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# (54) Control panel for injection moulding machine

(57) A control device comprises a panel for setting the sequence of operations of a computer-controlled plastics material injection-moulding machine, which panel includes a plurality of digital displays 14, 16 for nominal values input into an electronic parameter store and for measured values of specific processing parameters, for example pressures, temperatures and the like, and with a keyboard 12 for inserting parameter nominal values into the parameter store. The device includes a sequence control for the nominal value input of the individual parameters in a specific order, the parameters being displayed in turn to the user and all the other parameters being blocked for the nominal value input, until that signalled parameter is inserted. During input of a parameter, suggested values for that parameter are read from an electronic store and are visually reproduced on the respectively associated digital displays 14.

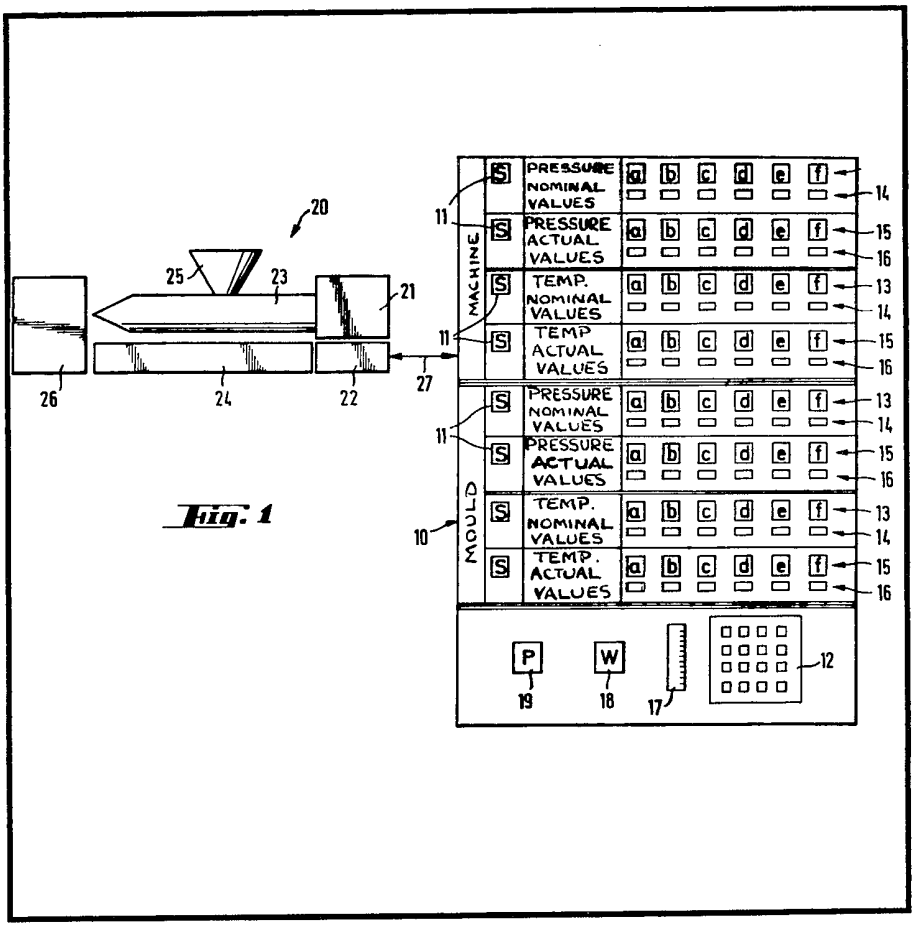


Fig. 1

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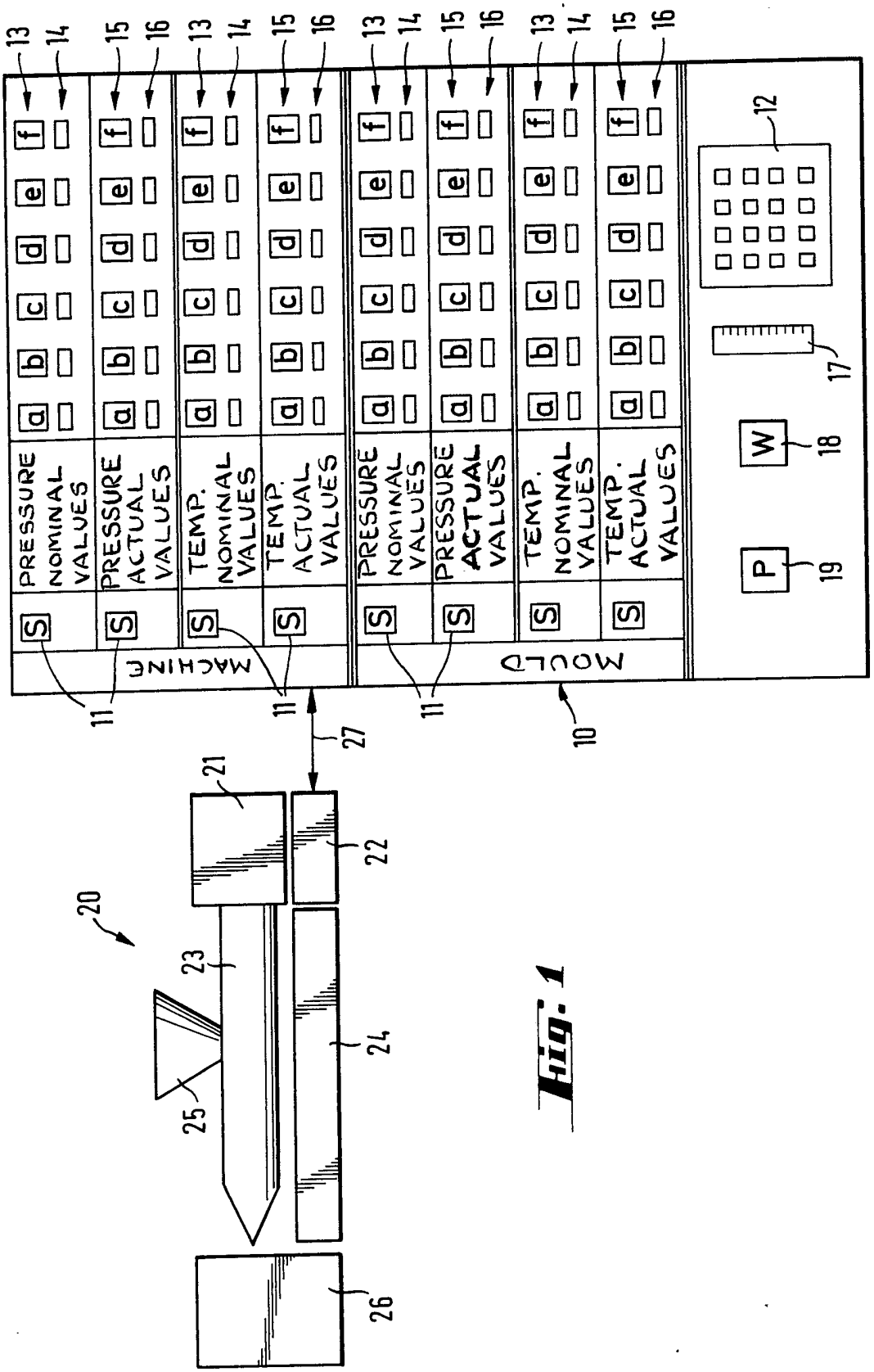
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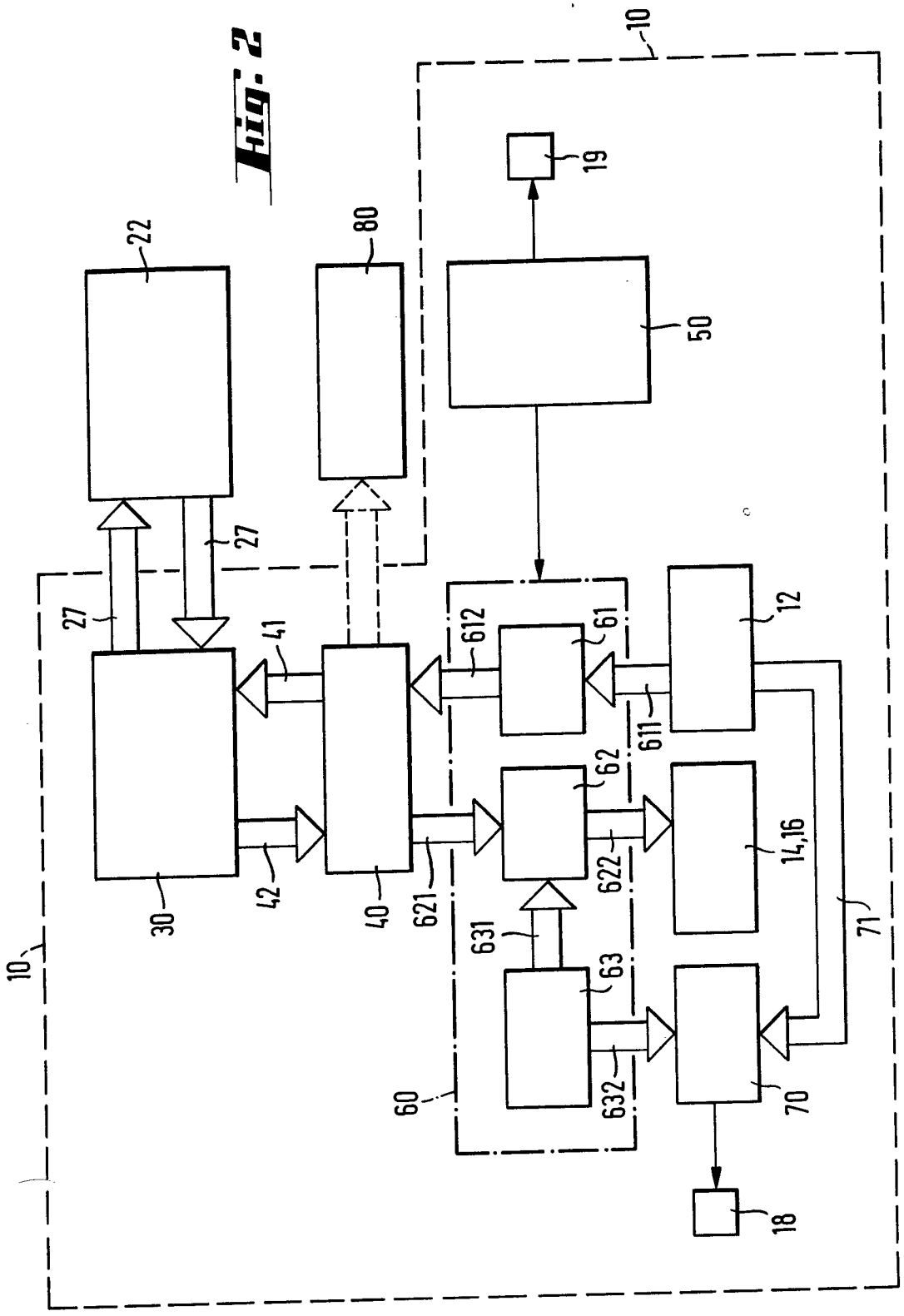
Fig. 1

Fig. 2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SPECIFICATION

## Control panel for injection moulding machine

The invention relates to a control panel for injection moulding machines. A control panel of this kind is known, for example, from DE OS 26 55 095.

The possibilities of modern microprocessor engineering increasingly allow a comprehensive control of virtually all the operating parameters of machines of any kind. The constructional expenditure for controls of this kind relates in by far the majority of cases to the provision of suitable programs for the sequence of operations as well as to the input of suitable nominal values during the setting of each individual machine. In connection with plastics material injection-moulding machines, there is added the fact that, due to changes in the processed plastics material, the moulds used and the machine periphery, a repeated setting of the machine is necessary while it is in operation. In view of the large number of parameters to be set, such new settings turn out to be extremely complicated on known computer-controlled injection-moulding machines and can only be carried out by specially qualified and trained skilled staff.

The object of the invention consists in providing a control panel of the kind mentioned at the beginning which allows a simple, foolproof setting of a large number of parameter nominal values.

According to the invention there is provided a control panel for setting the sequence of operations of a computer-controlled plastics material injection-moulding machine, which panel provided with a plurality of digital displays for the visual reproduction of nominal values input into an electronic parameter store as well as for the visual reproduction of measured actual values of specific processing parameters, for example pressures, temperatures and the like, and with a keyboard for inserting parameter nominal values into the parameter store, characterised by a sequence control for the nominal value input of the individual parameters in a specific order, which is preset to the user and is visually signalled, only one parameter being respectively released by the sequence control for the nominal value input and all the other parameters being blocked for the nominal value input, until that signalled parameter is inserted.

During the setting of a plastics material injection-moulding machine with the aid of the control panel according to the invention, the parameters to be set are automatically called up in succession so that the setter is forcibly and uniterruptedly guided by the setting of the machine. Preferably, it is possible simultaneously to indicate on the control panel for each parameter to be set preferential setting values which serve as a suggestion or as an orientation aid for the setter. If useless parameter values are input by the setter, an alarm signal can be emitted in a further development of the invention. In this way, setting operations on a plastics material injection-moulding machine are rendered extremely simple and fool-proof with the aid of the control panel according to the invention, so that the normal operating staff for plastics material injection-moulding machines can be entrusted with this task.

The invention will be explained in more detail with reference to the drawings, in which:–

*Figure 1* shows a front view of a control panel according to the invention with an associated, diagrammatically shown plastics material injection-moulding machine and

*Figure 2* shows a block diagram of the electrical components of a control panel according to the invention which are material to the invention.

The control panel 10 shown in a front view in Fig. 1 serves for controlling the sequence of operations of a diagrammatically shown plastics material injection-moulding machine 20 which includes in the usual way a drive 21, a control 22, a heated extruder screw 23, a machine column 24, a feed hopper 25 and a closing unit 26 which comprises the mould. The machine control 22 is connected through a connection line 27 to the arithmetic element 30 (Fig. 2) of a microprocessor which forms part of the control panel 10.

On the front of the control panel 10, there are provided a plurality of call-up keys 13a to 13f for parameter nominal values and call-up keys 15a to 15f for parameter actual values. As emerges from Fig. 1, the call-up keys 13 and 15 are distributed on the front of the control panel 10 in such a way that the call-up keys for the machine parameters are arranged in the upper third portion of the control panel front and the call-up keys for the mould parameters are arranged in the central third portion of the control panel front. Within this rough sub-division of the control panel front, the arrangement of the call-up keys 13, 15 has been made such that a horizontal row of call-up keys 13a to 13f and 15a to 15f is provided for the nominal values and the actual values respectively of each individual parameter, in the case of the example shown for pressures and temperatures. Each row of call-up keys 13a to 13f and 15a to 15f respectively can be simultaneously called up by a collective key 11 arranged at the left-hand end of each row. Beneath each individual call-up key 13a to 13f and 15a to 15f, there are located light-emitting diode digital displays 14 and 16, on which a nominal value previously stored or input via a keyboard 12 or a measured actual value is displayed when the asso-

ciated call-up key 13 or 15 or the associated collective key 11 is actuated. The keyboard 12 is situated, together with an alarm display 18, a programming key 19 and a plug board 17 for a read-only memory 80 (Fig. 2), in the lower third portion of the control panel front.

During a setting of the parameter nominal values via the keyboard 12, the setter is forcibly and uninterruptedly guided by the setting of the machine once the programming key 19 has been actuated, in that the parameters to be set are automatically called up in succession by the lighting-up of the associated call-up keys 13. For this purpose, there is provided, as emerges from Fig. 2, a sequence control 50 which is activated upon actuation of the programming key 19. The sequence control 50 is connected at the output end to an input/output unit 60, which is shown in Fig. 2 as a block provided with a dash-dotted edge and which contains an input unit 61, an output unit 62 and a preferential-value store 63. The input unit 61 is connected at the input end to the keyboard 12 via a data collection line 611 and at the output end to a parameter store 40 via a data collection line 612, which store is a component of the microprocessor and is coupled with the arithmetic element 30 via data collection lines 41, 42. The output unit 62 is connected at the input end to the parameter store 40 via a data collection line 521 and at the output end to the digital displays 14, 16 via a data collection line 622. The preferential-value store 63 is connected at the output end via data collection lines 631 and 632 to the output unit 62 and to a monitoring circuit 70 respectively, which circuit is furthermore coupled with the keyboard 12 via a data collection line 71 and controls the alarm display 18.

The mode of operation of the block circuit shown in Fig. 2 is as follows:–

Nominal values for the individual operating parameters of the plastics material injection-moulding mahine 20 (Fig. 1) are stored in the parameter store 40. These nominal values are called up by the arithmetic element 30 and are continuously compared with actual values which the machine control 22 supplies to the arithmetic element 30. In accordance with this continuous comparison, the arithmetic element 30 gives control commands to the machine control 22.

For storing the individual nominal values, there is provided the keyboard 12, the addressing of a nominal value entered into the keyboard 12 being effected by previous pressing of the associated call-up key 13 (Fig. 1). The corresponding addressing of the parameter store 40 as well as the conversion of the keyboard output signals into a form that is readable for the parameter store 40 is effected by the input unit 61. In a similar fashion, the output unit 62 provides the reading-out of the nominal values stored in the parameter store 40 to the digitial displays 14, the addressing of the parameter store 40 being again effected by pressing the associated call-up key 13 shown in Fig. 1. In the same way, the actual values supplied by the machine control 22 and stored in an intermediate store not shown are output by the output unit 62 to the digital displays shown in Fig. 1.

The sequence control 50 controls the input/output unit 60 in such a way that the output unit 62 successively triggers the individual call-up keys 13, and thus the respective parameters, in a sensible order, which is visually signalised by the lighting-up of the triggered call-up key 13. The setter thereupon presses the call-up key 13 that lights up and subsequently inputs the desired or new nominal value via the keyboard 12. Simultaneously with the sequential triggering of the call-up keys 13, the output unit 62 reads from the preferential-value store 63 an associated preferntial nominal value for the respective parameter to the digital display 14 arranged beneath the triggered call-up key 13 in order to give to the setter a suggestion or an orientation aid for the nominal value to be set. The nominal value input by the setter via the keyboard 12 is written via the input unit 61 into the parameter store 40 and is simultaneously fed via the data collection line 71 to the monitoring circuit 70 which compares the preferential nominal value read from the preferential-value store 63 with the nominal value actually input via the keyboard 12 and, if a maximum deviation allowed is exceeded, triggers the alarm display 18.

After the programming or re-programming of the parameter store 40 has been effected, the store contents thereof can be loaded into the read-only memory 80, which is then fixedly associated with the respective mould of the injection-moulding machine 20 shown in Fig. 1. When this mould is used again, all that then needs to be done is to plug the associated read-only memory 80 into the plug board 17 on the front of the control panel 10, which causes the parameter store 40 to be loaded with the store contents of the read-only memory 80.

CLAIMS

1. A control panel for setting the sequence of operations of a computer-controlled plastics material injection-moulding machine, which panel is provided with a plurality of digital displays for the visual reproduction of nominal values input into an electronic parameter store as well as for the visual reproduction of measured actual values of specific processing parameters, for example pressures, temperatures and the like, and with a keyboard for inserting parameter nominal values into the parameter store, characterised by a sequence control for the nominal value input of the individual parameters in a specific or-

der, which is preset to the user and is visually signalled, only one parameter being respectively released by the sequence control for the nominal value input and all the other parameters being blocked for the nominal value input until that signalled parameter is inserted.

2. A control panel as claimed in claim 1, wherein simultaneously with the setting release of a parameter, respectively associated preferential setting values serving as a suggestion or orientation aid to the user are read from an electronic store and are visually reproduced on the respectively associated digital displays.

3. A control panel as claimed in claim 2, wherein a monitoring circuit is provided which compares the preferential setting values read out for a respective parameter with the setting value input by the user via the keyboard and produces a warning signal if a maximum deviation that is allowable is exceeded.

4. A control panel as claimed in any one of claims 1 to 3, including a read-only memory which is loadable with the data from the parameter store when a setting operation is completed.

5. A control panel as claimed in claim 4, wherein the loaded read-only memory can be plugged into the front of the control panel.

6. A control panel substantially as described herein with reference to the accompanying drawings.

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