Oct. 31, 1961 G. J. ZAHRADNIK 3,006,061

IMPRESSION ROLLER

Filed Jan. 2, 1959 2 Sheets-Sheet 1

FIG. 1

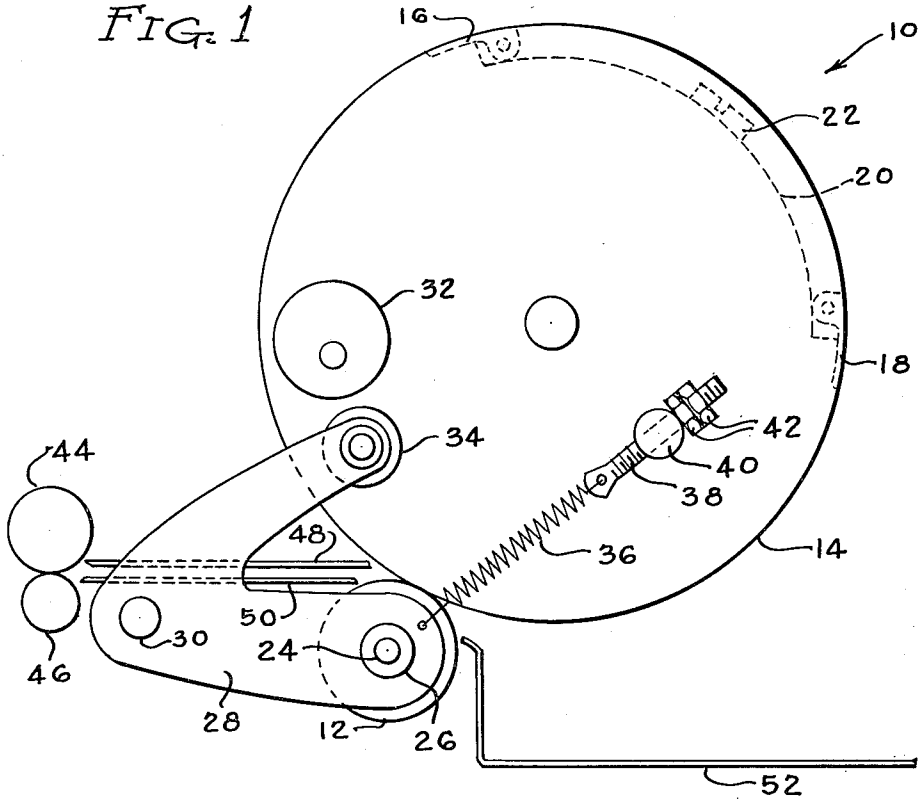


FIG. 2

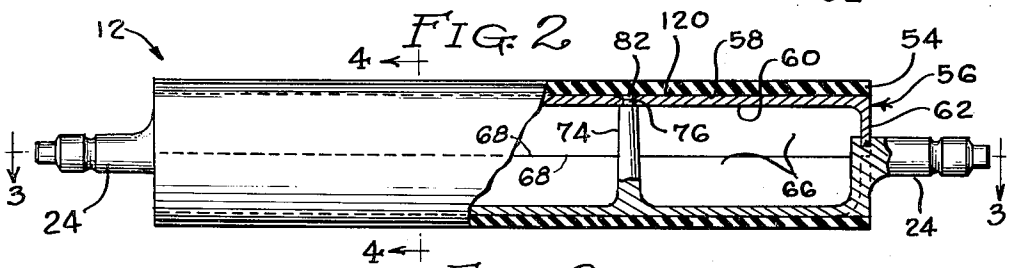
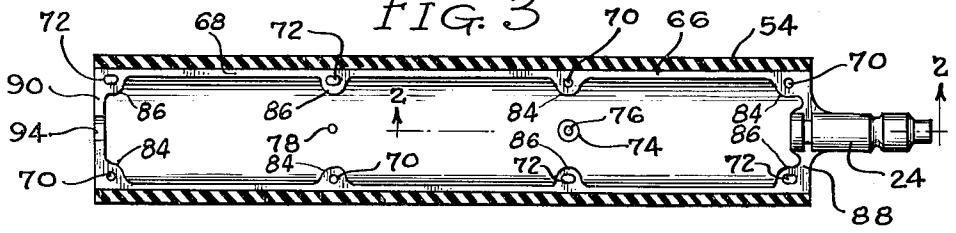


FIG. 3



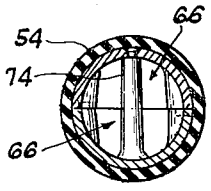


FIG. 4

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FIG. 5

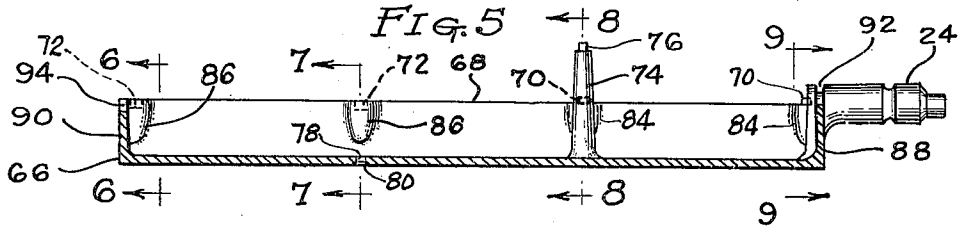


FIG. 6

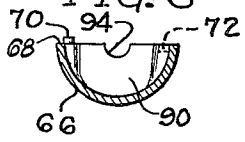


FIG. 7

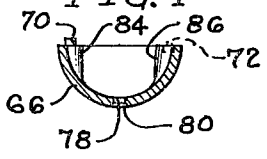


FIG. 8

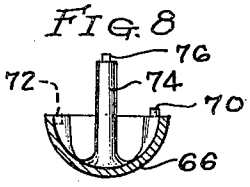


FIG. 9

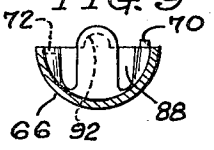


FIG. 10

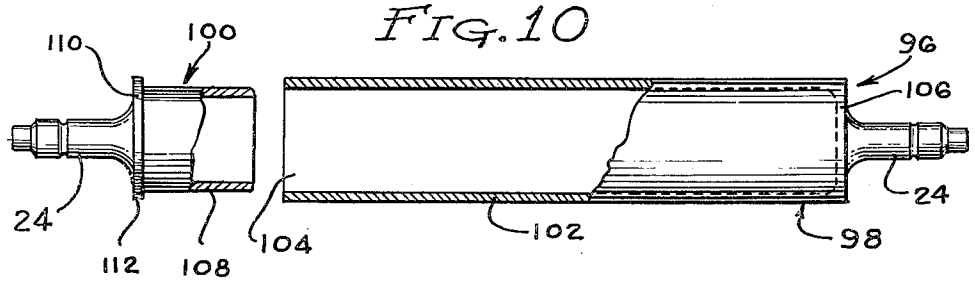
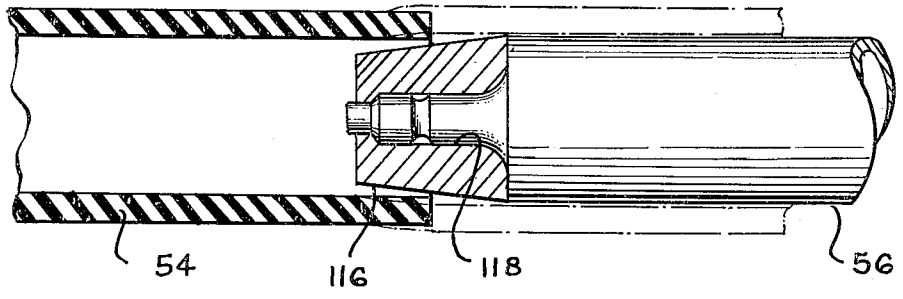


FIG. 11



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3,006,061
IMPRESSION ROLLER

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1 Claim. (Cl. 29—124)

This invention relates to rollers for duplicators or other printing machines, and pertains particularly to a new and improved impression roller.

One object of the present invention is to provide a new and improved impression roller which is so constructed as to minimize bouncing of the roller when it is engaged by a master cylinder, a printing drum or the like.

A further object is to provide a new and improved impression roller comprising a thin sleeve of relatively dead, rubberlike material, mounted around a hollow cylindrical core made of lightweight material, the deadness of the sleeve and the low mass of the roller being effective to minimize bouncing of the roller.

Another object is to provide a new and improved impression roller of the foregoing character, in which the core is formed in two complementary parts, so that the inside of the core may be hollow.

It is a further object to provide a new and improved impression roller which is made by inflating the rubberlike sleeve with compressed air and thereby stretching the sleeve circumferentially, so that it may be slipped over the hollow core.

Further objects and advantages of the present invention will appear from the following description taken with the accompanying drawings, in which:

FIG. 1 is a diagrammatic elevational view showing a duplicator equipped with an impression roller to be described as an illustrative embodiment of the present invention.

FIG. 2 is an elevational view of the impression roller, partly in section along a line 2—2 in FIG. 3.

FIG. 3 is a longitudinal section taken generally along a line 3—3 in FIG. 2.

FIG. 4 is a cross-sectional view, along a line 4—4 in FIG. 2.

FIG. 5 is a longitudinal section of one of the two complementary identical parts making up the hollow core of the impression roller shown in FIGS. 1–4.

FIGS. 6, 7, 8 and 9 are cross-sectional views, taken along the lines 6—6, 7—7, 8—8 and 9—9 in FIG. 5.

FIG. 10 is an elevational view, partly in longitudinal section, to show a modified core for the impression roller.

FIG. 11 is a fragmentary elevational view, partly in longitudinal section, to show the method whereby the core and the rubberlike sleeve are assembled to form the impression roller.

It will be seen that FIG. 1 illustrates a printing machine 10 which may be a stencil type duplicator, for example. The illustrated machine 10 comprises an impression roller 12 adapted to press copy sheets against a cylinder or drum 14, so that the drum can make printed impressions upon the sheets. As shown, the cylinder 14 takes the form of a stencil drum having clamps 16 and 18 for securing the opposite ends of a stencil around the drum. Of course, the stencil is adapted to be wrapped around the drum 14 between the clamps 16 and 18. The illustrated drum 14 is of the type adapted to hold a supply of ink, which is fed to the underside of the stencil. The pressure of the roller 12 forces the ink through the open portions of the stencil onto the copy sheets.

A short gap 20 is formed in the drum 14 between the clamps 16 and 18. In this case, a removable filler plug

22 is mounted in the gap to close the opening through which ink is poured into the drum.

The impression roller 12 is supported for free rotation, and also is mounted for movement into and out of engagement with the drum 14. In this case, the roller 12 has stub shaft elements 24 extending from its opposite ends. The shaft elements 24 are rotatably supported in bearings 26 which are mounted on levers 28. Each of the illustrated levers 28 is swingable about a pivot 30 so that the roller 12 may be moved toward and away from the drum 14. As the gap 20 in the drum 14 passes the roller 12, the roller may be held away from the drum by the action of rotary cams 32, adapted to engage cam follower rollers 34 on the levers 28. Tension springs 36 are connected to the levers 28 to bias the impression roller 12 toward the drum 14. In this case, each spring 36 is connected to an anchor screw 38 which extends through a stud 40 and is fitted with nuts 42 so that the position of the screw 38 may be adjusted to vary the tension in the spring 36. The cams 32 are effective to release the impression roller 12 for movement toward the drum 14 by the springs 36 after the gap 20 has passed the roller 12.

Any suitable mechanism may be provided for feeding the copy sheets between the impression roller 12 and the cylinder 14. In the illustrated arrangement, the copy sheets are fed initially between upper and lower forwarding rollers 44 and 46 which propel the sheets between guide plates 48 and 50. It will be apparent that the plates 48 and 50 direct each copy sheet between the roller 12 and the cylinder 14. After passing between the roller and the cylinder, each copy sheet drops into a suitable receiving tray 52.

When the duplicator 10 is operated at high speeds, it has been found that the impression roller 12 tends to bounce along the drum 14 when the roller engages the drum after the gap 20 has passed the roller. Normally, the roller does not bounce sufficiently to move entirely out of engagement with the copy sheet, but the bouncing of the roller causes oscillatory variations in the pressure between the roller and the copy sheet. This is sometimes made evident as alternate light and dark areas in the printed copy near the head ends of the sheets. Of course, the roller settles down after a few bounces so that the lower portions of the sheets are printed satisfactorily, without variations in the darkness of the printed copy.

The present impression roller 12 is constructed to minimize and virtually eliminate the tendency of the roller to bounce, so that there will be no evident variations in the darkness of the printed copy. To this end, the roller 12 is made with a relatively thin rubberlike sleeve 54 mounted around a hollow generally cylindrical core 56 which is extremely light in weight. The core 56 comprises a thin cylindrical shell 58 with a generally cylindrical cavity 60 therein. End walls 62 close the opposite ends of the cavity 60. In this case, the stub shafts 24 extend outwardly from the end wall 62, and do not extend along the entire length of the roller 12. The core 56 is preferably made of a material having an extremely low specific gravity. For example, the core may be made of a light metal, such as aluminum, or various synthetic plastic materials. As illustrated in FIGS. 2–9, the core 56 is made of metal and is formed in two identical parts 66 which are generally semi-cylindrical in shape. The parts or halves 66 of the core 56 may advantageously be made from aluminum, or some other suitable metal, by a die casting method. It will be seen that the parts 66 have mating surfaces 68 which extend along a plane coinciding with the axis of the roller 12. Each part 66 has a plurality of locating pins 70 adapted to be received in locating holes or recesses 72. The pins 70 and the recesses 72 are formed along

opposite edges of the parts 66 so that the pins and recesses will mate when the parts are assembled.

While the parts 66 may be secured together in various ways, it is preferred to form each part with a post 74 adapted to extend diametrically within the assembled core 56. Each post 74 has a reduced end portion 76 adapted to extend through a hole or aperture 78 formed in the other part. An enlarged counterbore 80 is formed around the outside end of each hole 78, so that the reduced portion 76 of each post 74 may be riveted to form an enlarged retaining head 82, which will be recessed into the counterbore. The pins 70 and the post 74 may be formed integrally with the parts 66. Reinforcing bosses 84 and 86 are formed around the pins 70 and the recesses 72.

One of the stub shafts 24 may be formed integrally with each of the parts 66. The circular end walls 62 are formed by half circular wall portions 88 and 90 at the opposite ends of the mating parts 66. For each part 66, the corresponding stub shaft 24 is formed integrally with the half circular wall portion 88. The inner end of the stub shaft 24 has a half circular groove 92 adapted to receive a half circular notched portion 94 on the opposite half circular end wall 90. Thus, the parts 66 fit tightly together with snug joints therebetween. It will be understood that the parts 66 might readily be molded out of a plastic material and might then be cemented or otherwise secured together. In that case, the stub shafts 24 could be formed as separate metal inserts.

FIG. 10 illustrates a modified core 96 comprising two complementary parts 98 and 100 which are circular in cross-section and telescopically joined. The parts 98 and 100 may advantageously be formed from aluminum, or some other suitable metal, by an impact extrusion method.

It will be seen that the part 98 comprises a tubular cylindrical shell 102 having an opening 104 in one end. The other end is enclosed by an end wall 106, on which the stub shaft 24 may be integrally formed.

The part 100 has a shorter tubular portion 108 adapted to be received within the opening 104 with a light press fit. One end of the part 100 is open, while the other end is closed by an end wall 110. The other stub shaft 24 may be formed integrally with the end wall 110. It will be seen that the end wall 110 extends outwardly beyond the tubular shell 108 to form a flange 112 adapted to engage the end of the tubular shell 102 when the shell 108 is pressed into the shell 102.

The rubberlike sleeve 54 is made of a material which is soft and elastic, but which has a fairly low order of resilience, so as to minimize the tendency of the material to bounce. A relatively dead synthetic rubber of the Buna type has been found highly satisfactory.

The rubber sleeve 54 is tightly fitted around the core 56 so as to prevent any relative movement between the sleeve and the core. In fact, it is preferred to form the sleeve 54 with an initial inside diameter which is substantially less than the outside diameter of the core 56, as clearly shown in FIG. 11. The sleeve 54 is stretched circumferentially so that it may be slipped over the core 56. This may advantageously be done by inflating the sleeve 54 with compressed air. The assembly of the sleeve 54 and the core 56 is facilitated by fitting one end of the core 56 with a removable tapered mandrel or guide 116, having a bore 118 therein adapted to be received over one of the stub shafts 24. The mandrel 116 tapers from the diameter of the core 56 to a diameter somewhat less than the inside diameter of the sleeve 54. Thus, the open end of the sleeve 54 may be pushed part way onto the mandrel. Pressure may then be built up in the sleeve until the sleeve is stretched sufficiently so that it may be pushed over the core 56. The air pressure is increased to a point such that the air will leak

outwardly to some extend between the sleeve 54 and the core 56. The outward stream of air has a lubricating effect which makes it easy to mount the sleeve 54 on the core 56.

It is preferred to employ a layer of cement 120 between the sleeve 54 and the core 56, so as to give added assurance that the sleeve will be firmly secured to the core. The cement may be applied to the inside of the sleeve 54 or the outside of the core 56, or preferably both, before the sleeve and the core are assembled. The cement may be dried so that it will not interfere to any extent with the assembly of the sleeve and the core. After the sleeve and the core are assembled, the cement may be activated by the application of heat to the roller.

When the roller has been assembled, the outside of the rubber sleeve 54 may be ground to provide a smooth cylindrical surface of the required diameter. When installed in the machine, the impression roller will afford a firm uniform pressure between the copy sheets and the cylinder 14. Because of the small mass of the roller and the deadness of the rubber sleeve 54, there is very little tendency for the roller to bounce when it first engages the cylinder at the head portion of the stencil. Thus, the pressure of the roller is applied to the head portions of the copy sheets with a high degree of uniformity, so that there is no noticeable variation in the darkness of the printed copy. The duplicator may thus be operated at extremely high speeds with highly satisfactory results.

Various other modifications, alternative constructions and equivalents may be employed, without departing from the true spirit and scope of the invention, as exemplified in the foregoing description and defined in the following claim.

I claim:

A roller for a printing machine, said roller comprising a hollow rigid core including a thin-walled cylindrical shell with a generally cylindrical cavity therein, said shell being formed in two generally semi-cylindrical parts with a longitudinal joint therebetween, a pair of end walls extending across the ends of said shell and closing the ends of said cavity, each of said end walls being formed in two generally semi-circular elements formed integrally with said semi-cylindrical parts of said shell, a pair of stub shafts extending outwardly from said end walls in opposite directions and along the axis of said shell, said stub shafts being greatly reduced in diameter relative to said shell, one of said stub shafts being formed integrally on one of said semi-circular end wall elements on one of said semi-cylindrical parts, the other stub shaft being formed integrally on one of said semi-circular end wall elements on the other semi-cylindrical part, said semi-cylindrical parts being identical in construction and having complementary interengageable joint elements thereon for holding said parts together to form said shell, said joint elements comprising a plurality of pins formed integrally with each of said parts and a plurality of openings in each of said parts for receiving the pins on the other part, one of said pins on each part having an end portion extending through and riveted into the corresponding opening in the other part to secure said parts together, and a soft rubber-like thin walled sleeve mounted around the outside of said shell and having a smooth cylindrical outer surface.

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