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**A drive system or isolating system for a web printing machine.**

The drive system is for use on a web printing machine of the kind having at least first and second printing units (8, 7) drivable from a prime mover (12). Drive is transmitted through a drive shaft (13) which is common to the printing units. The first printing unit (8) is disposed between the prime mover (12) and the second printing unit (7). The drive system comprises a drive unit (41) having a motor (42) for transmitting drive to a movable member (29) of the first printing unit. While drive from the prime mover (12) to the first printing unit (8) is interrupted. The drive motor (42) enables an operation requiring drive of the movable member (29) to be performed on the first printing unit (8) while the second printing unit (7) remains drivably connected to the prime mover (12) through the driveshaft (13). The isolating system comprises a switch (SW1) for disabling on the first printing unit (8) a sensing circuit which normally operates to inhibit drive to the first and second units (8, 7) from the prime mover (12) as a result of movement of guards (59, 60) on the first unit (8) into an inoperative position. Operation of the switch (SW1) is possible only after drive to the first print unit has been interrupted.

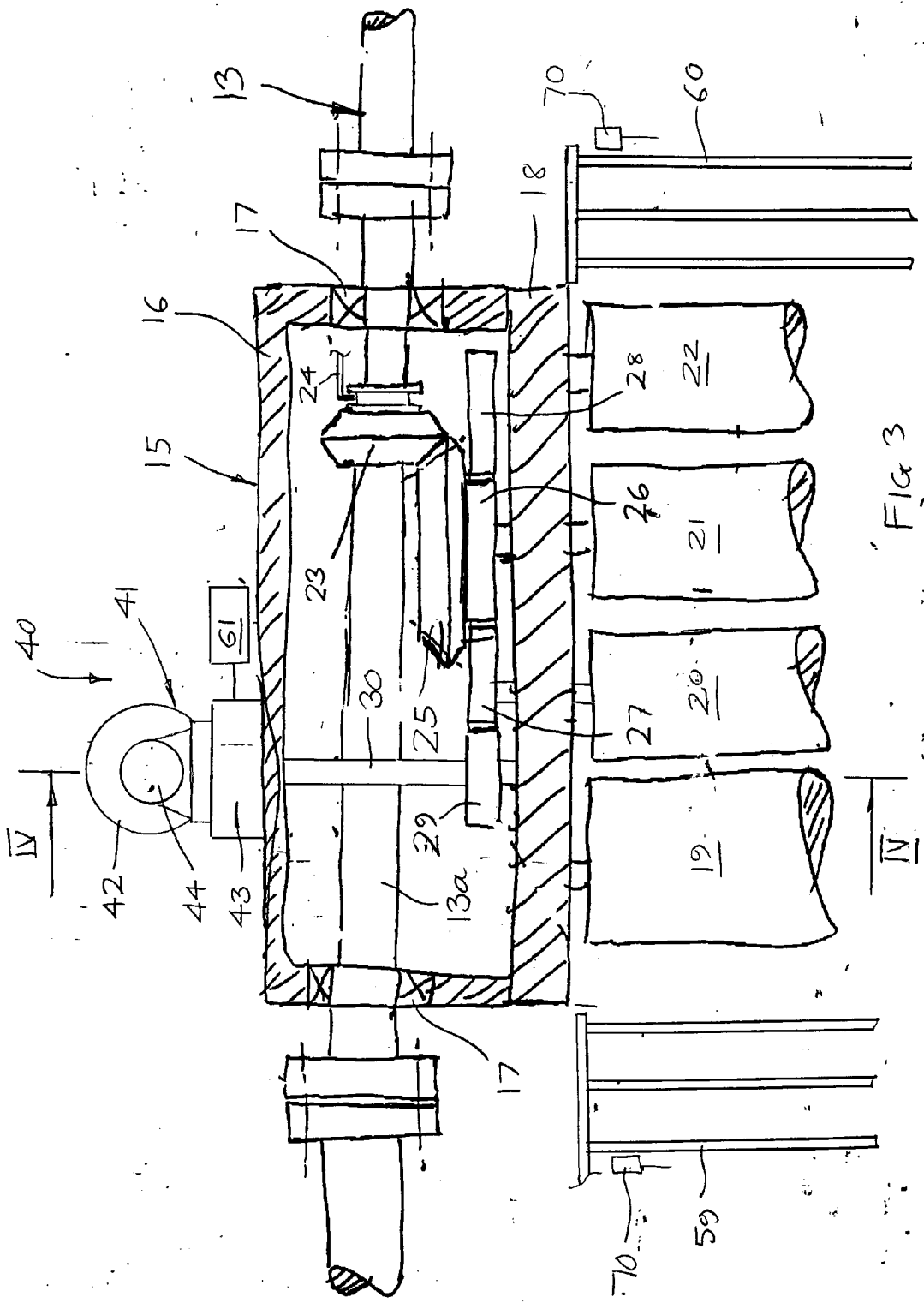


FIG 3

The invention relates to a drive system or isolating system for a web printing machine having at least first and second printing units or towers (hereinafter referred to as printing units) drivable from prime mover means.

Normally, in a web printing machine having a plurality of printing units, for example, printing machines used in the newspaper trade, there is generally a drive shaft from the prime mover or prime movers which is common to all of the printing units so that drive is transmitted to all of the units simultaneously through the drive shaft.

Occasionally, only one or a few of the printing units of the machine may be in use. For example, in a printing machine having eight printing units, only the first four may be in use. However, with printing machines of this type the remaining printing units continue to be driven even though they are not being used. This is disadvantageous, particularly where printing cylinders for a subsequent print run need to be changed in the idly driven printing units but the changeover operation cannot take place while they are being driven. During such printing cylinder changes it is often necessary to inch the cylinders around incrementally. However that can be difficult using the prime mover.

One object of the present invention is to provide a drive system for a printing machine which will enable the above disadvantage to be substantially overcome.

According to the invention there is provided a drive system for a web printing machine of the kind having at least first and second printing units drivable from prime mover means through drive shaft means common to both printing units, the first printing unit being disposed between said prime mover means and the second printing unit, the drive system comprising drive means for transmitting drive to a movable member of the first printing unit, with drive from said prime mover means to the first printing unit interrupted, to enable an operation requiring drive of said movable member to be performed on the first printing unit with the second printing unit remaining drivably connected to said prime mover means by said drive shaft means.

Such a drive system forms an auxiliary drive for that particular printing unit and enables, say, a movable member in the form of a printing cylinder to be inched around incrementally as desired for servicing or other purposes even though the second printing unit is still drivable or being driven by the prime mover means.

According to a second aspect of the invention there is provided a drive system for a web printing machine of the kind having at least first and second printing units drivable from prime mover means, the drive system comprising drive means for transmitting drive to a movable member of the first printing unit with drive from said prime mover means of the first printing unit interrupted to enable an operation requir-

ing drive of said movable member to be performed on the first printing unit with the second printing unit remaining drivably connected to said prime mover means.

Preferably, guard means are provided on the first and second printing units, movement of any or selected ones of which into an open or non-operative position will interrupt drive from the prime mover means to both print units simultaneously. In such a case, the drive system may include means for permitting the guard means of the first print unit to be moved into a non-operative position without interrupting the drive to the second print unit from the prime mover means.

The drive system may include electrical circuitry which includes indicator means which is arranged to provide an indication to an operator that the guard means of the first print unit can be moved to an inoperative position without affecting the operation of the second print unit.

Time delay means may be provided in the circuitry by which the aforesaid indicator means will operate only after operation of said time delay means. In that way, the time delay means will give time for movable components in the first printing unit to come to a halt after drive thereto from the prime mover or prime movers have been interrupted.

The drive means may be operable to drive said movable member of the first printing unit in response to a signal under the control of an operator using, say, a push-button switch of the circuitry.

Preferably, the drive means transmits drive to the movable member through a clutch. The clutch may be operated by the operator through suitable switch means, for example the aforesaid push-button switch.

A drive means time delay may be provided in the circuitry which is operable to ensure that the drive means will become operative to drive the movable member only after the clutch has been operated to permit transmission of drive.

Selector means may be provided in the circuitry for controlling the direction in which the drive means moves said movable member.

The drive means may transmit drive to gearing to which drive is normally transmitted by the prime mover means when the first printing unit is in normal use.

The drive means preferably includes a reduction drive transmission.

The circuitry preferably senses when drive to the first printing unit from the prime mover or means has been interrupted. Interruption of drive, in such a case, may be sensed by means of a microswitch.

The printing machine may include three or more printing units a plurality of which is provided with respective drive systems as aforesaid. In such a case the first printing unit may be arranged between two other printing units both of which remain drivably connected to the prime mover means during interruption of drive

to the first printing unit from the prime mover means. If desired drive to said first printing unit and at least one other printing unit from said prime mover means can be interrupted to enable the drive means thereof to be operated whilst leaving at least said second printing unit drivable connected to the prime mover.

According to a third aspect of the invention there is provided an isolating system for a printing machine of the kind having at least first and second printing units drivable from prime mover means the isolating system comprising means for disabling on said first printing unit drive inhibiting means which normally operates to inhibit drive to said first and second units from the prime mover means as a result of movement of guard means on said first unit into an open or inoperative position, operation of said disabling means being possible only after drive to the first print unit has been interrupted.

With such an arrangement, an operation such as cleaning can be performed on the first printing unit while the second printing unit is still operating.

The disabling means may comprise a switch to bridge one or more switches on the first printing unit which are operated by the or respective guard means.

Timer means may be provided whereby there will be a time delay between the time that drive to the first print unit has been interrupted and the time that said drive inhibiting means has been disabled. The aforesaid drive system preferably incorporates said isolating system according to said second aspect of the invention or any of the consistory clauses relating thereto.

According to a fourth aspect of the invention there is provided a printing machine having one or more drive or isolating systems in accordance with the first or second aspect of the invention or any of the consistory clauses dependent thereon.

A system in accordance with the invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig.1 is a diagrammatic plan view of a web printing machine having eight printing units,

Fig.2. is a diagrammatic elevation of the web printing machine shown in Fig.1,

Fig.3 is a diagrammatic view of part of a gearbox for driving cylinders of one printing unit and incorporating a drive system in accordance with the invention,

Fig.4 is a cross-section through part of the gearbox shown in Fig.3 on the line IV-IV in Fig.3 with a driving motor and reduction gear unit spaced from the gearbox casing,

Fig.5 is an end view of the reduction gear unit,

Fig.6 is a cross section of the reduction gear unit shown in Fig.5 on the line VI-VI in Fig.5 and

Fig.7 is a diagram showing a control circuit of the drive system in accordance with the invention.

Referring to Figs.1 and 2, a printing machine

for web W comprises a plurality of printing units 1 - 8 driven from a prime mover 12 through a common drive shaft 13. The prime mover 12 in the embodiment shown, also drives a folding unit 14. Whilst eight printing units are shown, additional printing units may be added as shown in broken lines at the lefthand end of the machine in Figs.1 and 2.

Each printing unit includes a gearbox 15 having a casing 16 (see Fig.3) through which passes a section 13a of the drive shaft 13. The section 13a is journaled on bearings 17 in the casing 16. The gearbox casing 16 is mounted on a side plate 18 of the printing unit which rotatably supports a plurality of cylinders 19 - 22 for applying print to the web W. The shaft section 13a carries a bevel gear 23. The bevel gear 23 is slidably mounted on the shaft and keyed thereto, e.g., by splines, so that it can be moved axially along the shaft 13a by means of a fork shown diagrammatically at 24. Such axial movement of the bevel gear 23 permits the gear to be moved into and out of meshing engagement with a bevel gear 25 drivably connected to a gear wheel 26. The gear wheel 26 meshes with adjacent gears 27, 28 which in turn mesh with further gearing (not shown) to form a gear train which drives the cylinders of the printing unit. It will be understood that the gearbox shown in Fig.3 is illustrated diagrammatically.

One gear wheel 29 of the gear train is drivably connected to a shaft 30 which is journaled in a bearing 32 (see Fig.4) at its end adjacent the side plate 18 and is journaled at its opposite end in a bearing 33 in a section 34 of the gearbox casing 16. As shown in Fig.4, the left hand end of the shaft 30 is formed with a hexagonal socket 35 which terminates at a short cylindrical blind bore 36. An oil seal 37 is disposed between the outer periphery of the shaft 30 and a counterbore 38 formed in the casing section 34.

A drive system 40 including an auxiliary drive unit 41 is carried by the gearbox casing 16 as shown in Fig.3. In Fig.4, the drive unit is shown spaced from the casing 16. The drive unit 41 comprises an electric motor 42 which provides drive input to a reduction drive unit 43 via an initial step down unit 44. The step down unit 44 has an output shaft 45 which, as shown in Fig.6, is drivably connected to a spur gear 46. The spur gear 46 meshes with a larger gear wheel 47 to provide a reduction drive ratio to a clutch armature 48 via an adapter 49. The armature 48 forms part of a magnetic clutch generally indicated at 50, the clutch including a rotor 52 drivably connected to a drive output shaft 53. The output shaft 53 is journaled in bearings 54, 55 in a casing 56 of the reduction unit 43. The shaft 53 is formed with a hexagonal section 57 of complementary shape to the socket 35 and is formed at its extreme right hand end as a spigot 58 which is locatable in the blind bore 36 when the auxiliary drive unit is mounted on the casing 16. The gear 47 is rotatably supported on the shaft 53 by a bearing 59.

Each of the printing units 1 - 8 is provided with a plurality of guards 59, 60. The guards are movable, typically pivotable, from closed operative positions to open inoperative positions and are associated with a sensing circuit 69. The sensing circuit is common to all units of the machine and includes series connected microswitches 70 associated with the guards of the printing units. If any one guard is opened when the printing machine is running, the sensing circuit, constituting the aforesaid drive inhibiting means, is broken and the whole of the machine (and not simply the individual unit concerned) will stop.

Reference is now made to Fig.7 which shows a control circuit 61 used to operate the auxiliary drive unit 40.

A three phase supply 62 provides an input to a main transformer 63 having an output side providing first and second outputs 64, 65. The first output 64 is connected to a rectifier 66 which provides direct current for energising the clutch 50. The second output 65 is connected to a relay 67 and other components of the circuit 61 as now described. A microswitch 68 is associated with the bevel gear 23 and is an open condition when the bevel gears 23, 25 mesh as shown in Fig.3 and moves to a closed condition when the bevel gear 23 is moved axially to disengage the bevel gear 25. In the disengaged position, drive from the drive shaft 13 to the bevel gear 25 will be interrupted and drive to the printing unit will cease. After a pre-determined time, e.g., 3 seconds, a timer 69 will operate relay 67 so as to close switches SW1 - SW4 thereof. Closure switch SW1 bridges switches 70 associated with guards of the printing unit. Closure of switch SW2 places the circuit for energising clutch 50 into a "ready" condition, closure of switch SW3 places a motor switching circuit 72 in a "ready" condition and closure of switch SW4 illuminates an indicator lamp 73 to show to an operator that the guards can be opened on that particular unit. In this condition, the bevel gear wheel 23 is in its non-meshing position so that no drive is transmitted to the printing unit from the shaft 13.

The motor 42 is drivable by the three phase supply 62 via a forward drive switch 73 or a reverse drive switch 74. A forward/reverse (F, R) drive selector switch 75 is provided which permits current to be directed to either one of the switches 73, 74 via respective thermistors 76, 77. The switch 75 also has an intermediate open circuit position S where neither F nor R is selected. A push button switch 78 is provided which, when closed causes, the motor drive circuit 72 and the clutch 50 to be energised. If desired, the switches 75, 78 could be provided on an extension lead for remote control of the motor 42.

An operational sequence will now be described.

All of the printing units 1 - 8 or selected individual units can be provided with a drive system 40 in accordance with the invention. Where the printing

machine is being run by utilising only, say, units 4 - 8 units 1, 2 and 3 will also be running in view of the common drive shaft 13. If units 1, 2 and 3 are provided with drive systems 40 in accordance with the invention, all or any one of them can be serviced whilst printing units 4 to 8 are still operating.

To perform a servicing operation on, say, printing unit 1, the bevel gear 23 of that printing unit is moved out of mesh with bevel gear 25 so that switch 68 operates. The timer 69 is set so that the relay 67 will operate after the rotary parts of the printing unit 1 have come to a halt. The relay 67 then operates to bridge out the switches 70 and simultaneously illuminate the indicator 73 so that an operator knows that any one of the guards can be opened without bringing the printing units 4 - 8 to a halt. So far, the invention has performed as an isolating system by which the printing unit 1 can be isolated from the remainder of the machine. Servicing work can now be performed on the printing unit 1. If the operator wishes to rotate the cylinders 19 - 22 of the printing unit 1 in a forward or reverse direction in an inching sense the forward and reverse selector switch 75 is operated appropriately and the push button switch 78 is then closed to rotate the cylinders. On a closing push button 78, the appropriate thermistor 76, 77 ensures that current will not pass to the electric motor 42 before the clutch 50 has been fully energised. Once current passes through the motor 42, the reduction drive through the clutch 50 will turn the cylinders 19 - 22 very slowly in the direction selected.

Once the bevel gear 23 resumes the Fig.3 position, the circuit shown in Fig.7 returns to an open condition.

When unit 1 is in normal use, the drive shaft 30 will rotate but, in view of the clutch 50 being in a deenergised state, the rotor 52 will simply idle.

The term "printing unit" as used herein embraces also perforating unit, embossing unit folding unit or like unit used in the printing trade.

If desired a slave motor unit 12a (Fig.1) which shares power with and rotates at the same speed as the prime mover 12 can be used as an additional drive for the shaft 13. Two or more such slave motor units could be provided.

## Claims

1. A drive system for a web printing machine of the kind having at least first and second printing units (8, 7) drivable from prime mover means (12) through drive shaft means (13) common to the printing units, the first printing unit (8) being disposed between said prime mover means (12) and the second printing unit (7), characterised in that the drive system (40) comprises drive means (41) for transmitting drive to a movable member (29)

- of the first printing unit (8), with drive from said prime mover means (12) to the first printing unit (8) interrupted, to enable an operation requiring drive of said movable member (29) to be performed on the first printing unit with the second printing unit (7) remaining drivably connected to said prime mover means (12) by said drive shaft means (13).
2. A drive system according to Claim 1 characterised in that guard means (59, 69) are provided on the first and second printing units (8, 7), movement of any or selected ones of which into an open or non-operative position will interrupt drive from the prime mover means to both print units simultaneously, the drive system (40) including means (61) permitting the guard means (59, 60) of the first print unit (8) to be moved into a non-operative position without interrupting the drive to the second print unit (7) from the prime mover means (12).
  3. A drive system according to Claim 2 characterised in that the drive system (40) includes electrical circuitry (61) which includes indicator means arranged to provide an indication to an operator that the guard means (59, 60) of the first print unit (8) can be moved to an inoperative position without affecting the operation of the second print unit (7).
  4. A drive system according to Claim 2 characterised in that time delay means (76, 77) is provided in the circuitry (61) by which the aforesaid indicator means (73) will operate only after operation of said time delay means.
  5. A drive system according to any preceding Claim characterised in that the drive means (41) transmits drive to the movable member through a clutch (50).
  6. A drive system according to Claim 5 characterised in that a timer means (69) is provided in the circuitry (61) which is operable to ensure that the drive means (41) will become operative to drive the movable member (29) only after the clutch (50) has been operated to permit transmission of drive.
  7. A drive system according to any preceding Claim characterised in that the drive means (41) transmits drive to gearing (29) to which drive is normally transmitted by the prime mover means (12) when the first printing unit (8) is in normal use.
  8. A drive system according to any preceding Claim characterised in that the circuit (61) is arranged to sense when drive to the first printing unit (8) from the prime mover means (12) has been interrupted.
  9. A drive system according to any preceding Claim characterised in that an isolating system is provided comprising means (67) for disabling on said first printing unit (8) drive inhibiting means (69) which normally operates to inhibit drive to said first and second units (8, 7) from the prime mover means (12) as a result of movement of guard means (59, 60) on said first unit (8) into an open or inoperative position, operation of said disabling means (SW1) being possible only after drive to the first print unit (8) has been interrupted.
  10. An isolating system for a printing machine having at least first and second printing units (8, 7) drivable from prime mover means (12) characterised in that the isolating system comprises means (SW1) for disabling on said first printing unit (8) drive inhibiting means (69) which normally operates to inhibit drive to said first and second units (8, 7) from the prime mover means (12) as a result of movement of guard means (59, 60) on said first unit (8) into an open or inoperative position, operation of said disabling means (SW1) being possible only after drive to the first print unit (8) has been interrupted.
  11. A drive system or isolating system according to Claim 9 or 10 respectively characterised in that the disabling means comprises a switch (SW1) to bridge one or more switches (70) on the first printing unit (8) which are operated by the or respective guard means (59, 60).
  12. A drive system according to Claim 8 or an isolating system according to Claim 11 or 12 characterised in that timer means (69) is provided whereby there will be a time delay between the time that drive to the first print unit (8) has been interrupted and the time that said drive inhibiting means (70) has been disabled.



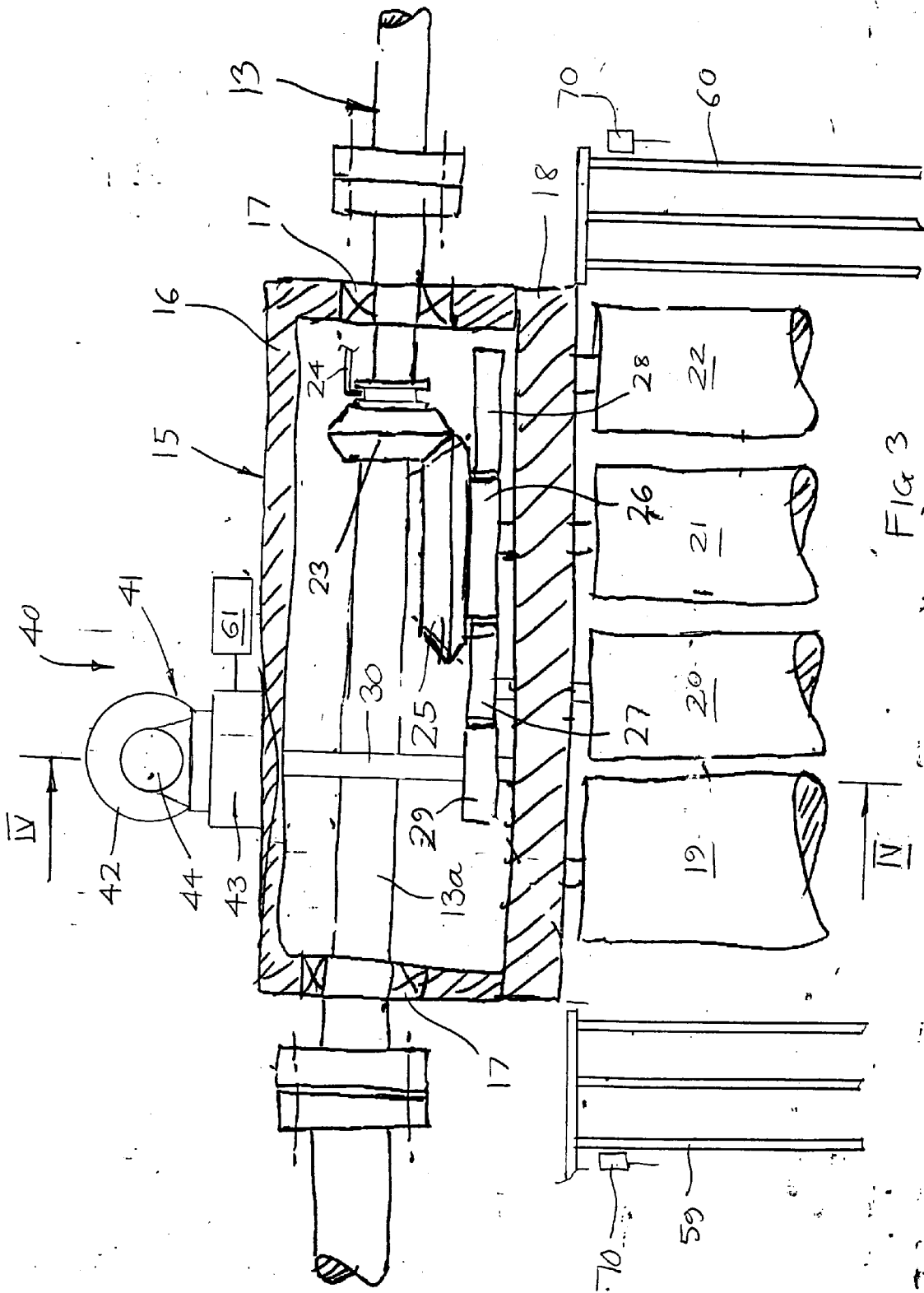


Fig 3

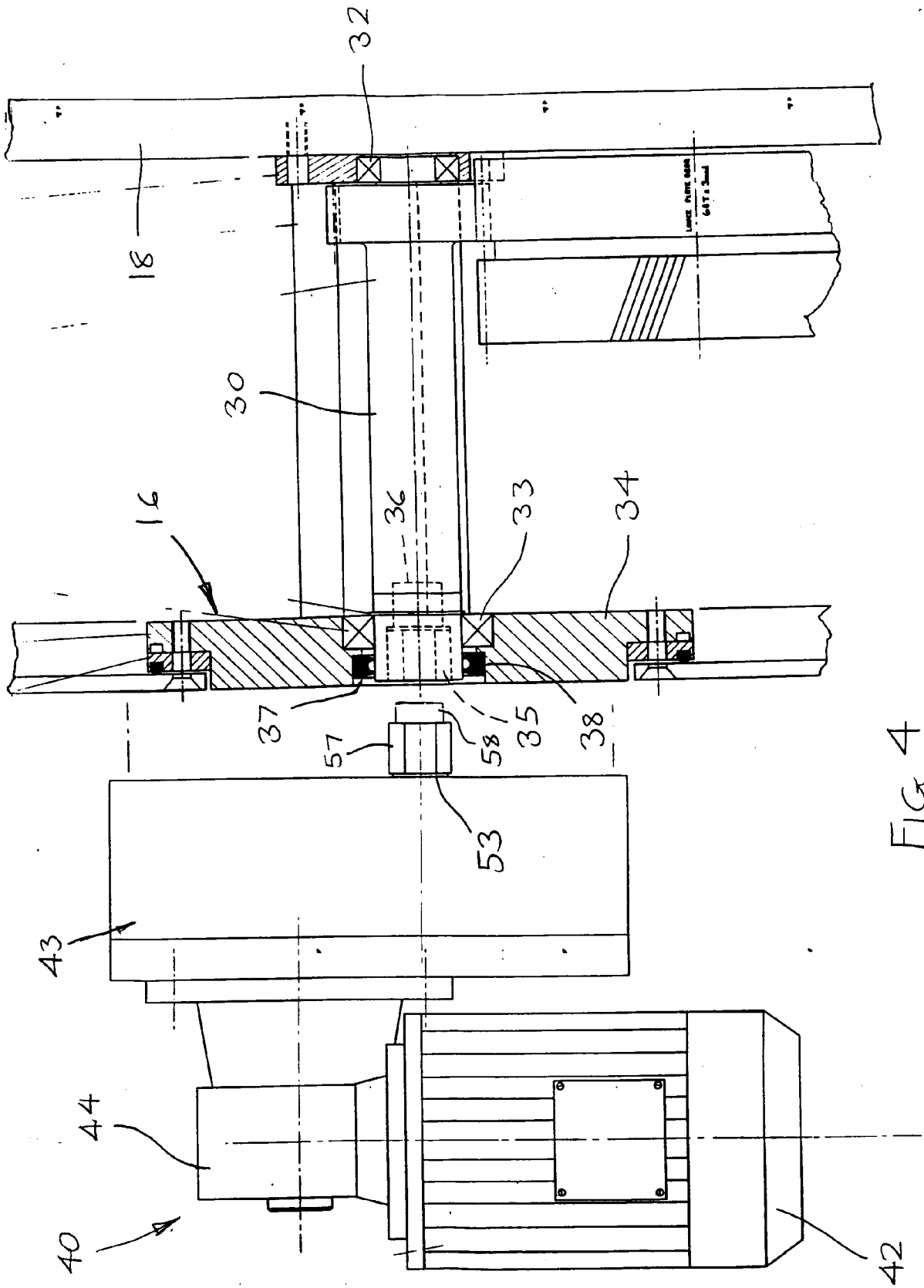
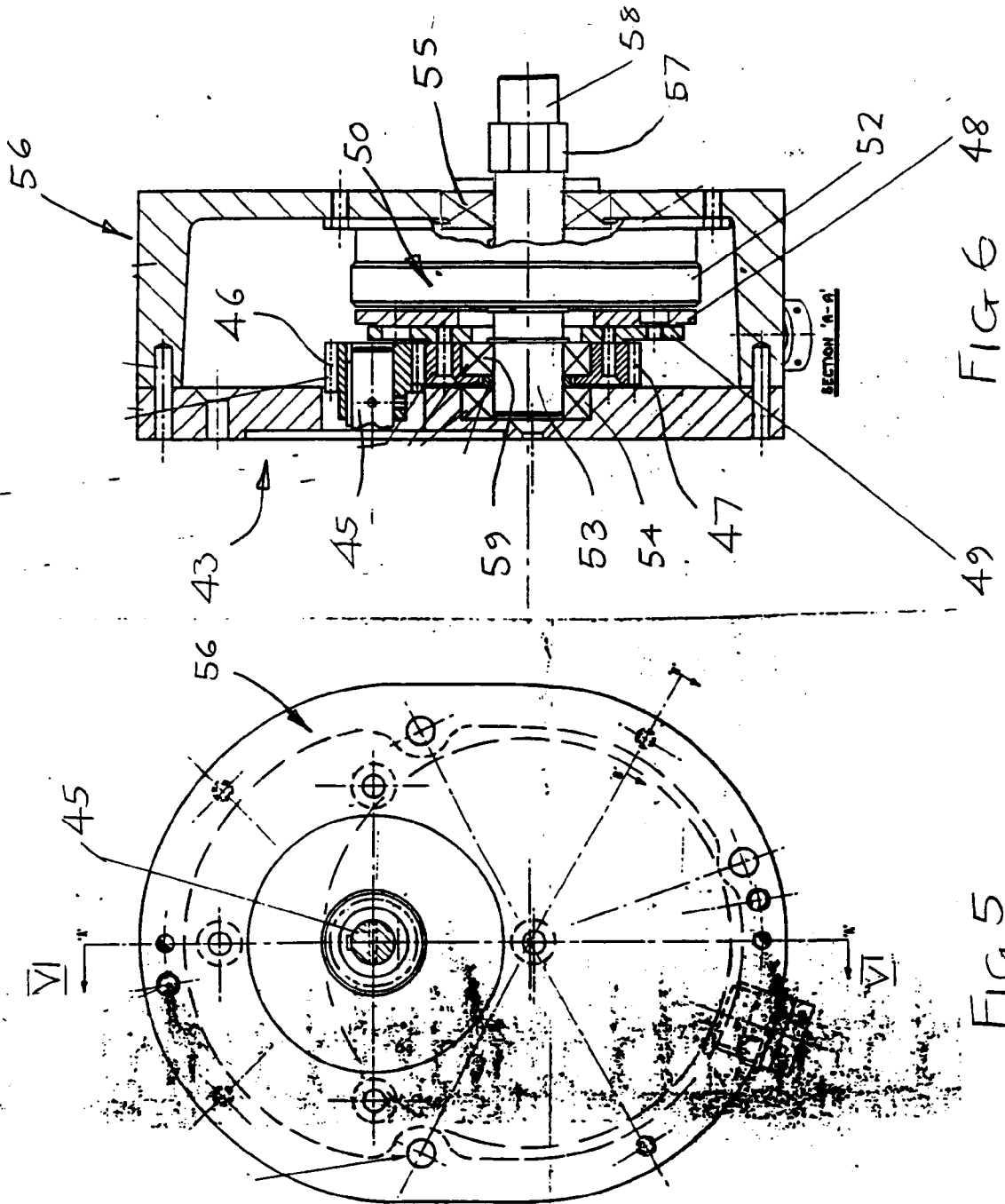


FIG 4



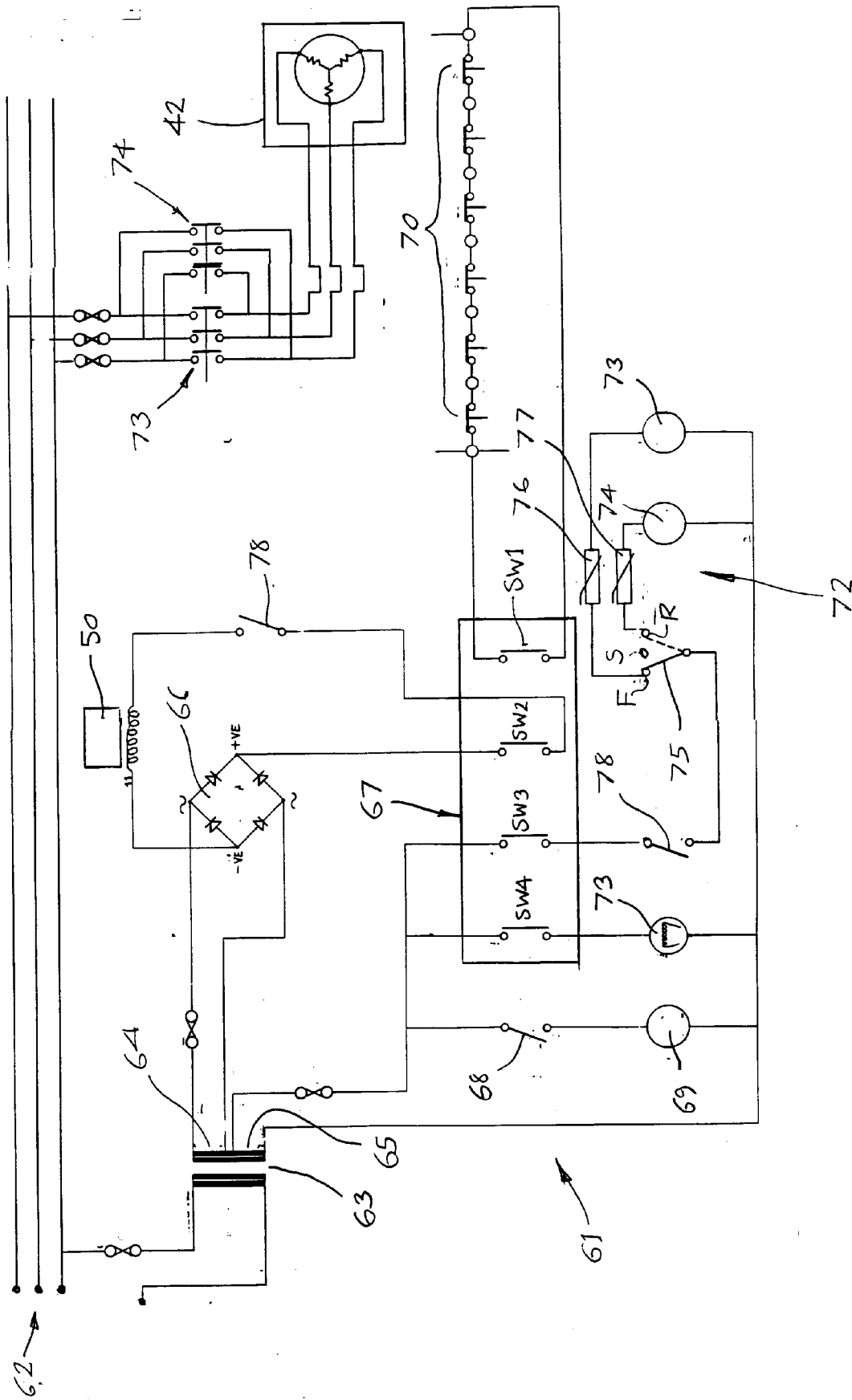


FIG 7



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 8143

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.5)
X	EP-A-0 328 741 (ROCKWELL INTERNATIONAL) * column 2, line 47 - column 3, line 17 * ---	1, 5, 7	B41F13/00
A	GB-A-245 368 (R. HOE & CO) * the whole document * ---	2, 3	
A	GB-A-970 613 (VEB DRUCKMASHINENWERK PLANETA) * the whole document * -----	4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B41F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 JANUARY 1992	Examiner HAGBERG A. M. E.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
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