodukterne (11), hvor hver især af kontrastvalserne (13, 15) er indrettet til at holde et pågældende af metalprodukterne (11) korrekt positioneret i den pågældende hals (17, 19) i den første drevne valse (12) under fremføring, og aktuatororganer (25, 26), der funktionsmæssigt er forbundet med de andre kontrastvalser (13, 15) og er i stand til at bevæge de andre kontrastvalser (13, 15) i forhold til den første drevne valse (12) for at variere afstanden mellem de andre kontrastvalser (13, 15) og den første drevne valse (12), hvor aktuatororganerne (25,26) er af den lineære type, og hver især af hvilke er forbundet med en respektiv af de andre kontrastvalser (13, 15) for at bevæge den lineært uafhængigt af den anden kontrastvalse (13, 15) for på en uafhængig og optimeret måde at danne et kontrasttryk på de pågældende metalprodukter (11), der er positioneret i den respektive hals (17, 19) i den første drevne valse (12), og er i stand til for hver anden kontrastvalse (13, 15) at styre både en indledende tilnærmelsesbevægelse mod den første drevne valse (12) og også den selektive og styrede bevægelse og dermed kontrasttrykket påført metalproduktet (11) i det væsentlige kontinuerligt under fremføringstrinet svarende til de aktuelle størrelser af det respektive metalprodukt (11), hvor der er tilvejebragt sensorelementer og/eller trykstyringsindretninger til at styre aktiveringen af aktuatororganerne (25, 26), således at de altid kan virke ved det samme arbejdstryk.

2. Træk- eller udretningsenhed ifølge krav 1, **kendetegnet ved, at** aktuatororganerne (25, 26) omfatter i det mindste et elastisk element, der er i stand til i det

mindste delvis at støddæmpe kontrastvirkningen af de andre valser (13, 15) på det pågældende metalprodukt (11).

3. Træk- eller udretningsenhed ifølge et hvilket som helst foregående krav, **kendetegnet ved, at** hver især af de andre kontrastvalser (13, 15) er monteret på en pågældende glider (20, 21), der er bevægelig uafhængigt ved hjælp af aktuator-organernes (25, 26) virkemåde.

DRAWINGS

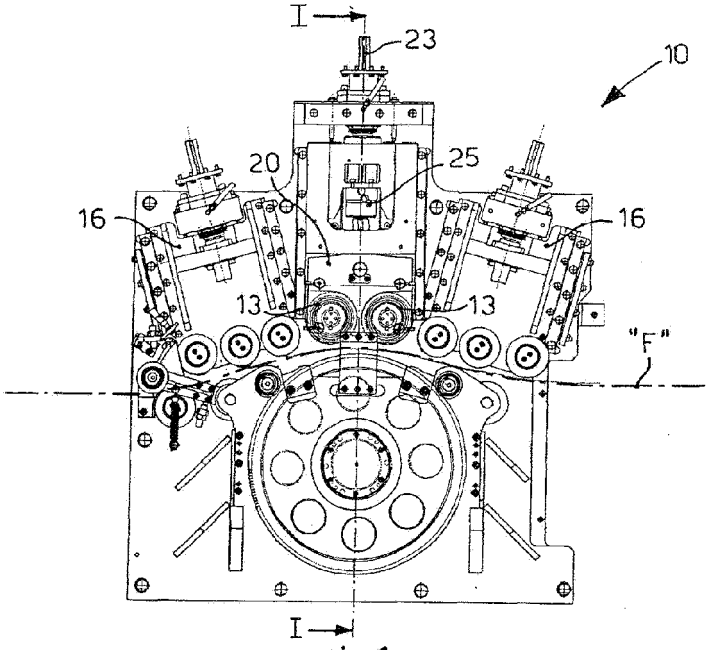

fig.1

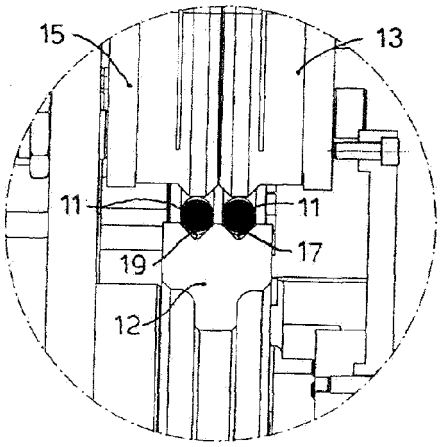

fig. 4

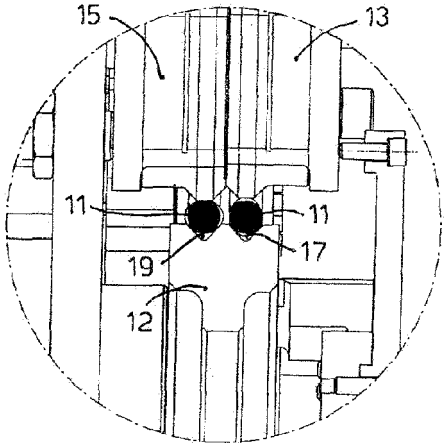

fig.5

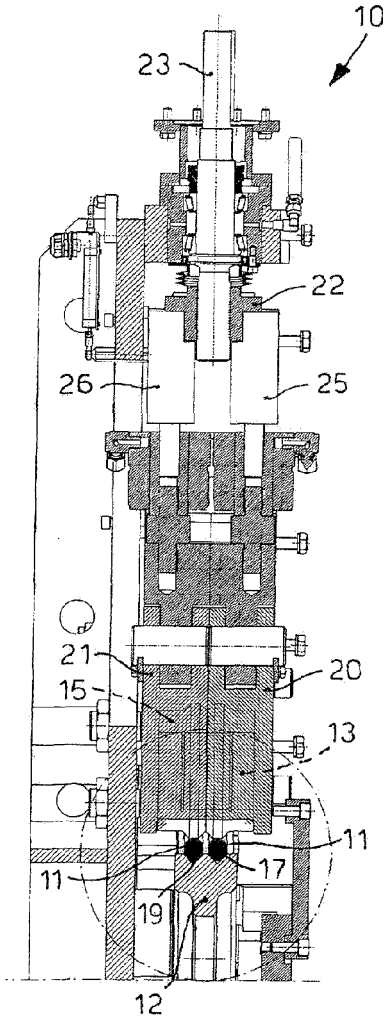
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fig. 2

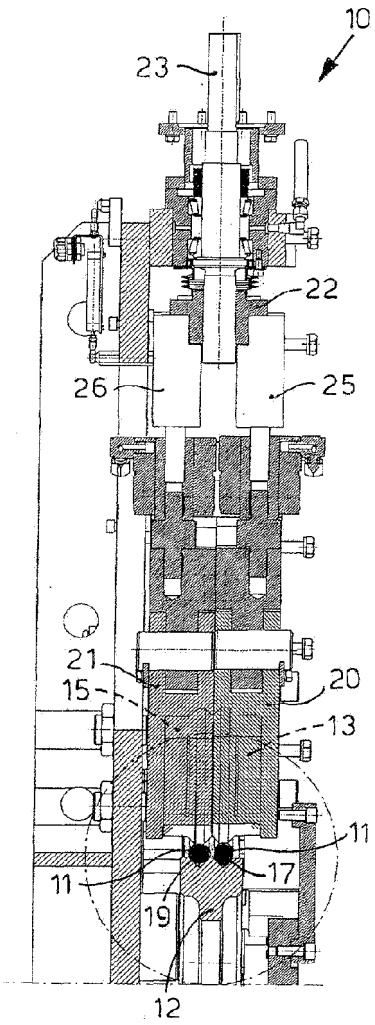
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fig. 3