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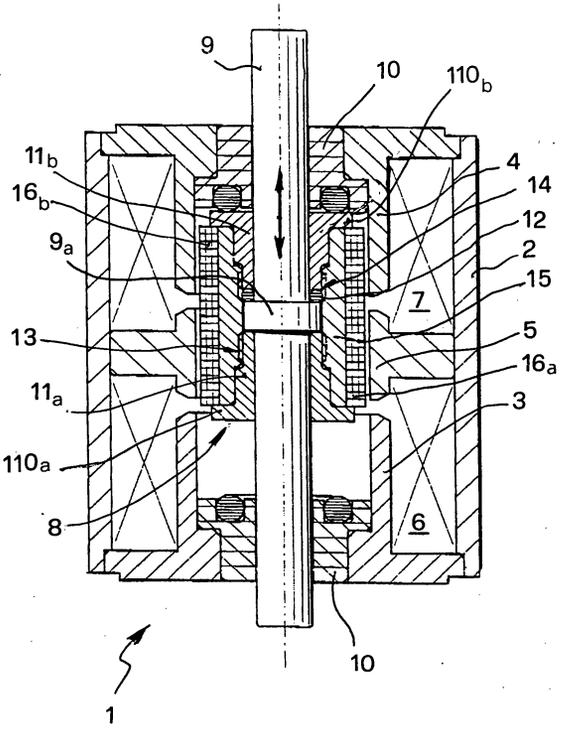
(54) Structure of a linear electric motor, particularly for electromechanical actuators of weaving machines

(57) The structure comprises a driving shaft (9) and an associated movable core (8), which linearly moves within a cavity of a stator housing (2) bearing excitation coils (6-7) and guide/supporting bushes (10) for the driving shaft. The latter is provided with a projecting central collar (9a) integral with the shaft, onto which the movable core (8) of the motor is crimped by means of two identical core portions (11a, 11b), made of a non-magnetic material, and provided with respective threaded areas and terminal flanges (110a, 110b), and mounted on the driving shaft (9) on opposite sides of the projecting collar (9a). The core portions (11a, 11b) are mutually connected through a threaded, cylindrical central case (15) which pushes the terminal flanges (110a-b) of the core portions axially into abutment with corresponding, radial-polarity magnetic rings (16a, 16b).

Fig. 1



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Description

[0001] The present invention is concerned with an improved structure of a linear electric motor for electromechanical actuators of weaving machines, and more particularly of metering weft-suppliers for fluid jet looms.

[0002] More precisely, the invention relates to linear electric motors comprising a driving shaft, usually made of a ceramic material, to which are coupled cylindrical, radial-polarity permanent magnets which form a movable core for the motor. The core linearly slides within a cavity of a stator housing bearing excitation coils and guide/supporting bushes for said driving shaft.

[0003] As well known to persons skilled in the art, the movable core in a linear motor of the above-specified kind moves at a high speed. Due to this circumstance, on the one hand, such motors are particularly suitable to operate as electromechanical actuators because of their quick action, but, on the other hand, because of the high accelerations and decelerations to which the core is subjected, the core suffers to high mechanical stresses, and the parts of the motor must therefore be oversized, with unfavorable dynamical and economical consequences, including a limitation of the life of the motor.

[0004] It is the main object of this invention to overcome the above mentioned drawbacks of known linear motors and, more particularly, to provide a linear motor having a considerably improved structure, with a high mechanical resistance, with a simple and compact construction, with a limited mass and inertia, and free from welded and bonded joints and from moulded polymeric components, so that the structure will be easy to assemble and able to operate under severe conditions for a long time and at high frequencies, e. g. in the range of 1300 to 1600 cycles/minute.

[0005] According to the invention, the above and other objects, such as will appear from the following detailed description, are achieved by means of a structure of a linear electric motor having the features recited in the attached claims.

[0006] Substantially, the invention is based on the innovative concept of providing the driving shaft with a central salient collar integral with the shaft and onto which the entire movable core of the motor is firmly crimped. To such purpose, the movable core consists of two substantially cylindrical, identical core portions made of a non-magnetic material, provided with respective terminal flanges and mounted on the driving shaft on opposite sides of said collar, from which they are separated by means of at least one elastomeric ring. Said core portions have respective threaded areas which are screwed into corresponding threaded areas of a cylindrical central case. The threaded engagement, by deforming said elastomeric ring, pushes the terminal flanges of said core portions axially into abutment with corresponding, radial-polarity, magnetic rings, thereby locking said magnetic rings onto said driving shaft.

[0007] The features, purposes and advantages of the improved motor structure according to the present invention will appear from the following detailed description and with reference to the attached explicatory drawings, wherein:

Fig. 1 is an axial section of an improved linear electric motor according to the present invention,

Fig. 2 is a detail of the movable core of the motor shown in Fig. 1,

Fig. 3 is an exploded perspective view of the movable core of Fig. 2.

[0008] Fig. 1 shows a known linear motor 1 of a known kind, comprising a hollow stator 2 having at least two pole pieces 3, 4 and preferably a third pole piece 5 (intended to considerably improve the performance of the motor) and two excitation coils 6, 7. A movable core of the motor, referenced generally as 8, is slidable with rectilinear motion within the stator cavity and is firmly crimped onto a driving shaft 9, typically of a ceramic material, and which is also slidable, being supported and guided by bushes 10 carried by stator 2.

[0009] According to the invention, driving shaft 9 is provided with a projecting central collar 9a integral with the shaft, onto which movable core 8 is firmly crimped. To such purpose, core 8 consists of two identical, substantially cylindrical core portions 11a, 11b, made of a non-magnetic material such as aluminum, and provided with respective terminal flanges 110a, 110b. Said portions are mounted on driving shaft 9 on opposite sides of collar 9a, and they are separated from the collar by at least one elastomeric O-ring 12. Core portions 11a, 11b have respective threaded areas 13-14 that are screwed into a correspondingly threaded cylindrical central case 15. The threaded engagement, by deforming elastomeric ring 12, pushes terminal flanges 110a-b of said core portions axially into abutment with corresponding, radial-polarity, magnetic rings 16a, 16b, thereby locking said magnetic rings onto said driving shaft 9.

Claims

1. A structure of a linear electric motor (1), particularly for electromechanical actuators of weaving machines, comprising a driving shaft (9) and an associated movable core (8) linearly moving within a corresponding cavity of a stator housing (2) bearing excitation coils (6-7) and guide/supporting bushes (10) for the driving shaft, **characterized in that** said driving shaft (9) is provided with a projecting central collar (9a), integral with the shaft, and onto which the whole movable core (8) of the motor is firmly crimped.

2. Structure of a linear electric motor according to claim 1, **characterized in that** said movable core (8) consists of two identical core portions (11a, 11b), made of a non-magnetic material, provided with respective terminal flanges (110a, 110b) and mounted on driving shaft (9) on opposite sides of the projecting collar (9a), from which they are separated by at least one elastomeric ring (12), and **in that** said core portions (11a, 11b) are substantially cylindrical and have respective threaded areas (13-14), engaging a correspondingly threaded, cylindrical central case (15), the threaded engagement deforming said elastomeric ring (12), to axially pushes the terminal flanges (110a-b) of the core portions into abutment with corresponding, radial-polarity magnetic rings (16a, 16b), thereby locking said magnetic rings onto said driving shaft (9).

3. Structure of a linear electric motor according to claim 2, **characterized in that** said driving shaft (9) is made of a ceramic material and said substantially cylindrical core portions (11a-11b) are made of aluminum.

Fig. 1

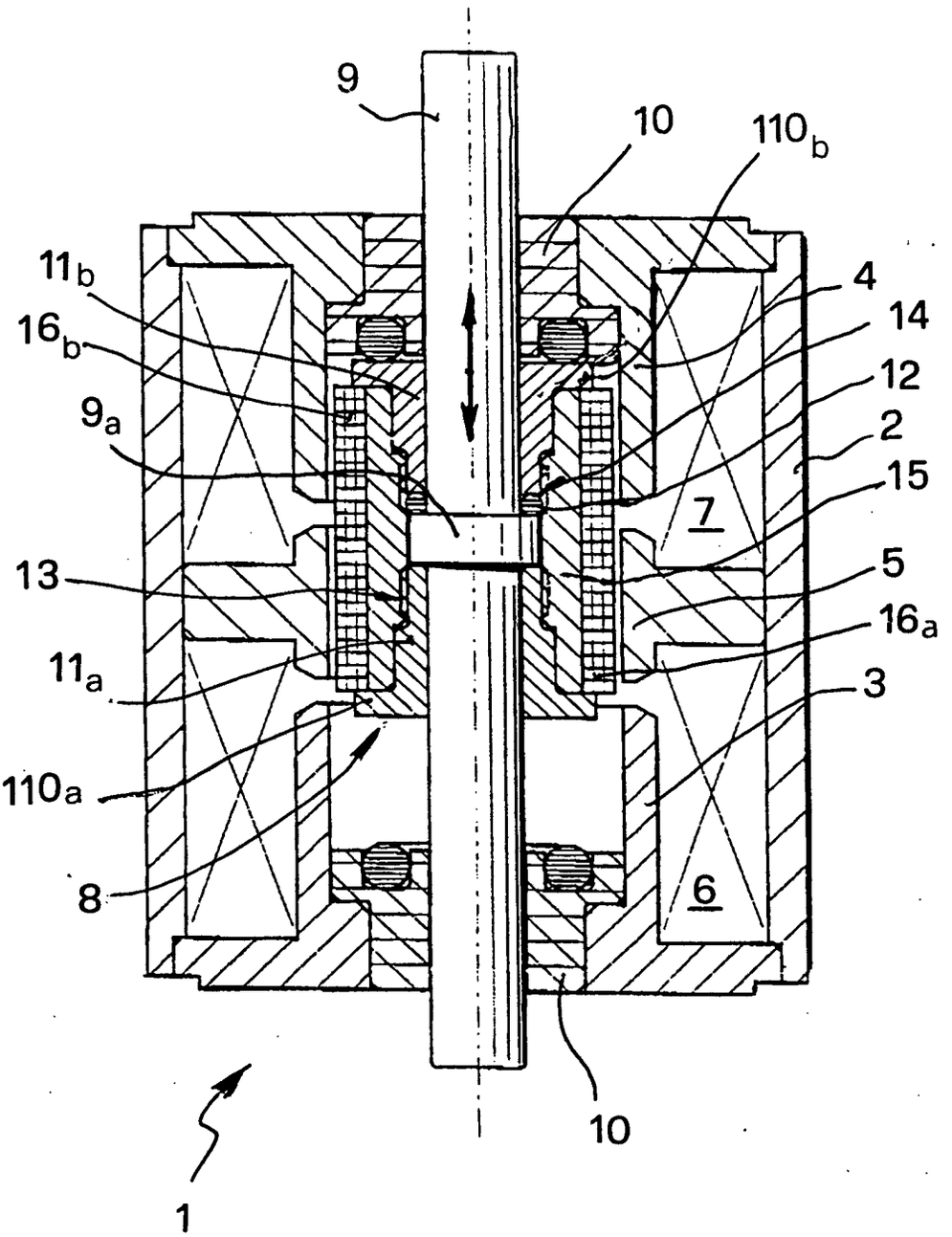


Fig. 2

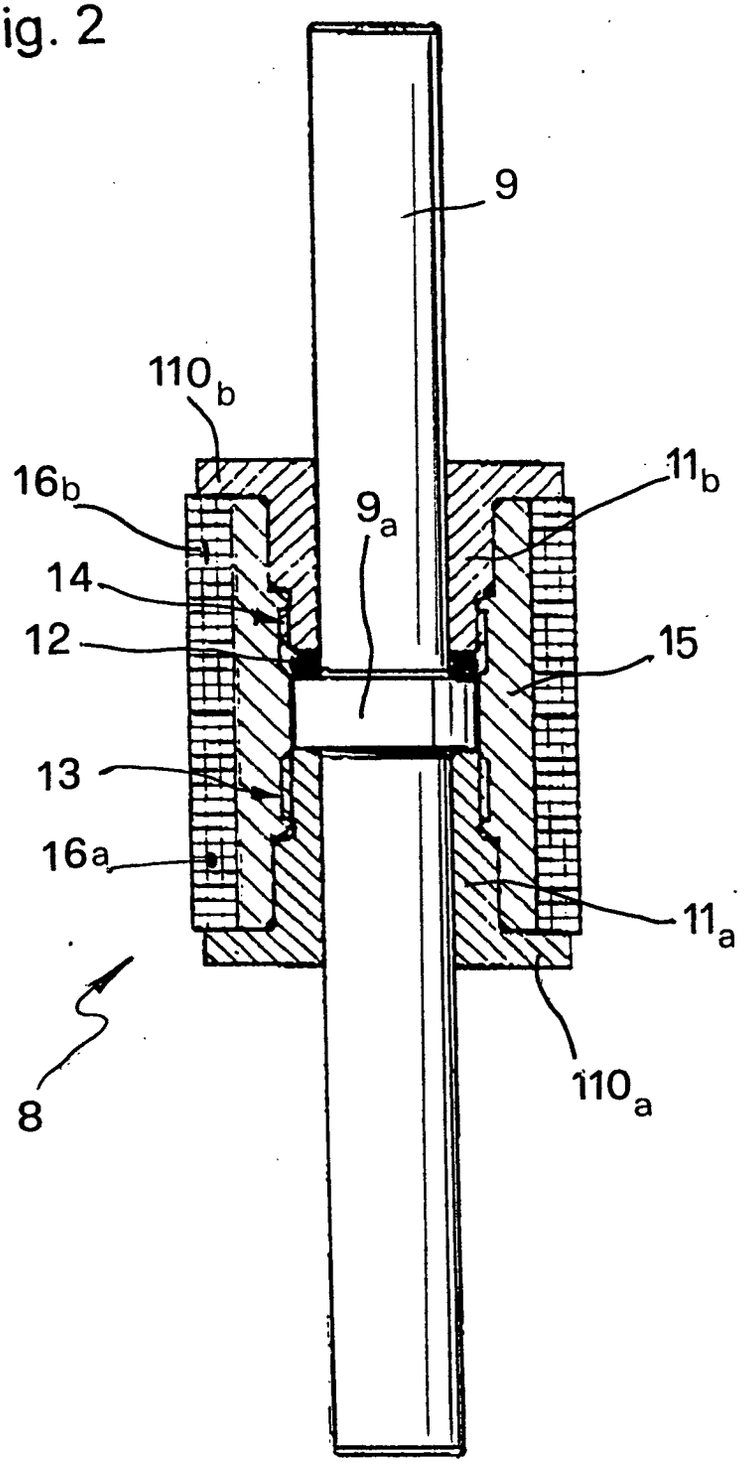
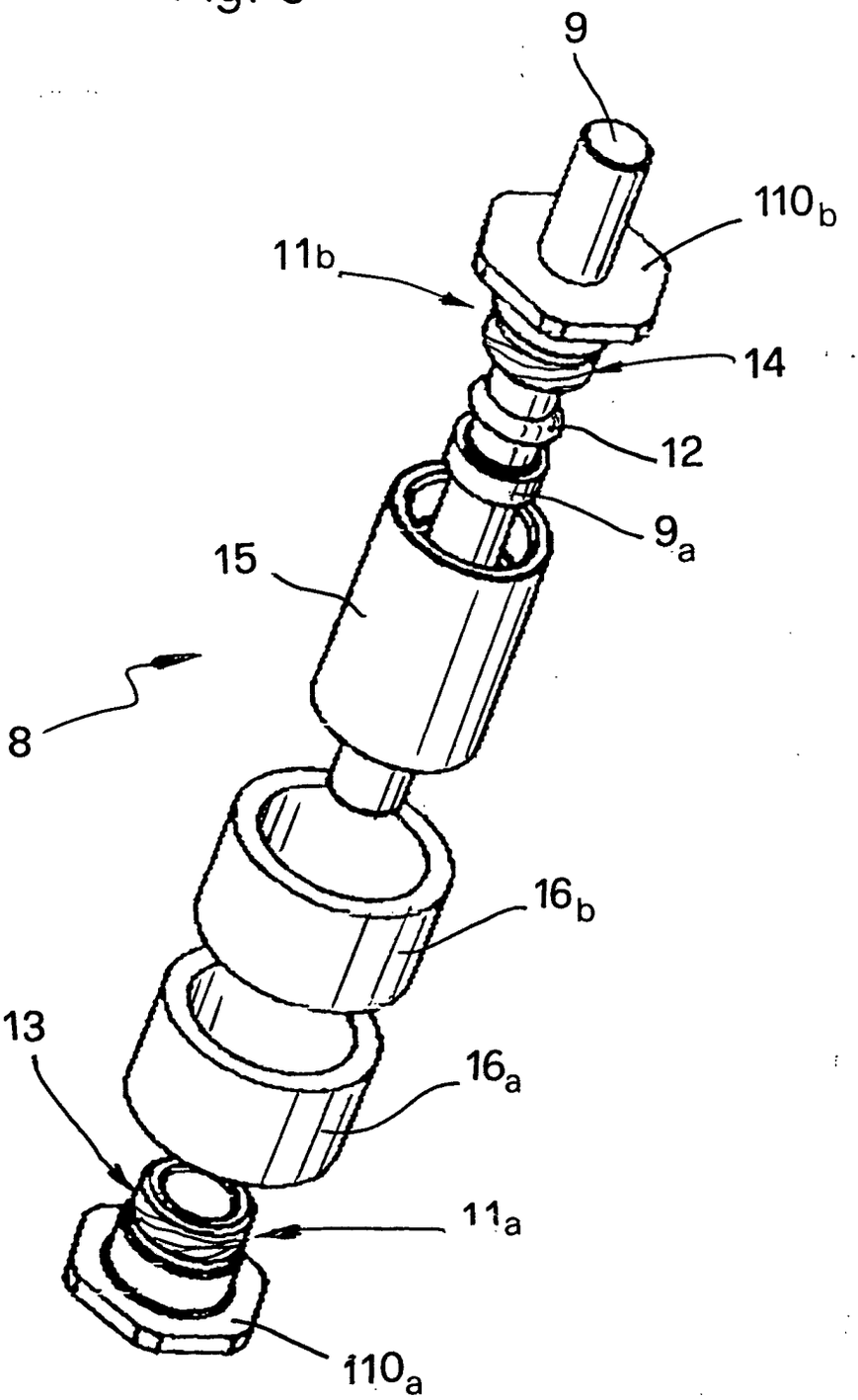


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 8352

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 870 931 A (MYERS JOHN L) 11 March 1975 (1975-03-11) * column 2, line 27 - line 63; figure 2 *	1	D03D47/36 H01F7/16
A	EP 0 363 938 A (ROY ELECTROTEX SPA) 18 April 1990 (1990-04-18) * column 3, line 47 - line 53; figure 2 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

D03D
H01F
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	22 August 2002	Louter, P

CATEGORY OF CITED DOCUMENTS

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22-08-2002

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