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Gutsche et al.

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[54] **SHEET GRIPPER**

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[52] **U.S. Cl.** **101/409,** 101/246

[51] **Int. Cl.** **B41f 21/04**

[58] **Field of Search** ..... 101/246, 408–412; 271/53, 82, 79, DIG. 3; 335/285, 286, 289, 290, 295; 269/276

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[57] **ABSTRACT**

Apparatus for gripping a sheet on a support surface. Gripper fingers are moved by first electromagnets, for gripping the sheet between the fingers and said surface. The fingers are then held against the sheet by second electromagnets which are arranged in the support surface and cause the fingers to hold the sheet against said surface with an added holding force.

8 Claims, 3 Drawing Figures

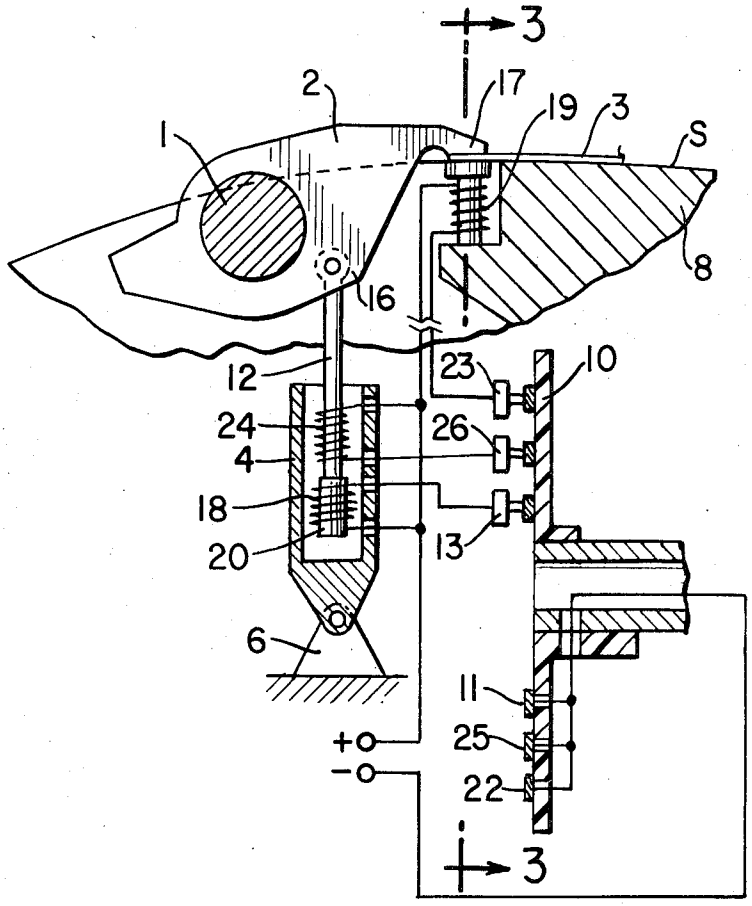


FIG. 1

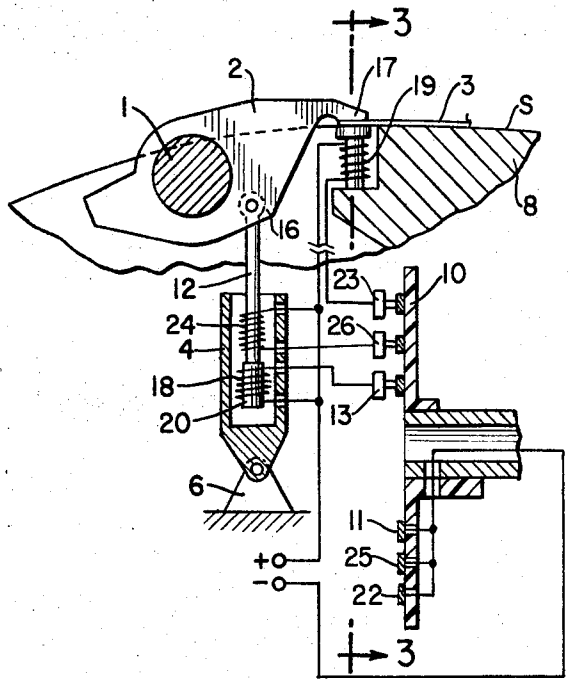


FIG. 2

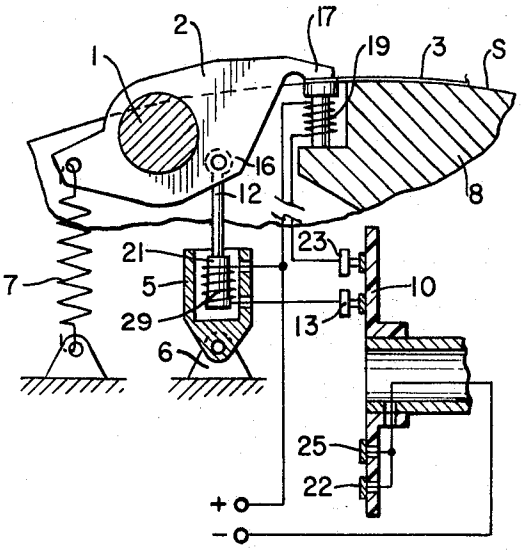
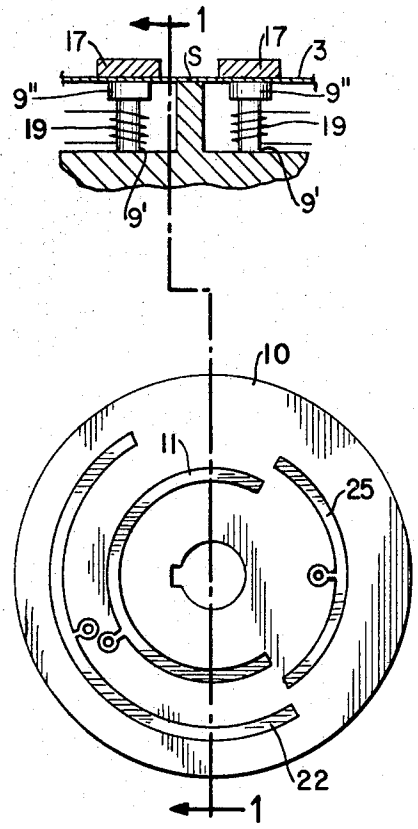


FIG. 3



SHEET GRIPPER

This is a continuation-in-part of Ser. No. 72,714, filed Sept. 16, 1970.

BACKGROUND AND NATURE OF THE INVENTION

Motion of sheet gripper fingers has been provided by pistons of pressure or vacuum cylinders, controlled by valves, which in turn often are controlled by rocker arms or the like. Those devices are subject to difficulties, mainly in the presence of paper dust and the like. Also, in rapidly operated machines, gripper forces of several tons are required, which the known sheet grippers do not easily provide; the pistons, if sufficiently large, cannot be accommodated in conventional printing cylinders and the like.

Other sheet grippers utilize a gripper crank, and the last segment of its movement usually is brought about by an electromagnet. The armature is used to turn a shaft, to which the grippers are secured; the magnet coil is mounted on the printing cylinder. This has the disadvantage that considerable holding forces, as well as a force for gripping the sheet under the grippers over its entire width, has to be supplied by a single electromagnet. Often the gripper shaft then is twisted. A uniform holding force is not realized over the entire width of the sheet. The gripper crank has very heavy wear, and there are other drawbacks.

Sheet grippers are also known in which magnetic gripper fingers clamp the sheet onto a counter surface at the gripper support by spring force and the force of a magnet, often a permanent magnet. These again have the disadvantage that twisting of a gripper shaft occurs. Also, to open the gripper, the magnet force must additionally be overcome.

Therefore, it is an object of the present invention to provide an improved sheet gripper and thereby to produce a better printed product.

It is a further object of this invention to provide means for gripping sheets, mainly in printing presses, which is hardly subject to wear, is small enough to fit into a conventional printing cylinder, requires little maintenance, provides uniform clamping of the sheets over their full width, remains operable at high speeds, and provides increased gripping forces. It is also desired to provide gripping means wherein all operations are carried out by electromagnetic means, which can be incorporated in substantially any kind of press and the like.

For these purposes, the invention provides electromagnetc means for gripping of successive sheets between gripper fingers and support surface, and additional electromagnetic means, arranged in the gripper support surface, for holding the sheets between these additional means and the gripper fingers.

DRAWINGS

FIG. 1 is a diagrammatic, elevational, sectional view of one construction according to the invention, the section being taken along line 1 — 1 in FIG. 3;

FIG. 2 is a similar view of another construction according to the invention; and

FIG. 3 is a sectional view taken along line 3 — 3 in FIG. 1.

In the drawings, the reference numeral 1 designates a rigid shaft on which several grippers 2 are movably arranged, extending over the entire width of the machine. The grippers are fixed laterally. A lug 16 serves to connect the gripper 2 with the drive means and a second lug designed as a gripper finger 17 serves for holding the material sheet 3. The drive of grippers 2 is brought about by double stroke electromagnets 4 (FIG. 1) or alternatively by electrolifting magnets 5 (FIG. 2) which electromagnets in either case are mounted for rotational movement in bearings 6 and in the case of the electrolifting magnets 5 by additional return springs 7. The counterpart of the gripper fingers 17 is a gripper support body 8 in which additional electromagnets 19 are mounted. The electromagnets are controlled by means of a discontinuous slip ring disc 10. Magnets 19 will also be designated as sheet holding or electroholding magnets, while magnets 4 are sometimes called push-pull magnets.

Shaft 1, bearings 6, and both coils and cores of electroholding magnets 19 are shown as rigidly mounted in printing cylinder or sheet support 8, the mounting of magnets 19 being shown at 9'. Pole shoes 9'' of these holding magnets are disposed directly below gripper fingers 17, which are also magnetic. The surfaces of the pole shoes are flush with surface S of body 8, and provide direct support for sheet 3. Fingers 17 may overlie portions of surface S other than the pole shoes, but this is not strictly necessary.

The movement sequence can be appreciated from the description which follows:

The slip ring disc 10 is rotated as a function of the machine's speed. There are provided on the slip ring disc contact zones and contactless zones. At the start of rotation, the contact zone 11 transmits current via the contact 13 to the closing coil 18 (FIG. 1) or to coil 19 (FIG. 2). In this manner, the magnet core 20 is pulled into the energized closing coil 18 (FIG. 1) or in the embodiment of FIG. 2 the magnet core 21 is pulled into the energized coil 29. By means of the plunger 12, which serves for connecting the magnet core 20 or 21 with the lug 16, the gripper finger 17 is pulled in the direction of the gripper support surface 8. Just before the gripper finger 17 impinges on the gripper support surface 8, the material sheet 3 has reached its correct position. Now the coil of the electroholding magnet 19 is energized, via the contact zone 22 and contact 23, and the ensuing magnetic force between pole 9'' and gripper finger 17 provides additional holding force for safely clamping sheet 3 to the surfaces of body 8, including the surface of pole shoe 9''.

Thus, when the movement of the gripper finger 17 is ended, the material sheet 3 is clamped between the gripper finger 17 and the gripper support surfaces, including pole shoes 9''. Added clamping by a holding force is then supplied by the electroholding magnets 19 and fingers 17.

The contacts 13 and 23 reach contactless zones by further rotation of the disc 10. The electromagnet 19 then no longer exerts its holding force, and no further closing force is exerted by the magnet core 20.

According to FIG. 1, the opening coil then is energized via the contact zone 25 and contact 26; the magnet core 20 is pulled into the opening coil 24 and via the plunger 12 the gripper finger 17 is pivoted away from the gripper support surfaces S. According to FIG. 2, the gripper finger 17 is pivoted away from the gripper support surface by the return spring 7 attached to the lug 27.

What is claimed is:

1. In a device for clamping a sheet, particularly on a cylinder of a printing press: a sheet support body; a rigid shaft secured thereto; a system of gripper fingers rotatably mounted on said shaft; a first system of electromagnets in said body; means connecting the first electromagnets with the gripper fingers to produce sheet closing forces between the gripper fingers and said body; and a second system of electromagnets in said body, providing means for applying holding forces between said fingers and the second system of electromagnets for holding the sheet.

2. Apparatus according to claim 1, wherein each of the first-mentioned electromagnets is a push-pull magnet for moving a gripper finger in either direction relative to said body.

3. Apparatus according to claim 1, wherein the first-mentioned electromagnets additionally have spring means for returning the gripper fingers to non-closing positions when the magnets are deenergized.

4. Apparatus according to claim 1, additionally including slip ring means for periodic control of both sets of electromagnets.

5. Apparatus for clamping sheets, particularly on a

cylinder of a printing press, comprising a sheet support body; a rigid shaft secured thereto; a system of gripper fingers rotatably mounted on said shaft; a first system of electromagnets rotationally mounted in said body and having parts movably mounted; means connecting said movable parts of the first electromagnets with the gripper fingers for gripping a sheet between the gripper fingers and said body; and a second system of electromagnets rigidly mounted in said body to provide means for applying holding forces between said fingers and the second system of electromagnets and for thereby firmly holding the gripped sheet to said body.

6. Apparatus according to claim 5, wherein each of the second-mentioned electromagnets is mounted opposite one of said gripper fingers.

7. Apparatus according to claim 5, wherein the gripper fingers are of magnetic material.

8. Apparatus according to claim 5, wherein each of the second-mentioned electromagnets has a pole shoe surface flush with the surface of the sheet support body.

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