(12) UK Patent Application (19) GB (11) 2 061 805 A

(21) Application No **8034102**
(22) Date of filing
22 Oct 1980
(30) Priority data
(31) **2942942**
(32) **24 Oct 1979**
(33) **Fed Rep of Germany (DE)**
(43) Application published
20 May 1981
(51) **INT CL³ B29C 1/16**
(52) Domestic classification
B5A M4
(56) Documents cited
GB 1392517
GB 1347099
GB 1309009
GB 1163877
GB 1105183
GB 1050212
(58) Field of search
B5A
(71) Applicant
Karl Händle & Söhne-Maschinenfabrik U Eisengiesserei GmbH & Co KG
Industriestrasse 47
7130 Mühlacker
Federal Republic of Germany
(72) Inventor
Hans Bross
(74) Agents
Sydney E M'Caw & Co
Saxone House
52-56 Market Street
Manchester M1 1PP

(54) **Moulding apparatus**

(57) Apparatus on which the mould parts are mounted in a moulding machine (1) comprises a frame (2), a fixed plate (3) and a movable plate (5). In one embodiment the fixed plate (3) and the frame (2) are spaced apart with the movable plate (5) disposed therebetween. One or more screws (8) extend between and are rotatable in the fixed plate (3) and the frame (2), and pass through nuts (7) attached to the movable plate (5). The screws (8) are driven by motors (9) so as to move the movable plate (5) towards or away from the fixed plate (3). The fixed plate (3), the movable plate (5) and the frame (2) are vertically arranged with the screws (8) horizontal. In another embodiment the fixed plate is mounted on top of the frame, both being horizontally disposed, and the movable frame is disposed horizontally above with the screws extending vertically.

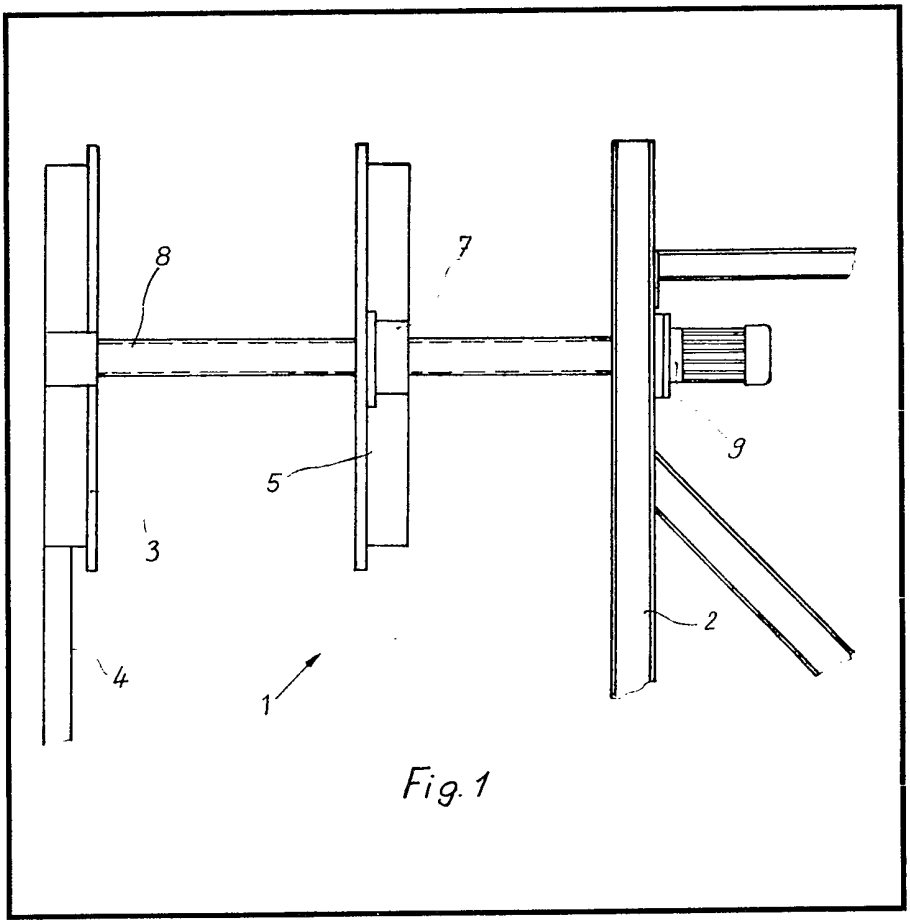

Fig. 1

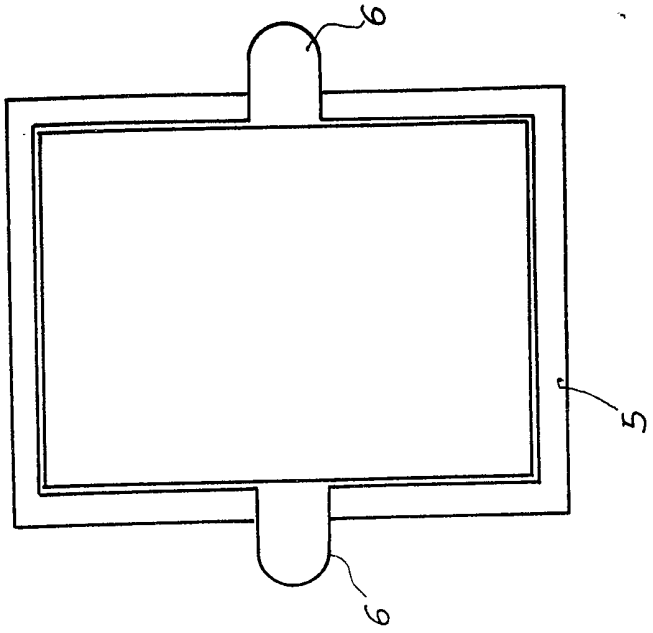

Fig. 2

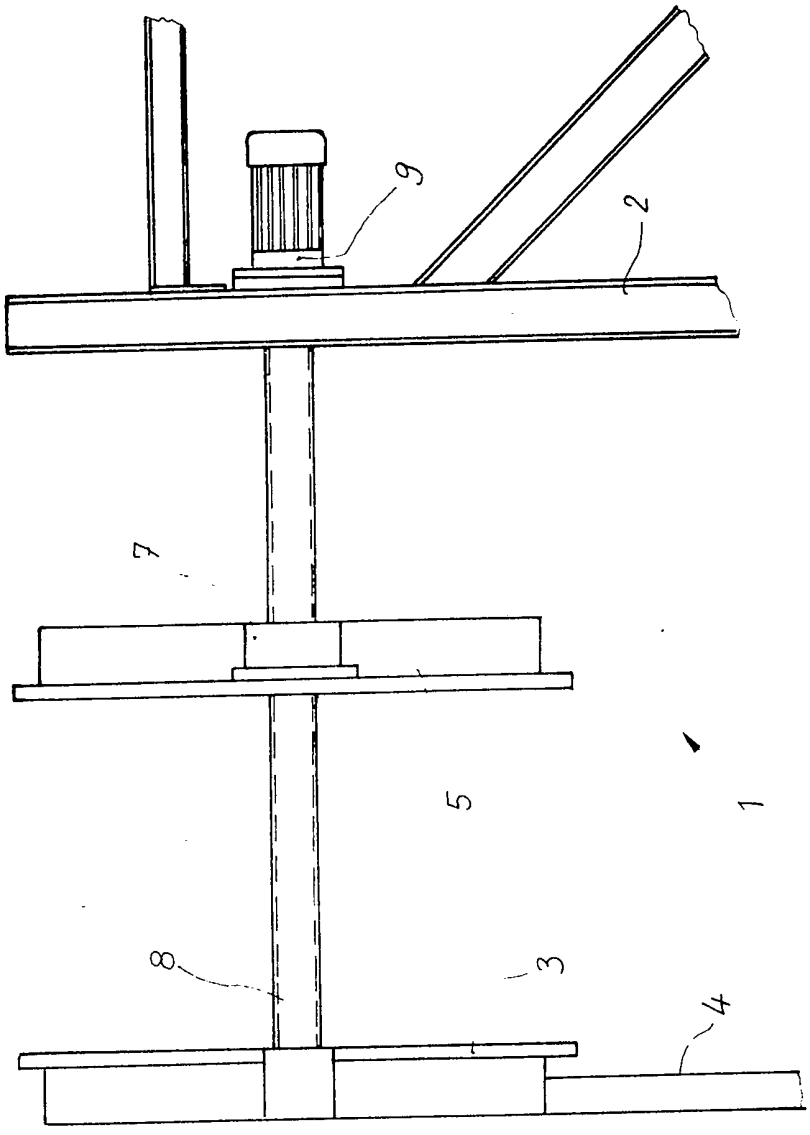

Fig. 1

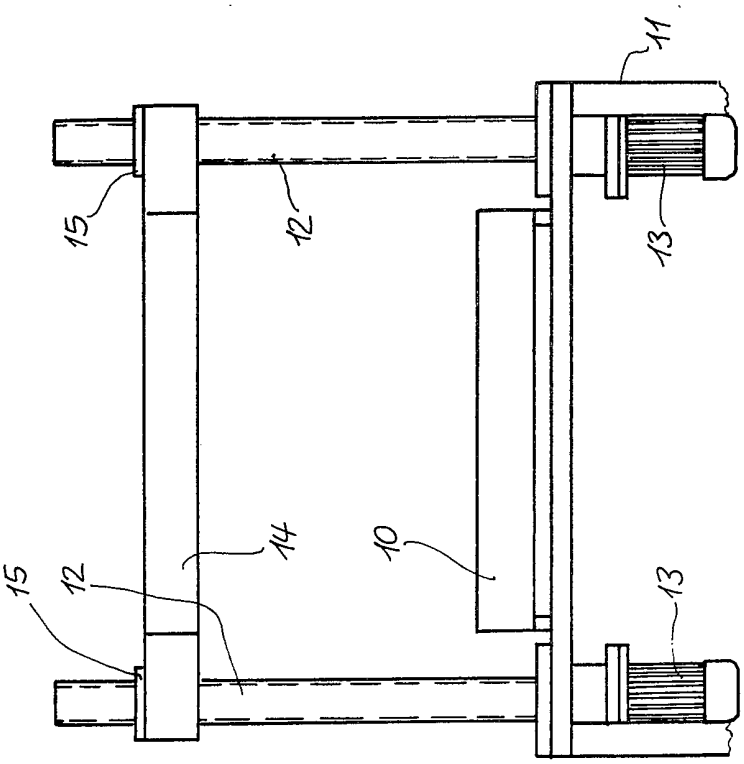

Fig. 4

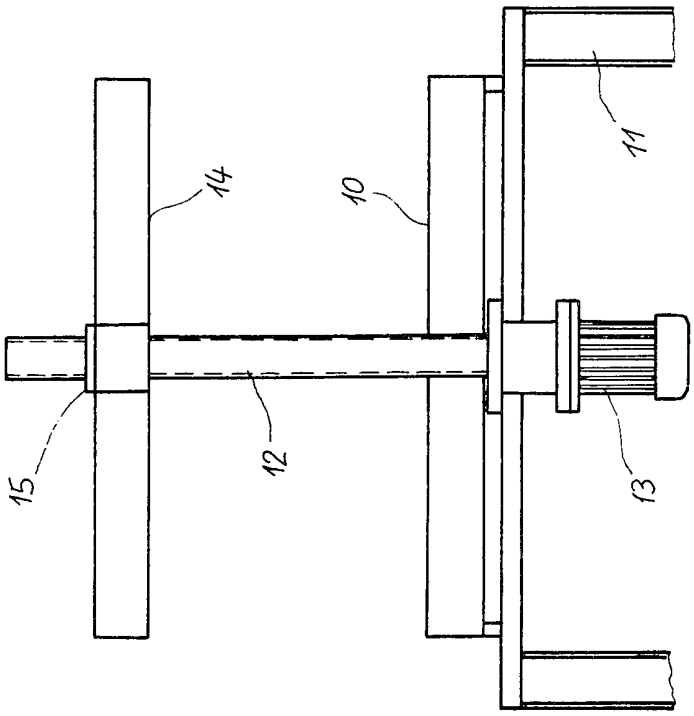

Fig. 3

SPECIFICATION

Moulding apparatus

The invention relates to a device for use in moulding and in particular for the moulding of expandible plastics material.

On machines for the production of plastics material mouldings from expandible plastics material, there is usually provided a two-part expansion mould. The two parts of the expansion mould are mounted on a fixed table plate and on a movably mounted table plate respectively. The movable plate is generally carried on two or four columns so that it can be guided, with the expansion mould part mounted thereon, towards the stationary plate which carries the other expansion mould part.

On a known device, the table plate is driven hydraulically or hydro-pneumatically or else mechanically through a toggle-lever system. The two expansion mould parts are held against each other by means of this driving and adjusting device in the closed position of the expansion mould. The guidance and the drive of the adjustable plate necessitate a considerable expenditure, and the known devices are complicated and susceptible to trouble.

The task underlying the invention is to improve the driving and guiding device or the guiding elements in such a way that there is a reduction in parts and a simple and reliable function of movement of the table plate is brought about with a constructionally uniform drive guidance.

The invention provides moulding apparatus for use in moulding expandible plastics material, comprising a frame, a fixed table plate and a table plate which can be adjustably moved towards the fixed table plate and which is guided in the direction of adjustment, characterised in that the apparatus comprises at least one recirculating ball screw which extends in the direction of adjustment, the or each recirculating ball screw being rotatably mounted on the frame, having a drive motor coupled therewith and having a screw nut mounted thereon, which screw nut is or nuts are attached to the movable table plate.

By this means, there comes about the advantage that the adjustable plate is moved against the fixed plate simply by the rotation of the recirculating ball screw and that special guiding elements are not necessary. The movement advance is effected in a continuous and jerk-free manner. The speed of the advance is selectable by means of the screw pitch and by means of the controllable rotational speed of the drive motor. The adjustable plate is returned merely by a simple reversal of the direction of rotation of the recirculating ball screw. Through the screw nut, which is mounted on top of the recirculating ball screw, of the adjustable plate, the latter is reliably guided during the reciprocating movements, Another advantage consists in that the device can be made or converted without any problem for differences in the lengths of travel between the fixed plate and the adjustable plate, in that there are simply inserted recirculating ball screws of different lengths, whereby complicated constructional conversions on the drive are avoided.

Preferred designs and further developments of the invention are given by the features of the sub-claims, through the application of which various advantageous guide and drive arrangements are provided.

Further advantages and details of the invention will emerge from the following description and the drawings, which show preferred constructional forms by way of example in diagrammatical representation. In the drawings:

Figure 1 shows an adjustable device according to the invention in a side view;

Figure 2 shows a front view of the adjustable plate shown in Fig. 1;

Figure 3 shows a side view of another adjustable device according to the invention; and

Figure 4 shows a front view of the adjustable device shown in Fig. 3.

The device shown in Figs. 1 and 2 comprises a frame 2 and a fixed plate 3 which is arranged so as to be vertical and has a supporting leg 4. Between the frame 2 and the fixed plate 3, there is located an adjustable plate 5 which is also arranged so as to be vertical and which comprises on two sides diametrically opposite eyes 6, in each of which there is provided a screw nut 7. The screw nuts 7 are penetrated by two recirculating ball screws 8 which are arranged at a distance from each other, and which carry the adjustable plate 5, and which are detachably and rotatably mounted in the fixed plate 3 at one end and in the frame 2 at the other end. On the rear of the frame 2, there are secured drive motors 9. Each drive motor 9 is arranged so as to be coaxial with a recirculating ball screw 8 and is coupled with the end thereof that is mounted in the frame 2.

When the drive motors 9 are switched on, the recirculating ball screws 8 are rotated. This causes the adjustable plate 5, together with an expansion mould half (not shown) mounted thereon, to be moved through the pitch of the screw, for example in the direction of the fixed plate 3 which carries the other expansion mould half. This movement occurs in a constrainedly uniform and jerk-free manner, the speed being controllable by a corresponding change in the rotational speed. For the opening of the expansion mould, the adjustable plate 5 is moved backwards in the direction of the frame 2 in that the direction of rotation of the drive motors 9, and thus

that of the recirculating ball screws 8, is reversed. By installing longer or shorter recirculating ball screws 8, it is easily possible to change the travel path between the fixed plate 3 and the adjustable plate 5.

In the device shown in Figs. 3 and 4, the fixed plate 10 is secured to the frame 11 while resting horizontally thereon. The recirculating ball screws 12, which are rotatably mounted only on the frame 11, extend vertically freely upwardly and are driven through the drive motors 13 coaxially arranged therewith, which are secured in the frame 11 and are coupled with the ends of the recirculating ball screws 12. The adjustable plate 14 is mounted parallel to the fixed plate 10 on the recirculating ball screws 12 by means of diametrically arranged screw nuts 15. By rotation of the recirculating ball screws 12, it is possible to move the adjustable plate 14 downwards for closing the expansion mould and upwards for opening the mould, there being simultaneously provided an exact guidance.

The feed device according to the invention is also suitable for other automatically working machines, such as machine tools or the like, whose components, such as tables etc., can be linearly moved, guided and locked without the hitherto necessary guides, such as circular, flat, dovetail or prismatic guides.

CLAIMS

1. Moulding apparatus for use in moulding expandible plastics material, comprising a frame, a fixed table plate and a table plate which can be adjustably moved towards the fixed table plate and which is guided in the direction of adjustment, characterised in that the apparatus comprises at least one recirculating ball screw which extends in the direction of adjustment, the or each recirculating ball screw being rotatably mounted on the frame, having a drive motor coupled therewith and having a screw nut mounted thereon, which screw nut is or nuts are attached to the movable table plate.

2. Apparatus as claimed in claim 1, characterised in that the or each recirculating ball screw is coaxially coupled at one end thereof with a drive motor.

3. Apparatus as claimed in claim 1 or claim 2, characterised in that there are provided two recirculating ball screws which are spaced apart, and in that the movable table plate comprises two screw nuts which are on opposed sides of said movable plate.

4. Apparatus as claimed in any one of claims 1 to 3, characterised in that the or each reciprocating ball screw is arranged so as to be substantially *horizontal* and in that the fixed table plate as well as the movable table plate are arranged so as to be substantially vertical.

5. Apparatus as claimed in claim 4, characterised in that the fixed table plate is arranged at the end of the recirculating ball screw that is remote from the drive motor and at a distance from the frame, and comprises a supporting leg, and in that the movable table plate is displaceably mounted between the frame and the fixed table plate.

6. Apparatus as claimed in any one of claims 1 to 3, characterised in that the recirculating ball screw is arranged so as to be substantially *vertical,* and in that the fixed plate as well as the adjustable plate are arranged so as to be substantially horizontal, and in that the fixed plate rests on top of the frame.

7. Apparatus as claimed in any one of claims 1 to 6, characterised in that the or each recirculating ball screw is detachably mounted on the frame and on the fixed plate.

8. Apparatus as claimed in any one of claims 1 to 7 characterised in that a plurality of recirculating ball screws are provided and are arranged in an equi-spaced group.

9. Moulding apparatus substantially as hereinbefore described with reference to and as illustrated in Figs. 1 and 2 or Figs. 3 and 4 of the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.