

Sept. 24, 1946.

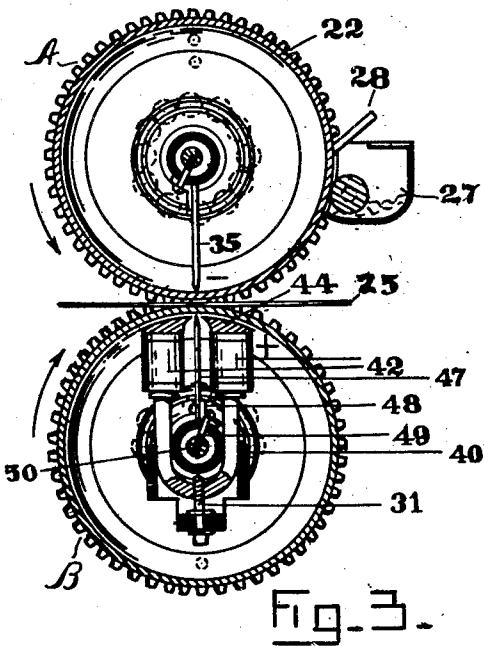
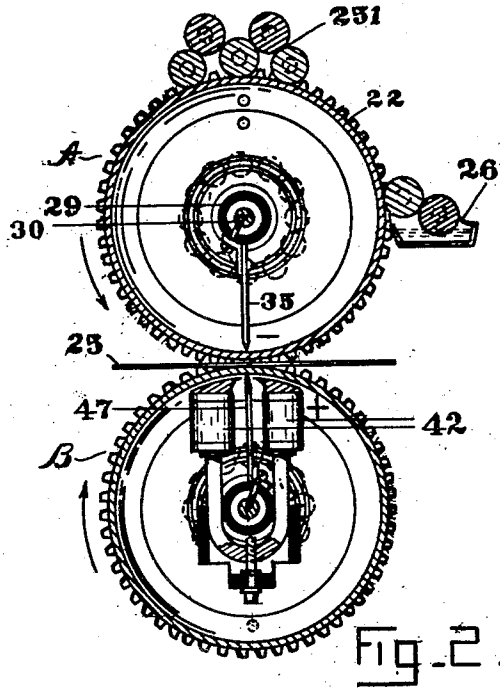
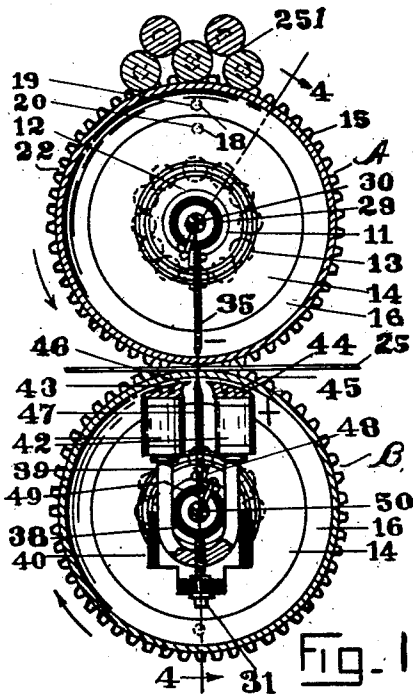
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2,408,144

MEANS FOR PRINTING

Filed Jan. 15, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

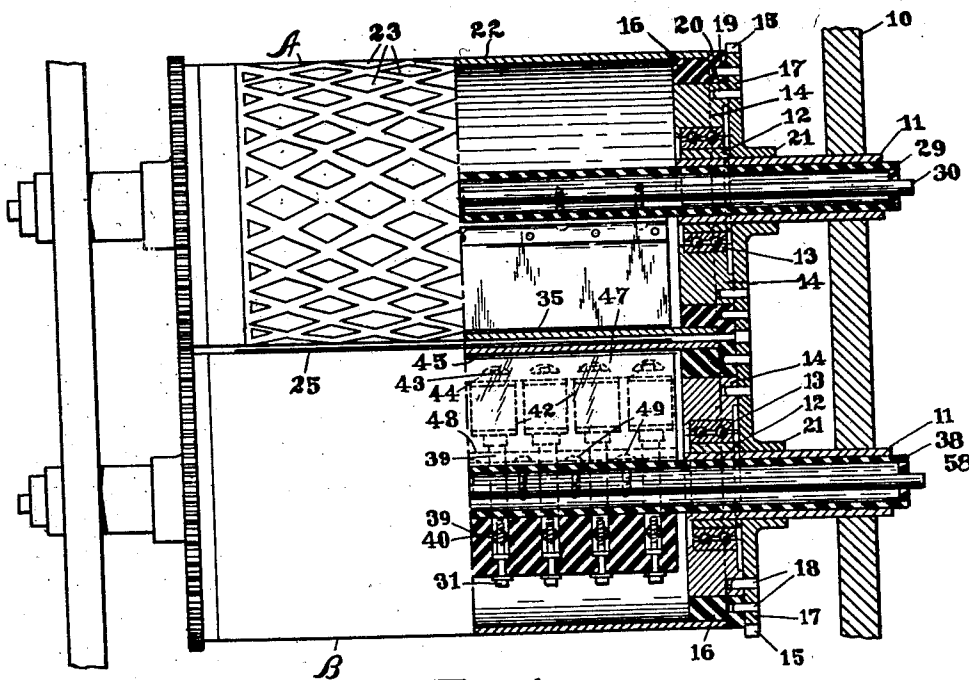


Fig. 4-

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MEANS FOR PRINTING

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11 Claims. (Cl. 101-1)

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This invention relates to means for printing and is in the nature of an improvement on the apparatuses and processes set forth in my prior patents, 1,820,194 of August 25, 1931, and 2,224,291 of December 10, 1940.

Inasmuch as the present invention, as do those disclosed in said prior patents, contemplates transference of ink, as hereinafter defined, to the paper or other ink-receiving surface without mechanical pressure or without substantial mechanical pressure at the zone of transfer, the terms "printing," "impression" and corresponding terms are, for brevity and conciseness, to be herein understood as being the nearest appropriate terms, notwithstanding usual dictionary definitions to the contrary.

With the foregoing understanding of the term "printing," one object of the present invention is to provide improved means for transferring ink, as hereinafter defined, from inked image areas of an ink-conveying member of a press to an ink-receiving surface by lines of force of an electro-induced field and without contact or pressure and/or without substantial pressure.

A further object of the invention is to provide an improved means for printing through the medium of electro lines of force and whereby the printed reproduction on the print receiving material is sharply and accurately defined due to the concentration of the electro field of force to a definite printing zone, i. e., that point which would be the pressure printing line in ordinary contact pressure printing, and to an absence of any substantial dispersion of the electro lines of force beyond said printing zone or to any substantial absorption of the lines of force by the movable image carrying member, the member for supporting the print receiving material or other parts of the printing apparatus.

Another object is to provide improved means for shielding the electrostatic and/or electronographic field of force to effect concentration thereof to the printing zone and accomplishing such object by utilizing an electromagnetic field of force which acts as a confining shield for the electrostatic and/or electronographic field of force.

Another object of the invention is to provide improved means for adjusting or regulating the intensity and concentration of the field of force at the zone of ink transference from the printing or image carrying element of the press to the paper or other print-receiving element.

Other objects of the invention will more clearly

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appear from the description and claims hereinafter following.

In the drawings forming a part of this specification,

5 Figures 1, 2 and 3 are vertical sectional views of printing couples of presses showing the improved means and process as applied to relief, planographic and intaglio printing, respectively, certain features of construction being shown conventionally. And Figure 4 is a broken, longitudinal sectional view, corresponding to the section line 4-4 of Figure 1, illustrating more particularly features of construction of the means for creating the induced fields of force.

10 The invention contemplates in a printing apparatus a printing couple comprising a movable image carrying member and a member for supporting the print receiving material and arranged in spaced but operative relationship with respect to said movable member. The print receiving material passes between the movable image carrying member and the supporting member and is in contact with the latter while the image carried by the former exerts no pressure thereon. The 25 movable member is moved so as to operatively correlate successive areas of the image carried thereby with successive areas of the print receiving material. The movable image carrying member and the print receiving material are moved relatively therefore in timed relation. The print receiving material may be moved by moving the supporting member in driving relationship thereto, or it may be supported by said supporting member and moved relative thereto by independent driving means.

30 The movable image carrying member and the supporting member are electrically insulated from each other and from the remainder of the apparatus. The movable image carrying member has operatively associated therewith a discharge or repulsion element or blade while the supporting member has operatively associated with it an attraction element or blade. The said elements or blades are separated from the print receiving material by the movable image carrying member and the supporting member respectively and have their free ends located closely adjacent to said members and in spaced relationship to each other to form a gap between the elements or blades. 45 The elements or blades are electrically insulated from said members and from the apparatus but are connected to a source of high potential electric energy, wherefore electro lines of force follow the shortest path and pass across the gap between the elements or blades and through said 55

members and the print receiving material in a concentrated field of force at that point which would be the pressure printing line in ordinary contact pressure printing. Inasmuch as the movable image carrying member and the supporting member are electrically insulated from each other and from the machine and from said elements or blades the lines of force follow the shortest path and produce a concentrated sharply defined narrow field of force which will not be substantially absorbed or dispersed by the completely insulated members. The image carried by the movable member is inked from a suitable source and the concentrated lines of force transfer this ink from the image to the print receiving material spaced therefrom. Inasmuch as the field of force is concentrated and confined to the pressure printing line of ordinary contact pressure printing a narrow printing zone is created which results in an improved reproduction of the image on the print receiving material.

In order to increase the concentration of the electro field of force magnets are operatively associated with said elements and the magnetic lines of force emanating from the field bars thereof provide a shield for the electro field of force and assure confinement thereof to the narrow printing zone. Provision is made for varying the location of the field bars of said magnets to change the shielding effect of the magnetic lines of force on the electro lines of force.

As illustrative of an actual embodiment of the inventive concept the movable image carrying member and the supporting member are hollow cylinders in which the discharge element and the attraction element are located respectively and extend radially of the cylinders.

Also in the embodiment illustrated the cylinders are shown by way of example as geared together to rotate in synchronism. The print receiving material is somewhat diagrammatically shown as passing in a straight line between the cylinders in contact with the supporting cylinder but spaced from the image on the image carrying cylinder, and it will be understood that said print receiving material might extend partially around the supporting cylinder as is well known in the art and as indicated in my said prior patents, Nos. 1,820,194 and 2,224,391. The magnets for creating the shielding magnetic field of force are shown as located in the supporting cylinder on opposite sides of the attraction element and said magnets can be adjustably positioned radially of the supporting cylinder.

In said drawings, 10—10 denote vertical frame members of a printing press or apparatus in which are supported non-rotatable hollow sleeves 11—11. Affixed to the sleeves 11—11 are collars 12—12 at each end of each of the two cylinders designated generally by the reference characters A and B which in this instance are the image carrying member and the supporting member. Mounted on each of the collars 12 is a ball race 13 to which are secured the respective cylinder ends 14—14, so that, as will be evident, the cylinders may be rotated freely about the fixed sleeves 11—11. As will be understood, one of the cylinders will be driven from a suitable source of power, not deemed necessary to illustrate, and the two cylinders as illustrated may be rotated synchronously by the gears 15—15.

Detachably mounted on each of the cylinder ends 14 is an insulating ring 16, the latter being adapted to be locked with its corresponding end 14 by a plate 17 provided with dowels 18 inserted

within corresponding dowel holes 19 and 20 in the ring 16 and cylinder end 14, respectively. Each of said plates 17 is provided with a hub 21 rotatable on and slidable lengthwise of the sleeve 11 so as to permit removal of the rings 16 and the plates carried thereby as will be evident. In the case of the image carrying cylinder A the outer surface thereof is provided with the desired images to be printed on the print receiving material and which image is indicated conventionally at 23. The supporting cylinder B, will have a smooth, plain surface, the function of which is to support the paper 25 or other print receiving material in proper position to be printed on while passing through the electrostatic and/or electronographic field of force hereinafter described.

As will be understood by those skilled in the art, the print-receiving material 25 may be paper, cloth, or other textile, certain metals, or any other material, either in sheet or web form, capable of receiving and retaining thereon a reproduced or printed image. It is further to be understood that the term "image" as used herein contemplates words, letters, delineations, drawings, pictures, illustrations and any other representation, singly or in combination, and which may be reproduced on the print-receiving material.

In Figure 1, showing relief printing, the cylinder 22 will have the image areas 23 thereof in relief, the same being inked in the usual manner by the five orthodox inking rollers 251. In the case of Figure 2 for planographic printing, an additional water fountain 26 will be employed for dampening the non-image areas of the cylinder 22 as will be understood. For intaglio printing, as indicated in Figure 3, ink is applied to the image areas of the cylinder 22 from the ink trough 27 and the surplus ink removed by the doctor blade 28 in a well known manner. Except for the differences in character of the printing cylinders for the three kinds of printing and the corresponding inking systems therefor, the other features of the present invention are the same for all three forms so that a single description will suffice for all.

Referring now more particularly to Figures 1 and 4, there is extended through the center of the supporting cylinder B, an insulator hollow tube 38 supported in the fixed sleeves 11—11. Straddling the tube 38 at relatively close intervals substantially the entire length of the cylinder B on the interior thereof, is a series of U-shaped magnet cores 39—39. These are slidably guided within a specially shaped bar 40 of insulating material which in turn is secured at its ends to the tube 38. Each of the cores 39 is provided with right and left windings or spools 42—42 and all connected to a suitable source of electric current as will be understood.

Extending lengthwise of each of the series of left and right spools 42 and secured to the ends of the respective sets of cores 39 by screws 43—43 are two specially shaped magnetic field bars 44—44. Each of the latter is formed with a partial cylindrical outer surface 45 disposed closely adjacent the inner surface of the cylinder B as shown. The bars 44—44 are further so designed that the same are formed with more or less knife-like edges 46—46 extended toward each other and leaving only a relatively narrow gap therebetween extending lengthwise of the cylinder B directly radially inward of the free end of the discharge or repulsion element or blade in cylinder A, hereinafter referred to.

Also secured to and extending the length of the tube 38 is what may be termed an attraction blade or element 47. The latter is secured to the tube 38 by angle plates 48 and screws 49, the latter being extended to the interior of the tube 38 and in electrical circuit with a high potential rod or conductor 50 disposed axially within the tube 38. The attraction blade 47 is extended radially between the sets of magnet spools 42 to a sharpened edge disposed closely adjacent the inner surface of the cylinder B, directly in line with said discharge blade of cylinder A and closely adjacent the magnetic field bar edges 46, as shown.

Within the printing or image carrying cylinder A is an insulating tube 29 mounted similarly to the insulating tube 38. Secured to the tube 29 is what may be termed a discharge or repulsion element or blade 35, the latter extending the length of the work area of the printing cylinder A and radially of the cylinder towards the printing zone and in alignment with the attraction blade 47, as shown. The discharge blade is electrically connected to a conductor 30 extending axially through the tube 29.

The discharge and attraction blades 35 and 47 are electrically connected in circuit with a high potential source of electrical energy, electronic and/or electrostatic and in such manner that the lines of force pass in a direction from the discharge blade 35 toward the attraction blade 47. As will be apparent, powerful lines of force are thus effective in a concentrated narrow zone between the cylinders A and B which are electrically insulated from each other, from the apparatus and from the blades or elements to impel or discharge ink from the surface of the cylinder A onto the paper or other print receiving material 25 as it passes between the rotating cylinders in spaced relation to the cylinder A and supported by the cylinder B.

By producing a magnetic field adjacent the attraction blade 47 magnetic lines of force thereof act as a shield to confine the lines of force of the electronic and/or electrostatic currents to the desired direct path between the discharge and attraction blades and prevent the said lines of force from wandering or spreading outside the narrow printing zone during the printing operation, thereby preventing blurring of the impressions and insuring fine clear impressions.

Referring to Figures 1, 2, and 3, it will be seen that the magnets with their attached field bars 44-44 are radially adjusted within the cylinder B by means of the adjusting screws 31. With this construction the shielding effect of the magnetic lines of force may be varied for different operative conditions.

As the term "ink" is employed herein, it is to be understood that the same is intended to include not only ink as that term is usually understood in the art but also pigments, coloring matter, paints and all other fluid consistency materials that may be employed for creating an impression or coating or lamination and which are susceptible of being acted upon by lines of force of an induced field of force. Also, the term "field of force" is used throughout the specification and claims in the same sense as generally employed in writings on electrical and magnetic phenomena to indicate the field, zone or sphere within which electronic, electrostatic, and electromagnetic forces are sufficiently active or powerful to act upon and effect transference of the ink from one surface to another across an

air gap. The term "lines of force" is similarly used to indicate the forces themselves acting in a definite path and direction. As will be understood, therefore, where the term "field of force" and related terms are employed herein, unless otherwise specifically qualified, such terms refer generically to either electronic, electrostatic or magnetic fields of force or any combination thereof.

The drawings indicate an appreciable space between the print or image receiving material 25 and the surface of the printing or image carrying cylinder A. In actual practice the spacing may vary but ordinarily will be approximately three or four thousandths of an inch.

For the sake of brevity, the invention has been shown as described as applied to a single unit rotary press or printing couple but, as will be obvious to those skilled in the art, which might be applied to the other types of presses.

As will be apparent to those skilled in the art, many important advantages result from the means and process of the improvements described. Among them may be mentioned the use of much lighter parts than possible in printing presses requiring heavy mechanical pressure to lift the ink from the printing plate to the paper or the like; the absence of wear on the printing plate with consequent unlimited life and length of editions; clean and unsmearred impressions; and the elimination of "make ready."

Although there has been shown and described what is now considered the preferred embodiment of the invention, the same is merely illustrative and all changes, modifications, and adaptations thereof are contemplated as come within the scope of the claims appended hereto.

What is claimed is:

1. In printing apparatus, a printing couple comprising a movable member, an image on a surface of said member, and a supporting member arranged in spaced relationship to said image; means electrically insulating said members from each other and from the apparatus, means for moving said first member to bring successive areas of said image into operative correlation with successive areas of print receiving material located between said members and supported by said supporting member, means for inking said image, and means for impelling the ink from said successive image areas to said successive print receiving material areas and comprising an element operatively associated with one of said members but insulated therefrom and a second element operatively associated with the other of said members but insulated therefrom, said elements having a gap therebetween and in which gap said members and material are located, said elements being connected to a source of high potential electric energy whereby said electric energy passes across said gap between said elements and through said members and said material and transfers ink from said successive image areas to said successive material areas to print the image on said material.

2. In printing apparatus, a printing couple comprising a movable member, an image on a surface of said member, and a supporting member arranged in spaced relationship to said image; means electrically insulating said members from each other and from the apparatus, means for moving said first member to bring successive areas of said image into operative correlation with successive areas of print receiving material

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located between said members and supported by said supporting member, means for inking said image, and means for impelling the ink from said successive image areas to said successive print receiving material areas and comprising a repulsion element operatively associated with said movable member but insulated therefrom and an attraction element operatively associated with said supporting member but insulated therefrom, said elements having a gap therebetween and in which gap said members and material are located, said elements being connected to a source of high potential electric energy whereby said electric energy passes across said gap between said elements and through said movable image carrying member and said supporting member and said material and transfers ink from successive image areas to said successive material areas to print the image on said material.

3. In printing apparatus, a printing couple comprising a movable member, an image on a surface of said member, and a supporting member arranged in spaced relation to said image; means electrically insulating said members from each other and from the apparatus, means for moving said first member to bring successive areas of said image into operative correlation with successive areas of print receiving material located between said members and supported by said supporting member, means for inking said image, and means for impelling the ink from said successive image areas to said successive print receiving material areas and comprising a repulsion element operatively associated with one of said members but insulated therefrom and an attraction element operatively associated with the other of said members but insulated therefrom, said elements being arranged substantially in a common plane and spaced from each other to provide a gap in which gap said members and material are located, said elements being connected to a source of high potential electric energy whereby said energy passes across said gap between said elements and through said members and said material and transfers ink from said successive image areas to said successive material areas to print the image on said material.

4. In printing apparatus, a printing couple comprising a movable cylinder, an image on the outer periphery of said cylinder, and a supporting cylinder having its outer periphery arranged in spaced relationship to said image; means electrically insulating said cylinders from each other and from the apparatus, means for moving said first cylinder to bring successive areas of said image into operative correlation with successive areas of print receiving material located between said cylinders and supported by said supporting cylinder, means for inking said image, and means for impelling the ink from said successive image areas to said successive print receiving material areas and comprising an element mounted within one of said cylinders and insulated therefrom and a second element mounted within the other of said cylinders and insulated therefrom, said elements having a gap therebetween and in which gap said cylinders and material extend, said elements being connected to a source of high potential electric energy whereby said electric energy passes across said gap between said elements and through said cylinders and said material and transfers ink from said successive image areas to said succes-

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sive material areas to print the image on said material.

5. In printing apparatus as defined in claim 4 and wherein the element mounted within said image carrying cylinder is the repulsion element and the element mounted within said supporting cylinder is the attraction element.

6. In printing apparatus as defined in claim 4 and wherein said elements extend radially of their respective cylinders and in substantially the same plane.

7. In printing apparatus, a printing couple comprising a movable member, an image on a surface of said member, and a supporting member arranged in spaced relationship to said image; means electrically insulating said members from each other and from the apparatus, means for moving said first member to bring successive areas of said image into operative correlation with successive areas of print receiving material located between said members and supported by said supporting member, means for inking said image; means for impelling ink from said successive image areas to said successive print receiving material areas and comprising a repulsion element operatively associated with one of said members and insulated therefrom and an attraction element operatively associated with the other of said members and insulated therefrom, said elements having a gap therebetween and in which gap said members and material extend, said elements being connected to a source of high potential electric energy whereby said electric energy passes across said gap between said elements and through said members and said material and transfers ink from said successive image areas to said successive material areas to print the image on said material; and magnetic means operatively associated with said elements and providing a magnetic field of force acting as a shield confining the electro induced field of force to a narrow printing zone.

8. In printing apparatus as defined in claim 7 and wherein means is provided for adjustably locating said magnets to vary the shielding effect of the magnetic field of force.

9. In printing apparatus as defined in claim 7 and wherein magnets are mounted within one of said cylinders on opposite sides of the said element mounted therein and which magnets produce a magnetic field of force that acts as a shield to confine the electro induced field of force to a narrow printing zone.

10. In printing apparatus, a printing couple comprising a movable cylinder, an image on the outer periphery of said cylinder, and a supporting cylinder arranged with its outer periphery in spaced relationship to said image, means electrically insulating said cylinders from each other and from the apparatus, means for moving said first cylinder to bring successive areas of said image into operative correlation with successive areas of print receiving material located between said cylinders and supported by the outer periphery of said supporting cylinder, means for inking said image; means for impelling the ink from said successive image areas to said successive print receiving material areas and comprising a repulsion element located within and extending radially of said first cylinder and insulated therefrom and an attraction element located within and extending radially of said supporting cylinder and insulated therefrom, said element being located in the same plane and having a gap therebetween and in which gap said cylinders and

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material extend, said elements being connected to a source of high potential electric energy whereby said electric energy passes across said gap between said elements and through said movable cylinder, said material and said supporting cylinder and transfers ink from said successive image areas to said successive material areas to print the image on said material; magnets mounted within said supporting cylinder on opposite sides of said attraction element and which produce a magnetic field of force that acts as a shield to confine the electro induced field of force to a narrow printing zone, and means for adjusting said magnets radially of said supporting cylinder to vary the shielding effect of the magnetic field of force.

11. In a printing apparatus, a frame, a movable

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image carrying member, a member for supporting the print receiving material spaced from said first member and the image thereon, and means for mounting said members in said frame so as to be electrically insulated therefrom and from each other and including supports carried by said frame and having member supporting portions formed of an electrical insulating material, and means for creating an electro induced field of force to transfer ink from the image to the print receiving material and including repulsion and attraction elements operatively associated with said members, an electrical insulating means carried by said supports and mounting said elements, wherefore said elements are electrically insulated from said members, supports and frame.

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