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(54) Method and apparatus for forming packs of stirrups and pack of stirrups thus formed

(57) A method for forming packs (10) of stirrups (12), entails arranging or picking up at least one first stirrup (12) at a front input region (E) and picking up the stirrup (12) by way of grip and welding means (5) that can move along a longitudinal direction with respect to the aid input region (E). Then the alternating movement of the grip and welding means (5) into a forward position is produced in order to draw the stirrup (12) into the same forward position. At least one longitudinal auxiliary rod (11) is fixed externally to the stirrup (12), which is retained by the grip and welding means (5). A series of additional stirrups (12), picked up in succession by the grip and welding means (5) at the input region (E), is arranged adjacent to the first stirrup (12) drawn into the forward position, so as to form a pack (10) of stirrups (12). The longitudinal auxiliary rod (11) is fixed externally to at least the last stirrup (12) and finally is cut ahead of the resulting pack (10). The invention also concerns an apparatus for forming packs of stirrups and a pack of stirrups thus formed.

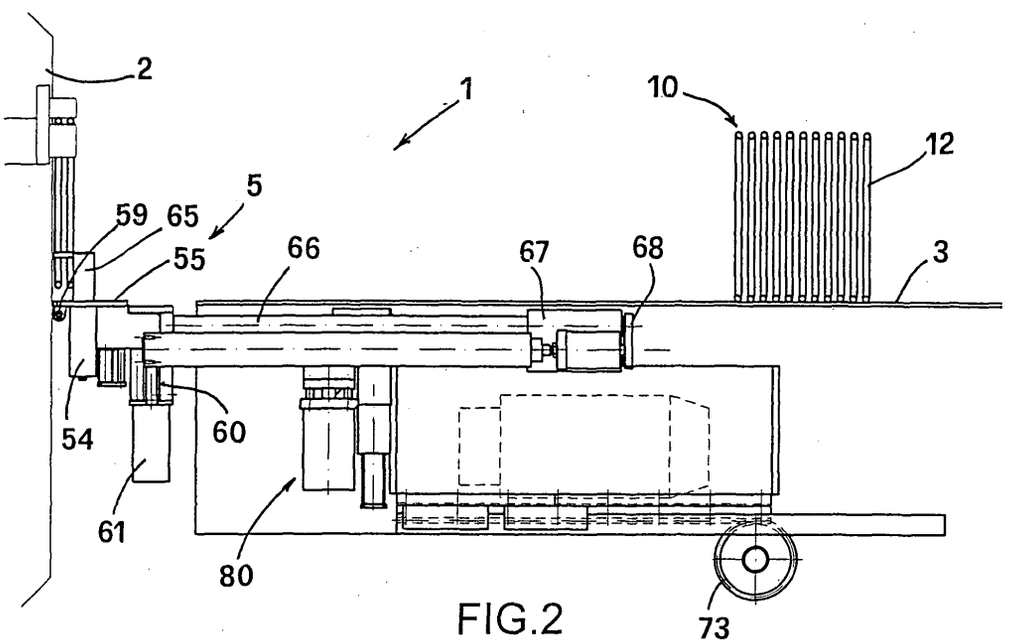

FIG.2

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Description

[0001] The present invention relates to a method and an apparatus for forming packs of stirrups and to the pack of stirrups thus formed.

[0002] It is known that the reinforcement frame of reinforced concrete pillars and beams is commonly formed by using metal frames constituted by longitudinal iron rods connected by suitably spaced transverse stirrups. The stirrups usually form a closed path, for example a quadrilateral one, with overlapping ends. The longitudinal rods are inserted in the profile formed by the stirrups and are fixed, for example at the comers of said profile.

[0003] The stirrups are formed by appropriately provided stirrup bending machines according to the required profile. If the stirrups are not meant for immediate use at the production site, they must be grouped in order to be able to store them tidily. This operation is currently performed manually by assigned operators, with obvious discomfort and fatigue.

[0004] In particular, one common operating method entails allowing the stirrups that exit from the stirrup bending machine to drop to the ground, where they gradually accumulate. The operator then picks up the stirrups and places them in a tidy pack to be bound by way of suitable bindings or the like. The stirrups that pile up on the ground can easily become entangled, so the operator also has to pick them up from the ground and disengage them from each other before tidying them up, which leads to an increase of the work required. Moreover, in the meantime the stirrup bending machine must be stopped, for obvious reasons, and therefore its productivity is penalized by this operation.

[0005] In a different operating method, the operator picks up the stirrups directly from the stirrup bending machine without allowing them to fall and then arranges them tidily, one after the other, until they form the intended pack. This solution is rational in itself, but it is not devoid of dangers, since the operator has to work close to the stirrup bending machine, and also requires constant involvement of the operator.

[0006] The aim of the present invention is to solve the cited problem, by providing a method that allows to produce automatically packs of stirrups for reinforced concrete.

[0007] Within this aim, an object of the present invention is to provide an apparatus that allows to perform said method for forming packs of stirrups by way of a structure that is simple in concept, safely reliable in operation, and versatile in use.

[0008] Another object of the present invention is to provide a pack of stirrups that has innovative characteristics as regards ease and versatility of use and formation.

[0009] This aim and these objects are achieved, according to the invention, by the present method for forming packs of stirrups, characterized in that it comprises the steps of:

(a). arranging or picking up at least one first stirrup at a front input region of an apparatus for forming packs of stirrups;
(b). picking up said first stirrup from said front input region by way of grip and welding means that can move along a longitudinal direction with respect to said input region;
(c). producing the alternating movement of said grip and welding means (5) into a forward position in order to draw said first stirrup into the same forward position;
(d). fixing at least one longitudinal auxiliary rod externally to said first stirrup, which is retained by said grip and welding means;
(e). arranging adjacent to said first stirrup drawn into said forward position a series of additional stirrups, picked up in succession by said grip and welding means at said input region, so as to form a pack of stirrups;
(f). fixing said longitudinal auxiliary rod externally to at least one last stirrup of said pack;
(g). cutting said auxiliary rod ahead of said pack thus formed.

[0010] The features of the invention will become better apparent from the detailed description of a preferred embodiment of the apparatus for forming packs of stirrups, illustrated by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a pack of stirrups formed according to the method of the invention;
Figures 2, 3, 4, 5, 6, 7, 8 and 9 are side views of the apparatus for forming packs of stirrups in successive steps of operation;
Figures 10 and 11 are respective perspective views of variously shaped packs of stirrups.

[0011] With reference to the figures, the reference numeral 1 generally designates a working head of the apparatus for forming packs 10 of stirrups 12 for reinforced concrete according to the present invention. The apparatus according to the invention duplicates, in its general features, the structure disclosed in co-pending Italian patent application B02002A000438, by the same Applicant, to which reference is made for a more complete general description. Patent application no. B02002A000438 relates to an apparatus for forming metal cages for reinforced concrete, and therefore the present invention relates to a different application of said structure.

[0012] The apparatus is adapted to be associated with a conventional stirrup bending machine 2; it should be noted that the stirrup bending machine 2 has a working surface that is arranged vertically for the sake of convenience.

[0013] The apparatus has a chassis, not shown, which is provided with the working elements and is arranged in front of the stirrup bending machine 2. A longitudinally elongated platform 3 protrudes from the chassis and forms a horizontal working surface. The packs 10 of stirrups are meant to form on the working surface of the platform 3 and are obtained, as specified hereinafter, by joining one or more longitudinal auxiliary rods 11 externally to a tidy series of said stirrups 12. The auxiliary rods 11 unwind from corresponding spools, not shown, which are arranged preferably with a vertical axis at the sides of the platform 3.

[0014] The chassis of the apparatus supports, in a suitably adjustable position, at least one working head 1, which is adapted to pick up the stirrups 12, form the pack 10 and weld a respective auxiliary rod 11 to the stirrups 12. In the case shown in Figure 1, the stirrups 12 form a substantially rectangular profile and are mutually connected by way of three auxiliary rods 11, which are arranged respectively on the lateral portions and on the lower portion of the stirrups 12, and therefore three working heads are required.

[0015] Each working head 1 is provided with means 5 for gripping and welding the auxiliary rod 11 and the stirrups 12 which form the pack 10 of stirrups.

[0016] More specifically, said gripping and welding means 5 provide a grip element 51, which is constituted by a beak 52 that is directed toward the stirrup bending machine 2 and is rigidly coupled to the stem 53 of a linear actuator 54. The actuator 54 is fixed to a bracket 55, which is rigidly coupled to a stem 56 that is guided so that it can slide, in contrast with elastic means 57, through a sliding block 58, which in turn is rigidly coupled to the stem 60 of a second linear actuator 61, along an axis that is parallel to the axis of the first actuator 54. The second actuator 61 is supported by a brace 63, which is provided with a pair of stems 64 for guiding the sliding block 58.

[0017] The bracket 55 is provided with a housing 65 for protecting the beak 52. The bracket 55 is further provided with a protruding roller 59, adapted to act as an abutment on the front surface of the stirrup bending machine 2.

[0018] The brace 63 is fixed to the end of a pair of horizontal guiding shafts 66, which pass slidingly through a body 67. At the opposite end, the shafts 66 are fixed, by means of a plate 68, to the stem 69 of a double-stroke grip actuator 70.

[0019] The body 67 is fixed to a box-like enclosure 74, which acts as a support for a transformer element 75. A rack 76 is rigidly coupled to the enclosure 74 in a downward region and is adapted to couple to a corresponding gear 73, which is turned by suitable motor elements.

[0020] The welding means 8 are supported in a cantilevered fashion in front of the enclosure 74 and are constituted by movable welding units 81, which cooperate with fixed welding units 82, for example of the resistance welding type, which are open in a forward direction. The movable welding units 81 are supported by an arm 83, which is suitable to be actuated by a linear actuator 84. The fixed welding units 82 are mounted on a body 85, which is supported elastically on stems 86 in contrast with elastic means 87.

[0021] The method for producing packs of stirrups for reinforced concrete by way of the described apparatus mainly entails picking up automatically or manually the stirrups 12 on the stirrup bending machine 2, which for this purpose is arranged, so that its working surface is preferably vertical, in front of the apparatus according to the invention, at an input region E thereof.

[0022] The apparatus grips the stirrups 12 to be picked up by means of the grip elements 51 of the working heads 1 before the step for cutting the stirrups 12 from the material in bar or coil form from which they are obtained by bending. For this purpose there is an intermediate stop in the working cycle of the stirrup bending machine 2 in order to allow the grip elements 51 to grip the stirrups 12 in a point that is certain.

[0023] In order to grip the stirrups 12, the grip elements 51 are moved by the double-stroke grip actuator 70 into a grip position formed by the abutment of the roller 59 on the stirrup bending machine 2, with the beak 52 open onto a corresponding portion of the stirrup 12 (Figure 2).

[0024] In the illustrated case, the grip elements 51 grip two stirrups 12, which are provided simultaneously by the stirrup bending machine 2, which is of the so-called twin-rod type. However, it is evident that the apparatus can operate likewise with a single stirrup 12 or with multiple stirrups 12, depending on the characteristics of the stirrup bending machine 2.

[0025] The beak 52 is then closed by way of the actuator 54 in order to clamp said portion of the stirrups 12 (Figure 3). It should be noted that the elastic support of the actuator 54, by means of the stem 56, which can slide in contrast with the elastic means 57, causes by reaction the movement of the bracket 55 and accordingly causes the automatic centering of the stirrups 12 on the grip elements 51. Clearly, it is possible to use other different grip systems.

[0026] This allows to adapt to the position of the stirrups 12 which, due to imperfect working, to flexing under their own weight and to the dynamic nature of the process, can easily not be in the theoretically expected position.

[0027] For this purpose, it has been found that the best way to grip the stirrups is to fasten the clamps sequentially rather than all simultaneously. A particular stirrup closure sequence has therefore been devised which offers the best results and allows to prevent said stirrups from being gripped and then locked in a position that is deformed due to the elasticity of the material, which undergoes deformation due to its own weight.

[0028] The particular sequence, in the case shown in Figure 1, entails gripping the lower portion of the stirrup, then the lateral portion that lies opposite the closing

overlap of the stirrup, and finally the other lateral portion.

[0029] After the stirrups 12 have been gripped by the grip elements 51, said stirrups 12 are cut by the conventional cutting elements of the stirrup bending machine 2. The stirrups 12 gripped by the grip elements 51 are then moved in a longitudinal direction by the actuation of the corresponding double-stroke actuators 70 or the like, until a preset working position (Figure 4) is reached.

[0030] At this point, the actuation of the welding means 80, preset in said working position, is activated. In particular, first the lifting of the movable welding units 81 on the part of the actuator 84 is activated (Figure 5), followed by a suitable retraction stroke of the grip elements 51 actuated by the actuator 70, in order to place the stirrups 12 at said movable welding units 81 (Figure 6).

[0031] The stirrups 12 are then gripped between the welding units 81 and 82 and released by the grip elements 51, which advance again, by a limited extent, in order to disengage from said stirrups 12 (Figure 7). It should be noted that in this step the welding units 81 and 82 do not clamp the stirrups 12 fully, but close only to the extent sufficient to prevent only the fall of the stirrups 12, or as an alternative it is possible to provide additional stirrup retention elements, for example of the mechanical or magnetic type or the like.

[0032] The grip elements 51 are then moved into a lowered position by means of the actuation of the second actuator 61, in order to allow the return stroke of said grip elements 51 without interfering with the subsequent working steps of the welding means 80 (Figure 8).

[0033] It is therefore possible to actuate the movement of the welding means 80 to a forward position by way of the traction unit carried by the enclosure 74, monolithically provided with the body 67 through which the guiding shafts 66 of the grip elements 51 can slide (Figure 9). This advancement is actuated by the rotary actuation of the gear 73, which is coupled to the rack 76 rigidly coupled to the enclosure 74. This determines the traction of the stirrups 12, which advance while resting on the platform 3. During this step, it is advisable to block the longitudinal rods 11 by way of known means in order to prevent said rods from being drawn forward due to the friction generated with the stirrup and with the grip elements themselves.

[0034] During said traction step, the return stroke of the grip elements 51 is also performed through the actuation of the double-stroke actuator 70.

[0035] More specifically, the welding means 80 initially place the first pair of stirrups 12 at a preset position, starting from which the pack 10 is formed. In this preset position, said stirrups 12 are clamped by the welding units 81 and 82 and are welded to the auxiliary rods 11, which are simultaneously fed in a longitudinal direction outside said stirrups 12.

[0036] The welding means 80 then perform a return stroke to the preceding active position in order to pick up a subsequent pair of stirrups 12 from the picking elements 51, which in the meantime have in turn picked up said pair of stirrups 12 from the input region E of the stirrup bending machine 2, in the manner described earlier.

[0037] Said subsequent pair of stirrups 12 picked up by the welding means 80 is transferred into a forward position adjacent to the first pair of stirrups 12, which is moved to said preset position and there welded likewise to the auxiliary rods 11.

[0038] In a similar manner, the subsequent pairs of stirrups 12 are picked up and transferred until the intended pack 10 is completed. These pairs of stirrups 12 are respectively arranged adjacent to the ones transferred and welded previously, so that the welding means 80 perform strokes of gradually decreasing breadth during the forming of the pack 10.

[0039] Therefore, by means of a series of successive cycles of advancement and return of the grip elements 51 and of the welding means 80, a plurality of stirrups 12 is welded to the auxiliary rods 11, so as to form the pack 10. The mutual distance between the stirrups 12 is generally limited and is preferably such as to arrange said stirrups tidily and equidistantly in contact with each other. For example, if the stirrups 12 have a closed profile with overlapping ends, as shown in Figure 1, said distance is substantially equal to the diameter of the rod.

[0040] The auxiliary rods 11 are constituted by rods that have any cross-section and are preferably narrower than the stirrups 12. Of course, in addition to having a circular cross-section, the auxiliary rods 11 can have a flattened shape or other similar shapes. It is further possible to provide on the auxiliary rods 11 suitable shaped portions or distinctive elements of any kind, for example a series of suitably spaced recesses.

[0041] It should be noted that since the auxiliary rods 11 are preferably narrow with respect to the stirrups 12, said stirrups are not affected by the welding step, which instead causes the local melting of the auxiliary rods 11 alone.

[0042] Conveniently, the auxiliary rods 11 are welded to the stirrups 12 so as to allow their easy separation subsequently, when the stirrups 12 are used. The welding can affect only some of the stirrups 12 that are arranged mutually adjacent so as to form the pack 10 or can be very limited. It is obvious, however, that at least the first and last stirrups 12 of the pack 10 are necessarily welded to the auxiliary rods 11.

[0043] The pack 10 thus formed is moved away from the platform 3 after cutting the auxiliary rods 11. During the welding step, provisions can be made to provide a weakening of the auxiliary rods 11 at the last stirrup 12 of the pack 10, so as to produce the cutting of said rods 11 through a suitable traction applied to the pack 10, without having to resort to cutting elements.

[0044] According to a different embodiment of the method according to the invention, it is possible to move stepwise the pack being formed instead of varying the

stroke of the welding means 80 during the successive forward and return cycles.

[0045] In this case, after the stirrups 12 have been gripped between the welding units 81 and 82 and the grip elements 51 have moved into the lowered position (see Figure 8 again), the welding means 80 are moved into a fixed forward position, in which the stirrups 12 are clamped by the welding units 81 and 82 and welded to the auxiliary rods 11. Then a further limited advancement stroke of the welding means 80 is actuated, so as to clear said fixed position in order to allow the subsequent work cycle.

[0046] In practice, at each cycle the welding means 80 first move the pair of picked-up stirrups 12 closer to the already-formed pack, and then weld said stirrups 12 to the auxiliary rods 11 and produce the advancement of the entire pack 10 by one step, in order to clear said fixed position, which in the examples cited above is substantially equal in extent to the diameter in the case of open stirrups and substantially equal to twice the diameter for closed stirrups in which there is an overlap. The stepwise advancement of the pack 10 being formed of course causes the corresponding traction of the auxiliary rods 11 welded to the stirrups 12.

[0047] During the step in which the stirrups 12 move toward the pack being formed, the auxiliary rods 11 can be retained by suitable locking means. Furthermore, welding can be performed during motion or in stationary conditions.

[0048] As an alternative, it is possible to provide relative motion between the welding means 80 and the pack 10 being formed through a retrograde movement of the auxiliary rods 11, which is actuated by suitable traction means or by way of the corresponding spools or by acting on the pack of stirrups itself being formed and by taking up the excess rod that is produced, by way of means that are suitable for the purpose.

[0049] In summary, the method and the apparatus according to the invention allow to form automatically packs of stirrups for reinforced concrete, eliminating the need for the operator to pick up the stirrups that exit from the stirrup forming machine, tidy them up and bind them in a pack. This clearly allows to optimize the productivity of the machines in addition to freeing the operator from an awkward and potentially dangerous task.

[0050] It should be noted that the auxiliary rods 11 can be joined to the stirrups 12 by way of any type of coupling, particularly by means of any welding method. The rods 11 can be on any side of the stirrups 12, and there may be even more than one rod per side, according to the requirements. Moreover, the method for moving the frame being formed may also be any, by traction or pushing, for example by using traction wheels integrated in the straightening unit.

[0051] It should also be noted that the cited results are achieved by means of an apparatus that has a structure that is simple in concept, safely reliable in operation, and versatile in use.

[0052] The shape of the stirrups 12 can in fact be of any kind, even a very complex one. By way of example, Figure 10 illustrates a pack that is formed with stirrups that have an open configuration. In this case, since the stirrups do not have overlapping portions, it is possible to arrange the stirrups in close contact with each other. Figure 11 instead shows a pack that is formed with closed stirrups that have a more complex geometry.

[0053] In the practical embodiment of the invention, the materials used, as well as the shape and the dimensions, may be any according to requirements.

[0054] The disclosures in Italian Patent Applications No. B02002A000438 and No. B02002A000652 from which this application claims priority are incorporated herein by reference.

[0055] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A method for forming packs of stirrups, **characterized in that** it comprises the steps of:

   (a). arranging at least one first stirrup (12) at a front input region (E) of an apparatus for forming packs of stirrups;
   (b). picking up said first stirrup (12) from said front input region (E) by way of grip and welding means (5) that can move along a longitudinal direction with respect to said input region (E);
   (c). producing the alternating movement of said grip and welding means (5) into a forward position for the drawing of said first stirrup (12) at said forward position;
   (d). fixing at least one longitudinal auxiliary rod (11) externally to said first stirrup (12), which is retained by said grip and welding means (5);
   (e). arranging adjacent to said first stirrup (12) drawn into said forward position a series of additional stirrups (12), picked up in succession by said grip and welding means (5) at said input region (E), so as to form a pack (10) of stirrups (12);
   (f). fixing said longitudinal auxiliary rod (11) externally to at least one last stirrup (12) of said pack (10);
   (g). cutting said auxiliary rod (11) ahead of said pack (10) thus formed, or creating a gap to space the next pack to be formed.

2. The method according to claim 1, **characterized in that** said steps of: (b). picking up said first stirrup

(12) from said front input region (E) and (e). arranging adjacent to said first stirrup (12) a series of additional stirrups (12), entail picking in succession said stirrups (12) by way of grip means (51) and transferring in succession said stirrups (12) to welding means (80), which are associated with said grip and welding means (5).

3. The method according to claim 2, **characterized in that** it entails transferring said first stirrup (12) into said forward position and the arrangement of said additional stirrups (12) adjacent to said first stirrup (12) by way of said welding means (80), with a suitable timing with respect to the picking of said stirrups (12) by said grip means (51) at said front input region (E).

4. The method according to claim 3, **characterized in that** it entails simultaneously moving said welding means (80) into said forward position by actuation of the traction means (74) and producing the return stroke, in the opposite direction, of said grip means (51) at said front input region (E), by actuation of corresponding grip actuation means (70).

5. The method according to claim 1, **characterized in that** it entails arranging in succession said stirrups (2) to be picked up on a working surface of a stirrup bending machine (2) that faces said front input region (E).

6. The method according to claim 5, **characterized in that** it entails gripping said stirrups (12) at said working surface of said stirrup bending machine (2), by way of grip elements (51) that are associated with said grip and welding means (5), before the step for cutting said stirrups (12) from the material from which they are obtained by bending.

7. The method according to claim 6, **characterized in that** said grip means (51) grip said stirrups (12) according to a sequence.

8. The method according to claim 7, **characterized in that** said sequence entails gripping first the lower portion of said stirrups (12) and then the lateral portion that lies opposite the closure overlap of said stirrups (12) and finally the other lateral portion.

9. The method according to claim 1, **characterized in that** said step of: (e). arranging adjacent to said first stirrup (12) drawn into said forward position a plurality of additional stirrups (12) entails transferring in succession said stirrups (12) to welding means (80) that are associated with said gripping and welding means (5), and performing in succession the alternating movement of said welding means (80) with strokes of gradually decreasing breadth during the forming of said pack (10).

10. The method according to claim 1, **characterized in that** said step of: (f). fixing said auxiliary rod (11) to said last stirrup (12) entails the provision, during welding, of a weakening of said auxiliary rod (11) at said last stirrup (12), so as to then cut said auxiliary rod (11) through a traction applied to said pack (10).

11. The method according to claim 1, **characterized in that** said step of: (e). arranging adjacent to said first stirrup (12) a series of additional stirrups (12) picked up in succession by said grip and welding means (5) entails moving in succession said additional stirrups (12) into a fixed forward position, in which said stirrups (12) are welded to said auxiliary rod (11), and then actuating an additional stroke of said gripping and welding means (5) of limited extent, such as to produce the stepwise advancement of said pack (10) being formed and clear said fixed position in order to allow the next working cycle.

12. The method according to claim 11, **characterized in that** said stepwise advancement of said pack (10) being formed causes the corresponding traction of said auxiliary rod (11) welded to said stirrups (12).

13. An apparatus for forming packs of stirrups, **characterized in that** it comprises: a front input region (E), in which a series of stirrups (12) is adapted to be fed in succession; gripping and welding means (5), which can move along a longitudinal direction with respect to said input region (E) and are adapted to pick up in succession said stirrups (12) from said front input region (E) and be actuated with an alternating motion in order to arrange said stirrups (12) mutually adjacent in a forward position, so as to form a pack (10) of stirrups (12); welding means (80), which are associated with said gripping and welding means (5) and are adapted to fix a longitudinal auxiliary rod (11) externally at least to first and last stirrups (12) of said pack (10).

14. The apparatus according to claim 13, **characterized in that** said gripping and welding means (5) can move in a longitudinal direction that is substantially perpendicular to a vertical plane traced by said input region (E).

15. The apparatus according to claim 13, **characterized in that** said gripping and welding means (5) comprise grip means (51), which are constituted by a clamp (52) adapted to be actuated by a linear actuator (54) and is directed toward said input region (E).

16. The apparatus according to claim 15, **character-**

ized in that said clamp (52) is actuatable by said actuator (54) in abutment against a bracket (55), which is rigidly coupled to a stem (56) that is guided so that it can slide in contrast with elastic means (57) through a sliding block (58).

17. The apparatus according to claim 16, **characterized in that** the floating support of said actuator (54) by way of said stem (56), which can slide in contrast with said elastic means (57), is suitable to produce by reaction the movement of said bracket (55) for the automatic centering of said stirrup (12) on said grip means (51).

18. The apparatus according to claim 16, **characterized in that** said sliding block (58) is rigidly coupled to the stem (60) of a second linear actuator (61), which is actuatable to move said grip means (51) into a lowered disengagement position.

19. The apparatus according to claim 18, **characterized in that** said second linear actuator (61) is rigidly coupled to horizontal stems (66), which pass slidingly through a body (67) that is rigidly coupled to traction means (74) and are actuatable by a grip actuator (70).

20. The apparatus according to claim 13, **characterized in that** said welding means (80) comprise movable welding units (81), which are supported by an arm (83), actuatable by a linear actuator (84), and cooperate with fixed welding units (82), which are mounted on a body (85) that is supported in front of traction means (74).

21. The apparatus according to claim 20, **characterized in that** said traction means (74) are constituted by an enclosure that is guided so that it can slide along said longitudinal direction and is monolithically provided with a longitudinal rack (76) that is coupled to a corresponding gear (73) driven by suitable motor elements.

22. The apparatus according to claim 13, **characterized in that** said gripping and welding means (5) are supported by a working head (1), whose position is adjustable on a chassis arranged in front of said input region (E).

23. The apparatus according to claim 13, **characterized in that** said auxiliary rod (11) unwinds from a spool that is arranged to one side of a platform (3) on which said pack (10) of stirrups (12) is formed.

24. A pack of stirrups, **characterized in that** it comprises a series of stirrups (12) arranged side by side and coupled to each other by at least one longitudinal auxiliary rod (11) that is welded externally at least to the first and last of said stirrups (12).

25. The pack according to claim 24, **characterized in that** said stirrups (12) are arranged equidistantly and mutually adjacent.

26. The pack according to claim 25, **characterized in that** all of said stirrups (12) are welded to said longitudinal auxiliary rod (11).

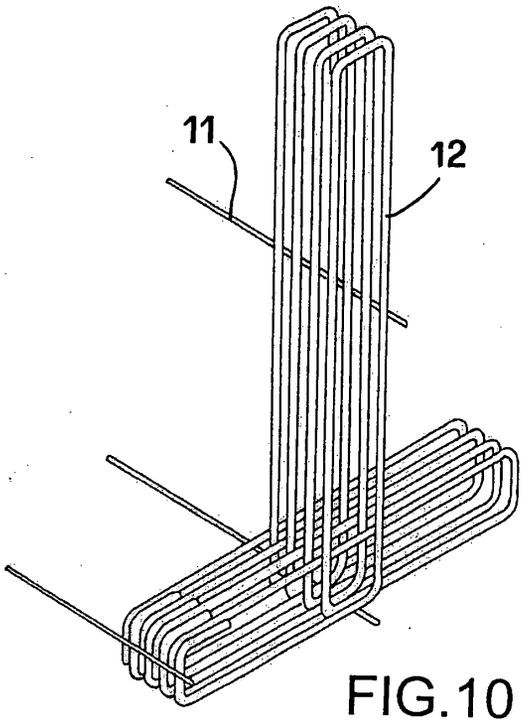


FIG.10

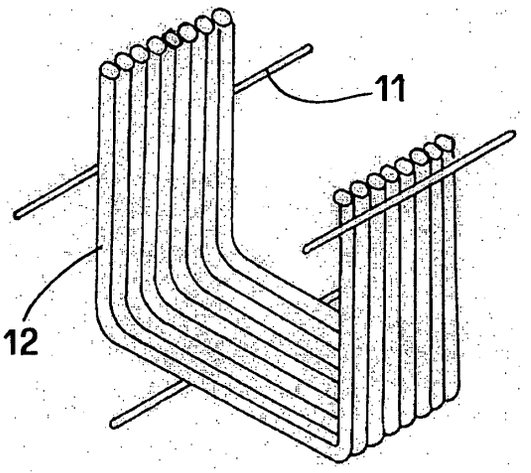


FIG.11

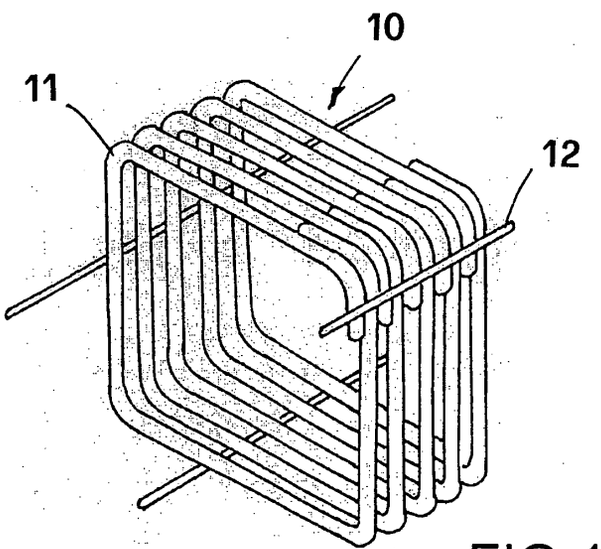
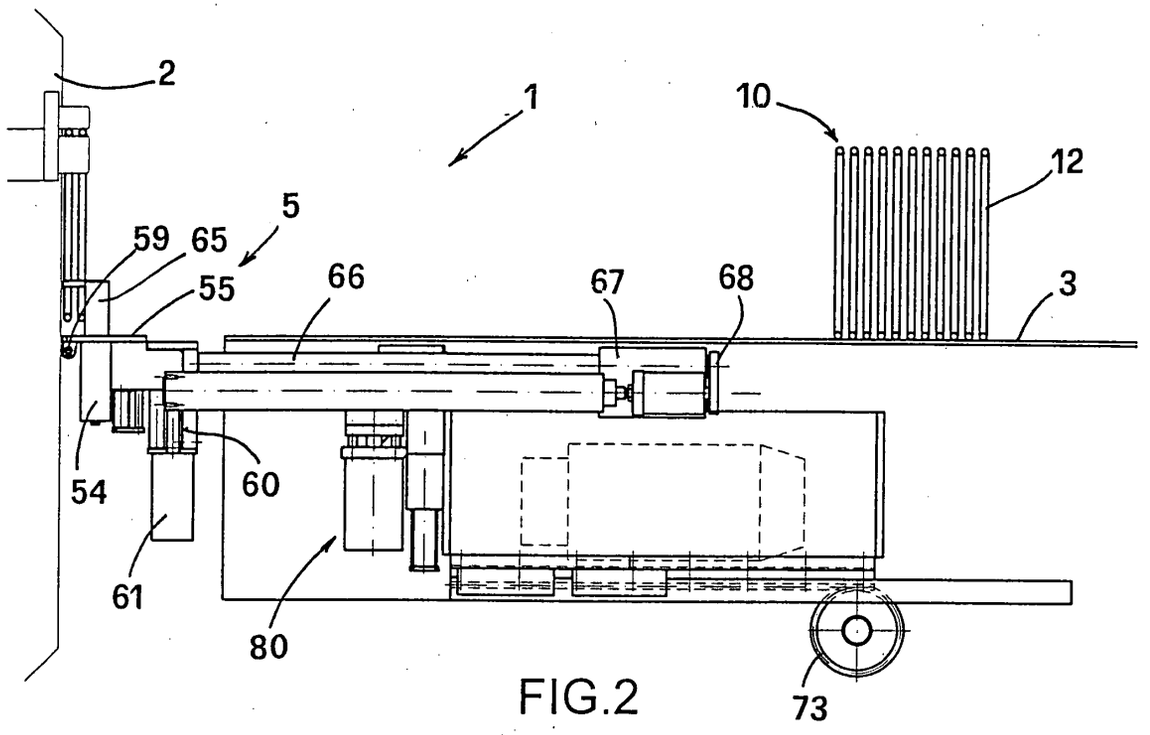


FIG.1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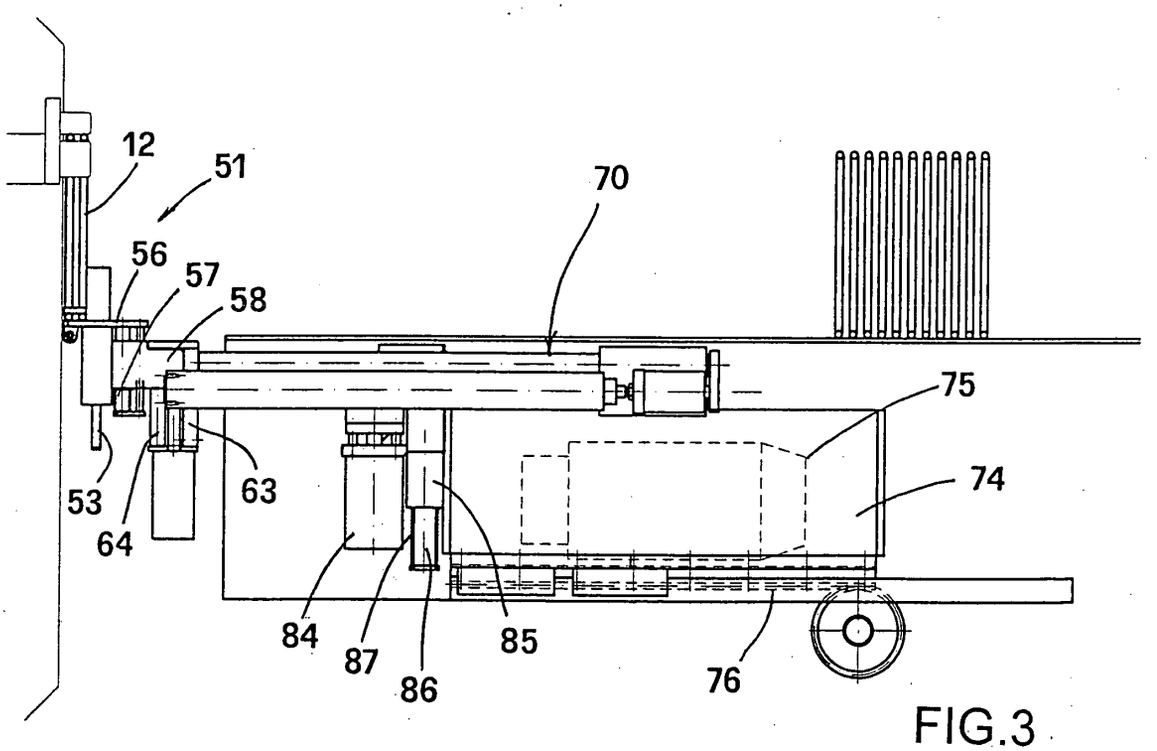
65
55
66
67
68
3
54
60
61
80
73

FIG.2


12
51
70
56
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58
75
74
53
64
63
84
87
86
85
76

FIG.3

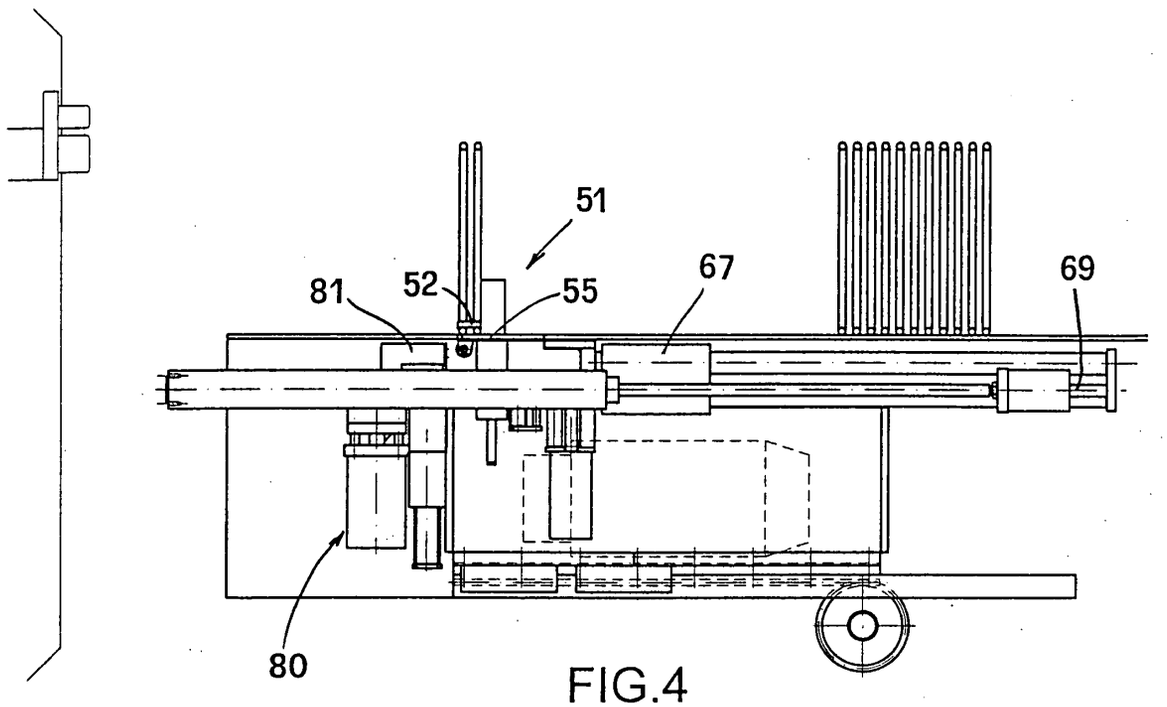

FIG.4

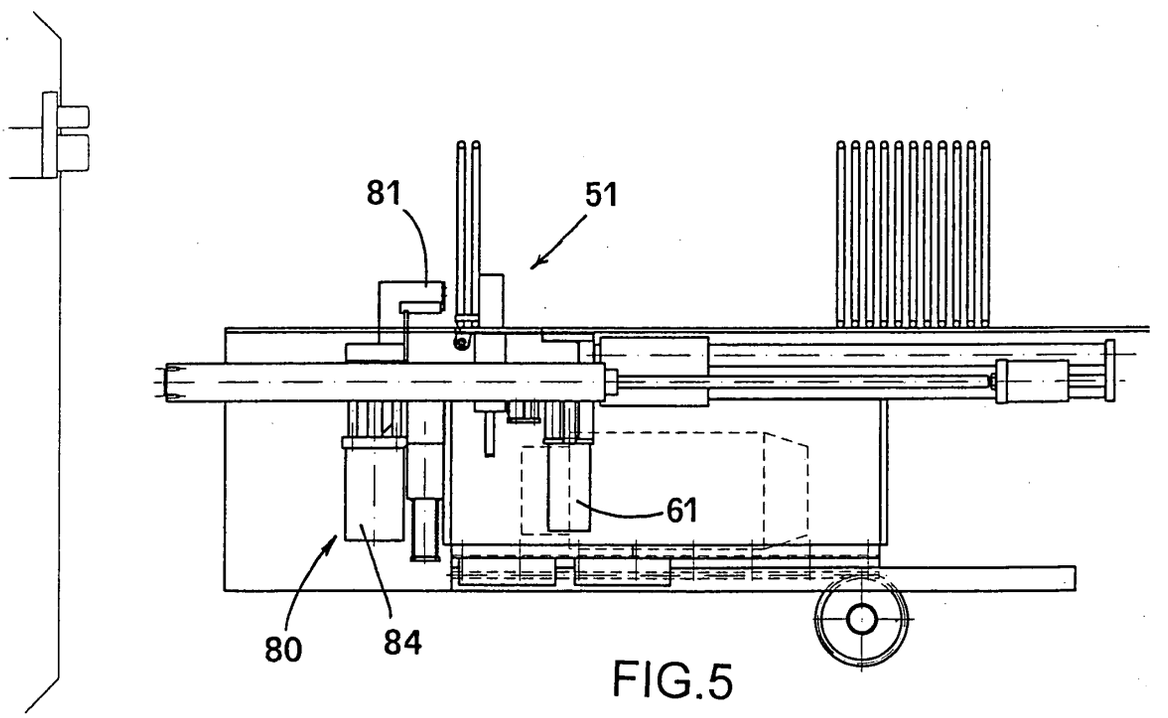

FIG.5

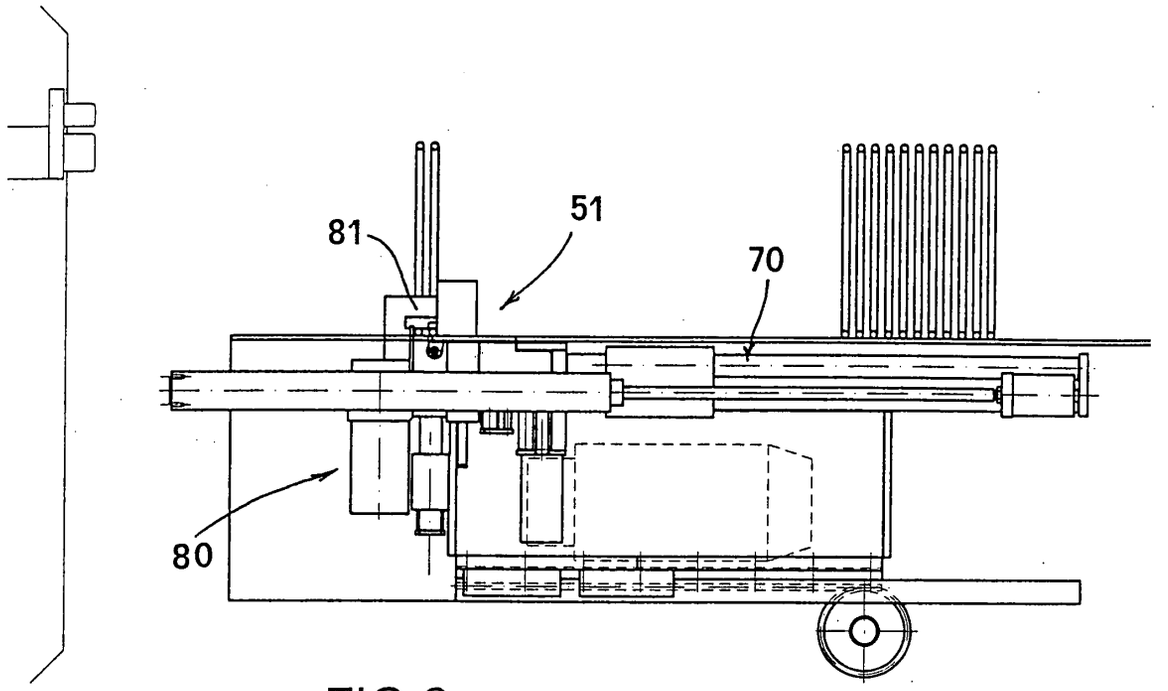

FIG.6

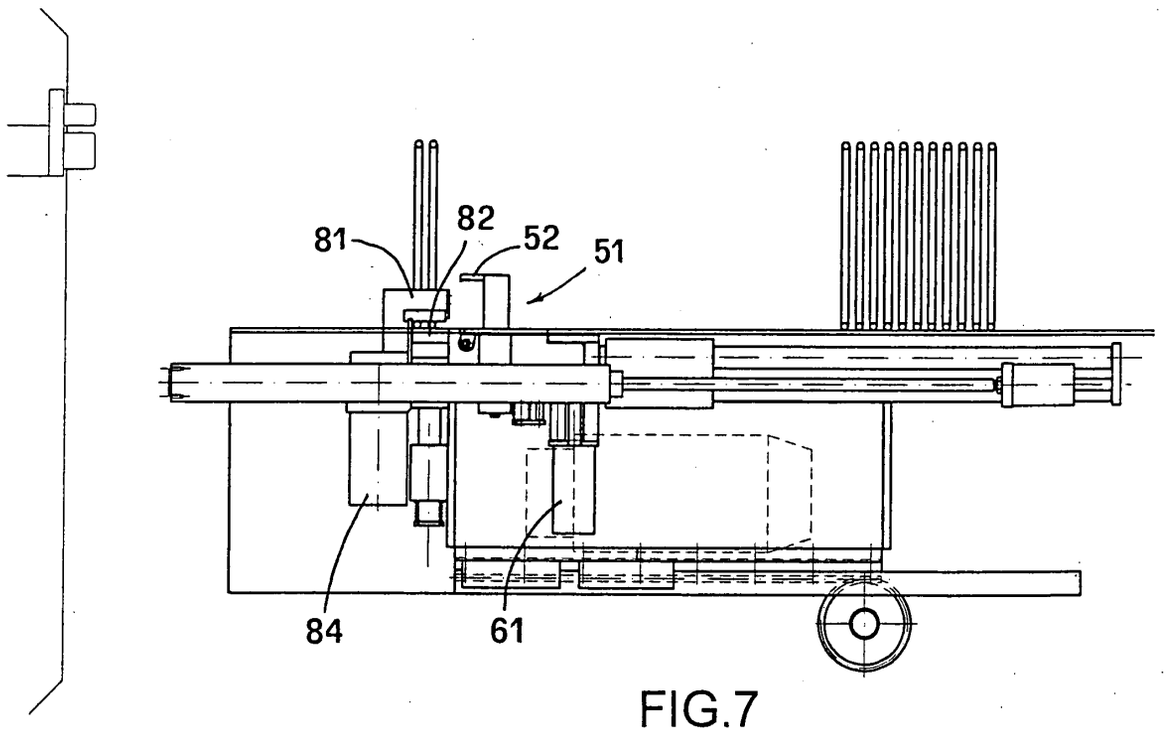

FIG.7

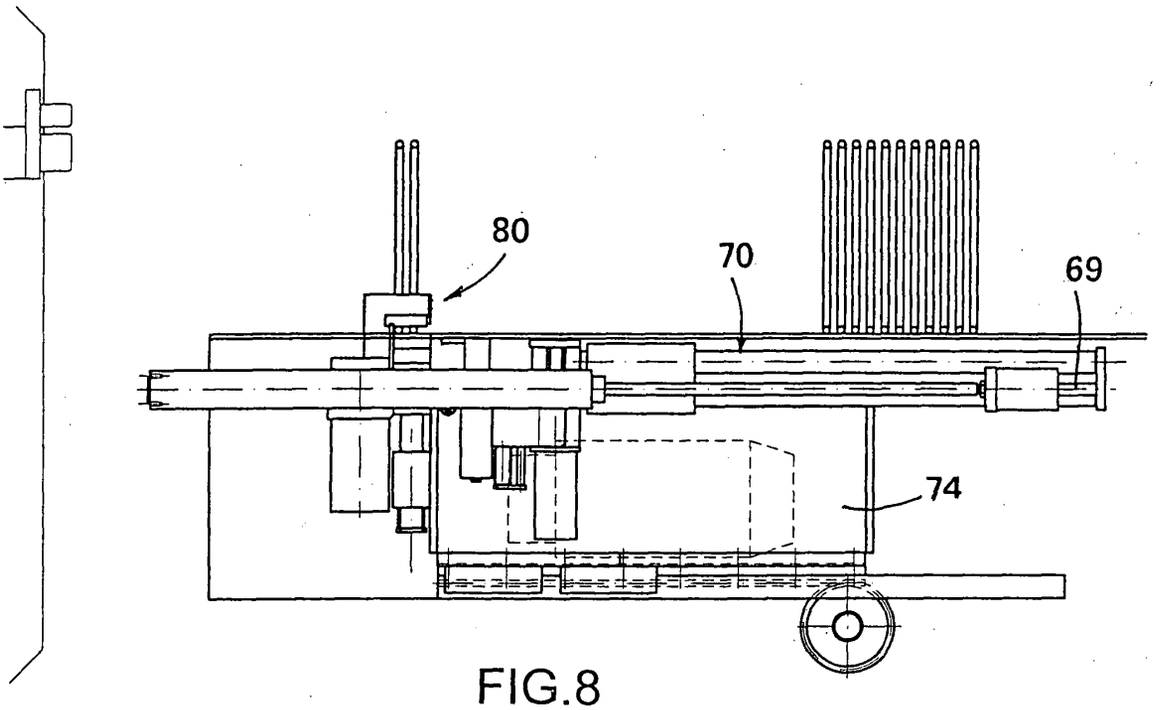

FIG.8

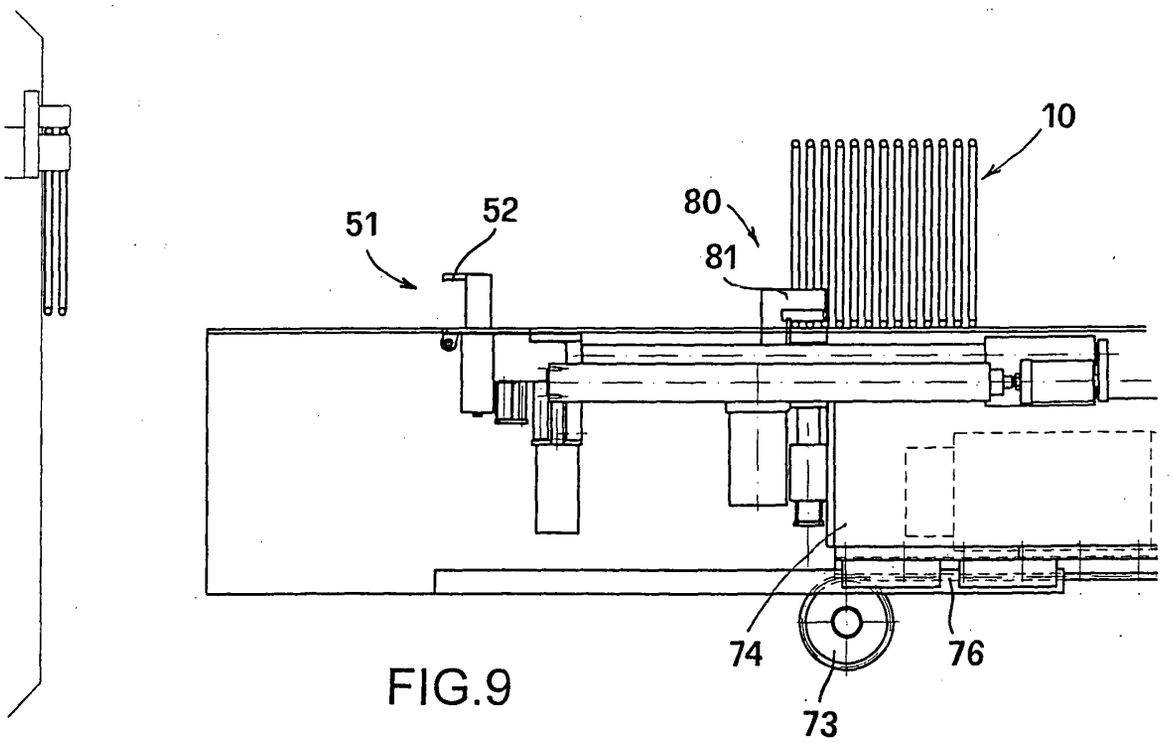

FIG.9